

Phenomenologies of Egalitarianism in Free Improvisation:
A Virtual Performer Meets its Critics

By

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Abstract

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This dissertation offers a descriptive, anthropological account of diverse phenomenologies of egalitarian ethics through an experimental ethnography of music and social interaction among performers of free improvisation. Based on several years of ethnographic fieldwork with improvisers in Berlin, Chicago, and San Francisco as a saxophonist and participant in these scenes, I show how performers of free improvisation refrain from instructing or criticizing their peers out of respect for their creative liberty and to maintain their experience of equal status. Consequently, I argue that canonical modes of musical ethnography tend to confirm the utopian conception of free improvisation, widely promoted in discourses on this form of musicking over the past half century, as a practice in which performers are liberated from aesthetic constraints and interpersonal hierarchies.

This project highlights the shortcomings of typical modes of musical and anthropological fieldwork through an experimental fusion of ethnography and arts-technology research in which I have asked improvisers to critique the interactive and performance capabilities of a virtual performer, known as “Maxine.” Designed based on my experiences improvising with, watching, and listening to others, Maxine is simultaneously a virtual performer but also a form of interactive, algorithmic ethnography. By asking improvisers to play with this system and compare it to human performers, the fieldwork presented in this dissertation illustrates how improvisers espouse a wide variety of notions of how egalitarian experience is realized in how each player listens and responds to others in the course of performance. Crucially, it demonstrates that what is revealed in an encounter with a nonhuman social interactant like Maxine is precisely what often escapes canonical approaches to ethnographic fieldwork. Broadly speaking, while some improvisers regard continual displays of attentiveness from their partners as essential to the experience and performance of an egalitarian ethos in musical interaction, others regard these behaviors as injurious to the ideal of a nonhierarchical sociality in sound.

In the process of offering this experiential account of egalitarianism, this dissertation illustrates the many ways in which the design of artificial social interactants implicitly poses a

variety of provocative hypotheses about the nature of listening and musical cognition as it takes place between improvisers, many of which are yet to be tested through methodologies such as the one practiced in this project as well as analysis of recorded performances of free improvisation. Furthermore, I also argue that the methodology developed in this project suggests productive new avenues for phenomenologically-oriented ethnography in that encounters with an artificial social interactant like Maxine elicit commentary on real-time sociality as an experience which participants normally refrain from discussing, both within and far beyond free improvisation. By eliciting explicit articulations of ethical normativities, as conceived of by improvisers interacting with Maxine, this project also responds to recent work in the anthropology of ethics by suggesting that much of human moral experience may take the form of latent moral critiques, in which subjects experience an unfulfilled desire to express criticism of the behavior of their interlocutors but nonetheless refrain from doing so for a variety of reasons. Lastly, I argue that subjecting artificial social interactants to the evaluation of the human beings they are modeled upon constitutes a radically new, vibrant form of critical ethnography, one which is implicitly performed throughout the field of human computer interaction even if its practitioners hardly theorize it as such.

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Chapter 1: Torsten's Silence

“I *wish* I could tell other people things like this!”

Torsten¹ is frustrated with Maxine. In the casual, private setting of an April afternoon in 2015 at his apartment in Berlin, he and Maxine have just finished playing a handful of short improvised duos, with Torsten on his usual instrument, the double bass, and Maxine working with controlled feedback and synthesizers. Like many improvisers Torsten has played with, Maxine has a rather unfortunate tendency to confuse and mislead him as they play together. At one point, Maxine suddenly unilaterally tears into an aggressive stream of musical ideas, a radical change in direction from a relatively quiet moment with Torsten. The sharp turn prompts Torsten to join in, thrashing at his bass strings as the two build energy together for a moment.

Abruptly, Maxine pauses in the middle of this rush of sound to lie inactive and Torsten follows suit. In the tense silence, Torsten glances over to Maxine expectantly, waiting for the pause to break back into a storm of sonic activity. Assuming that Maxine will resume with another bout of energetic playing, Torsten ends the silence with a new barrage. Rather than coming along, however, Maxine remains quiet, leaving Torsten out alone, almost as if to suggest an inappropriate excess in Torsten's response to the silence.

Built to play with performers of free improvisation like Torsten just as they would with one another, Maxine is not a person, but a system I have designed to make music with improvisers in the same manner they would with one another (Banerji, 2010, 2012, 2014, 2016, 2018). Physically, Maxine consists of two microphones, an audio interface,² laptop, loudspeaker, and assorted cables. Computationally, Maxine is a set of algorithms that extract pitch and amplitude information from incoming audio signal in order to guide the system's sonic responses to its current environment. Ethnographically, Maxine is my algorithmic impression of the practices of listening and interaction I have observed in improvisers in my engagement in this scenes as a concertgoer and saxophonist over the past decade.

Like other systems of its kind (Assayag & Dubnov, 2004; Blackwell & Bentley, 2002; Bown, 2011; Carey, 2012; Casal & Morelli, 2007; Collins, 2008; Hsu, 2005; Lewis, 1999; Linson, Dobbyn, Lewis, & Laney, 2015; Yee-King, 2011), Maxine is built to embody the values of freedom and egalitarianism which have informed the socio-musical practice of free improvisation over the past half century (Bailey, 1980/1993; Baraka, 1967; Carles & Comolli, 1971/2015; Lange, 2011; Rodriguez, 2016; L. Smith, 1973; Stanyek, 1999; Steinbeck, 2010b; Wilmer, 1980). No player acts as leader. Players are unfettered by the external direction of a composer, unmoored from any commitment to upholding conventions of genre or tradition, and without an obligation to organize their playing around parameters like form, harmony, or pulse. Ideally, each player hears that other players are listening, able to sense the impact of their sonic activities in how others play. At the same time, each player also feels independence from their partners, neither needing to, let alone always able to, control or guide how others play through sonic suggestions alone.

¹ Any individual named by first name only has been given a pseudonym.

² This is a digital device that converts audio signal from analog to digital and vice-versa.

But again, all this *ideally*. As Torsten makes clear, Maxine's ways of listening and interacting remind him of the numerous times when players have engaged in conduct that falls short of his expectations or desires for how an improvisatory collaboration should proceed. As I have with over 100 improvisers, primarily in Berlin, Chicago, and San Francisco, I am meeting with Torsten in order to allow him to play with Maxine and offer his feedback on how the system compares to a human player in order to use this commentary to re-design the system to behave in a more humanlike manner. Unfortunately, Torsten confirms that I have succeeded in my goal of creating an interactive system that embodies the behavior of a human improviser. Regrettably, however, it is not necessarily the behavior of an improviser who Torsten finds to be a delightful and engaging partner, but instead one that annoys him, as he makes abundantly obvious in his commentary on his experience playing with Maxine.

Nevertheless, as much as Torsten finds something familiar in Maxine's irksome ways of making music with others, his exasperated comment reveals that the opportunity to openly, directly, and explicitly divulge his feelings of dissatisfaction with another player is wholly out of the ordinary in his experience as an improviser. The freedom to be frank afforded in his meeting with Maxine reminds him of the awkward reality that being an improviser means one must keep quiet about what one really thinks of other players, no matter how displeased one may be. And so Torsten interrupts his litany of complaints with a broader meta-complaint about the way improvisers have chosen to practice their brand of egalitarianism. His interjection swiftly indexes a long catalog of annoying improvisers he has never felt the liberty to directly criticize. For all the times that another player may have gotten on his nerves, Torsten would never have had the nerve to call them out for it. Like most improvisers, Torsten simply conceals these misgivings with pleasantries — "*That was great!*" "*Let's do it again!*" Instead of confronting the other player, one simply doesn't call them back.

As is the case for many improvisers, Torsten's encounter with Maxine exposes a profound ambivalence about the ways that participants of scenes of free improvisation experience the twin values of freedom and egalitarianism that drive this practice. In principle, the practice of free improvisation liberates musicians from a variety of constraints typically assumed in many musical practices. Rather than orienting their playing towards the realization of a composition or other musical plan (e.g., a verbal sketch of how the performance should proceed), performers of free improvisation instead leave the music to develop as an artifact of the ensemble's indeterminate interactions. The nonuse of a formal blueprint for the performance implies that performers are more or less free from any kind of expectation — from other performers, the audience, or another observer — that their performance adhere to a well-defined standard for evaluation.

The same principle structures the common practices of interpersonal social organization among musicians and other participants. In order to preserve the experience of freedom in the course of performance, musicians refrain from organizing themselves according to any of the usual hierarchies which often govern music as a collective activity (e.g., composer/performer, leader/ensemble, soloist/accompanist, etc.), the same often being true for other participants (e.g., critic/performer, teacher/student, expert/novice). Theoretically the combination of these commitments to emancipation from musical and social structure leaves musicians at liberty to contribute to (or obstruct) the ongoing sonic moment with whatever materials lie within reach.

But as Torsten's comment reveals, improvisers still doubt the ultimate desirability of allowing musicians the unrestricted privilege of exercising the sonic freedom afforded by the principles of this practice. His meeting with Maxine recalls the many occasions that he has had to deal with improvisers who fail to perform in a manner conducive to the experience of an egalitarian partnership and collaboration. The aggravation audible in the tone of his voice readily denotes that Torsten's disappointment with other improvisers is far from occasional. On the contrary, to put up with lousy players seems to be almost inescapable his experience of free improvisation as a performer working with many other musicians over time. To be a player in such scenes means that one will inevitably encounter other artists who use their improvisational liberties to upset the flat, nonhierarchical arrangement between players through their impromptu actions in performance. Still, regardless of whether other players take an aggressive, domineering stance or consistently laying back in order to cede power to others, improvisers like Torsten feel that it is inappropriate to ever voice such criticisms directly.

Questioning Freedom

What do performers of free improvisation expect of their collaborators in musical and social interaction? What does the nature of such expectations (as well as their frequent concealment from fellow performers and other participants) illustrate about the efficacy of abstract values like freedom and egalitarianism in real social practice? The realities of the values of freedom and egalitarianism? This project examines the nature of such expectations through an experimental ethnographic practice in which human musicians improvise with a performer made from computing machinery and compare this performer to human players.

Discourses on free improvisation frequently promote the notion that this practice liberates performers from many of the constraints assumed across a wide variety of other musical art forms (Bailey, 1980/1993; L. Smith, 1973; Zorn, 2000). Implicitly, such discourses suggest that performers are delivered of any expectation to adhere to a set of prescribed or tacit standards for how they should exercise their creative agency. Experiences like Torsten's beg the reconsideration of the notion that performers of free improvisation truly believe in the efficacy of leaving complete liberty to their fellow performers in the course of collective improvisation.

On the one hand, the proposition that the practice of free improvisation is defined by a certain "reverence for uncertainty" (Borgo, 2005, pp. 13-35) is well-reasoned. By their relentless commitment to the underspecification of the outcomes they desire from the performance, performers leave themselves open to the unpredictability of what may happen. As literature scholars Daniel Fischlin and Ajay Heble suggest, improvisation, particularly "free improvisation," is just one of many types of "liberatory cultural practices" (2004a, p. 2) across the 20th century. Writing with George Lipsitz, they testify that they "believe" that improvisation is an "emancipatory practice" (2013, p. xi) which "compels us to leave our comfort zones" (*ibid.*, p. xxxi).

On the other, however, Torsten plainly conveys that this "reverence for uncertainty" is rather heavily qualified; he doesn't really want just any kind of uncertainty. As is the case for many other improvisers I have asked to play with Maxine, he does not have the "openness to unexpected outcomes" (*ibid.*, p. xii) that Fischlin, Heble, and Lipsitz assert is integral to

collaborative improvisation. Outwardly, improvisers may profess such suspension of judgment; inwardly, however, their encounter with Maxine reveals a whole catalog of sentiments which escape the rhetoric of free improvisation as an experience of emancipation and liberation.

Of course, that free improvisation hardly amounts to the achievement of complete musical freedom has already been suggested by many scholars. Jason Stanyek (1999) was among the first to discuss the complicated relationship between free improvisation as a practice and freedom as an achievement by highlighting experimental vocalist Sainkho Namtchylak's sentiment that "a lot of it doesn't sound very free to me" (Dutton & Raine-Reusch, 1997, p. 7, qtd. in Stanyek, 1999, p. 45). Based on ethnographic engagement with free improvisation as a performing saxophonist, David Borgo observes that the "'freedom' inherent in free improvisation is not an 'anything goes' type of anarchy" (Borgo, 2002b, p. 19). In a similar vein, George Lewis writes that "it may be difficult to see how free improvisation avoids becoming an idiom like all the others out there" (Lewis, 2004a, p. 22), critiquing Derek Bailey's continual implication in *Improvisation: Its Nature and Practice in Music* (Bailey, 1980/1993) that this practice transcends the limits of various "idiomatic" genres. Extending Lewis' critique, Melvin Backstrom finds that performers exhibit an audible tendency to reduce their freedom "to only a small portion — that of the most abstract, rhythmically irregular, and non-tonal — of the total sonic possibilities available for musical instantiation" (Backstrom, 2013, p. 2).

For observers of the pursuit of freedom beyond this practice, it is quite unsurprising that free improvisation fails to liberate musicians. Within music studies, this point has been made in diverse cases. For example, Joshua Gunn (1999) proposes that there is a certain "inevitability of genre" which emerged in the relationship between goth and punk rock. As Gunn notes, many practitioners of goth understood themselves as attempting to remedy the paradoxically cliched nature of punk rock, a cultural practice symbolizing, broadly speaking, various forms of resistance. Ironically, however, this effort leads to the formation of goth, a genre which far from transcending cliché is itself a subculture which immediately brings audible and visual tropes to mind.

In an arena more closely linked to free improvisation, Theodor Adorno (1955/2002) comments on a strikingly similar assumption which shot throughout much of the discourse of new music, particularly atonality. While the departure from tonality as a structure for organization of pitch in the compositional practices of Arnold Schönberg and others was at one point a resistance to an audible ubiquitous cultural norm, Adorno makes the rather obvious point that it is ridiculous to assert that this is a "new" idea once it essentially becomes a paradigmatic, perfunctory expectation in mid-century "new music." Much of what Gunn and Adorno write can also be said for free improvisation. At one point, free improvisation was a novel practice. Over time, however, the sensation of innovation in its sonic results wears off, particularly if a handful of traits consistently emerge in how musicians choose to practice this purportedly "innovative" music.

Outside music studies, still more scholars have established that the quest for liberation often leads to situations which still involve new forms of constraint. At the level of individual behavior, sociologist Erving Goffman questions the notion of authentically "spontaneous" social action by arguing that the impromptu qualities of such actions are actually quite well rehearsed: "the performer is typically unaware of just how routinized [his or her] performance really

is” (Goffman, 1959, p. 49). In activist collectives, feminist scholar Jo Freeman (1972) describes a “tyranny of structurelessness” in organizations which deliberately avoid a formal hierarchy between participants. While the lack of hierarchy allows for new forms of collaboration and agility in the group’s work, it is also crippling. When members with dominant personalities acquire greater influence in the group, the remaining constituents are implicitly barred from being frank about the imbalance in power distribution that has accrued because all members are putatively “equals.”

At the intersection of culture and politics, Frantz Fanon (1968) warns of the tendency of anticolonial struggles to lead to the elaboration of neotraditionalist cultural movements which retain many of the repressive qualities of colonization. Rightly regarding foreign rule as a situation in which the freedom of the colonized is robbed, these movements often regard a return to precolonial traditions (or cultural phenomena imagined as such, at least) as a restoration of “freedom.” In terms of international relations after decolonization, Fanon also prophesied lingering colonial relations between newly independent and formerly colonizing nations which preserve the inherent political imbalance that existed before.

On the scale of electoral politics, Jacques Derrida (2005)³ refers to such paradoxes as “autoimmunity.” In its original context in physiology, the term refers to unfortunate afflictions in which an organism’s defense mechanisms against infections attack not the enemy, but the organism itself. Derrida creatively reapplies this term to describe the ever-disturbing phenomenon of leaders with totalitarian tendencies or sympathies rising to power through the standard electoral process. Though the democratic process should theoretically prevent the rise of such a leader by ensuring that the majority’s choice is carried, there is nothing in a democracy that prevents the rise of a leader with no respect for the idea that their rule should reflect the consent of the governed. Moreover, it is not only that such a leader rises to power, but that they do so through precisely the means that should prevent tyranny.

The weight and breadth of these critiques should give any reasonable observer of free improvisation serious doubts about the idea that this practice either affords complete creative liberty or avoids the risk of new constraints slowly emerging. Nevertheless, to say that a pursuit of freedom negates itself can only be the beginning of the study of such phenomena. If free improvisation “doesn’t sound free,” as Namtchylak claims (Dutton & Raine-Reusch, 1997, p. 7), then why? And what does it sound like? And why are these sounds assumed to be a more appropriate or logical embodiment of freedom? If the “‘freedom’ inherent in free improvisation is not an ‘anything goes’ type of anarchy” (Borgo, 2002b, p. 19), then what exactly are the limits of what is acceptable? What do those limits mean in terms of how participants recognize “freedom” or “equality” as experiences in making music? If free improvisation has become an “idiom,” then what are its idiomatic constraints and why? If the outward social performance of a sense of tolerance and openness conceals what many improvisers “*wish*” they could insist that other players do, as Torsten confessed to me, then what do these wishes signify? If participants

³ For the present discussion, this particular text of Derrida’s is most relevant. While that text features Derrida’s arguments about autoimmunity in the case of democracy, however, an earlier essay, “Faith and Knowledge” (Derrida, 2002), asserts that this notion of autoimmunity applies to a far wider range of institutions (see Naas, 2006).

of a project aimed at an experience of liberation do not experience liberation, then what can be learned from the shortcomings of their efforts?

To borrow from Gavin Steingo's recent monograph on Kwaito music in South Africa, encounters with Maxine reveal how improvisers "struggle, not for freedom, but with freedom, in freedom, or perhaps against freedom" (Steingo, 2016, p. 2). Improvisers are quite "free" from many typical orthodoxies of musical practice. Their ways of being and making music with one another allow many kinds of latitude and liberty which players regularly exploit. All the same, this freedom leaves them with many dissatisfactions and discontents. For radically different reasons and in a radically different context, improvisers "struggle precisely because they are free" (ibid.). The freedom from the judgment of others means they continually endure the vexatious musical habits of their peers in silence.

Free Improvisation as an Egalitarian Practice

An improviser's habitual hesitation to discuss what they think of fellow players reflects a distinct interpretation of the relationship between freedom, equality, and communicative practices between persons. Refraining from instructive or critical commentary on how others play serves to preserve — nominally, at least — each participant's experience of a sense of freedom from the normative judgments and corrective disciplining of experts. Parallel to this preservation of liberty, abstaining from instruction or critique of peers also preserves the equality of status between participants. For improvisers, to engage in such commentary would constitute a speech act (Searle, 1969) which intrinsically places the speaker in a position of authority over the addressee and thereby upsets the flat, nonhierarchical relationship desired.

Finding a sociocultural milieu in which one can experience freedom from the evaluative scrutiny and feedback of experts or other practitioners is what attracts many performers to free improvisation. For example, improvising cellist Tristan Honsinger suggests that part of what inspired him to pursue free improvisation was the frustration of experiences like studying with a private teacher who insisted that he imitate his mentor's style as much as possible (Honsinger & Uitti, 2006, pp. 476-477). Aside from my own observations of this habitual reticence through ethnographic work as in Berlin, Chicago, and San Francisco, others have also found that improvisers hesitate to criticize their peers for similar reasons (Borgo, 2002b; Pras, Schober, & Spiro, 2017). The tendency towards this interpretation of egalitarianism as an ideal requiring the renunciation of critical feedback is all the more striking when free improvisation takes place as a collective activity among students supervised, howsoever nominally, by an expert. Music education scholar Maud Hickey (2015) notes that even in a situation where the instructor is a celebrated performer, the "leader" of this pedagogical situation strains to avoid any kind of "evaluative" feedback.

Paradoxically, however, this conception of egalitarianism as the silencing of one's appraisals of other players prevents the open enunciation of how players conceive of egalitarianism as an experience of collaboration in music-making itself. More importantly, this anti-evaluative conception of egalitarianism leads players to stay silent on the many moments when other improvisers fail to live up to such ideals. In other words, the effort to preserve equality by abstaining from evaluation leads musicians to silently endure players whose

domineering or passive interactive approaches yield an unequal collaboration. Derrida's concept of "autoimmunity" (2005) aptly describes this contradiction. Instead of liberating players from the experience of hierarchy, the egalitarian pressure to steer clear of judgmental talk about other musicians leads improvisers to quietly put up with the inequalities they are made to experience in the moment of play.

For the most part, the presence of Maxine as a kind of "co-ethnographer" in my fieldwork (see Banerji, 2012) allows improvisers to break this silence. Beneath the egalitarian veneer of nonjudgmental tolerance, the encounter with Maxine reveals two conflicting conceptions of how egalitarian partnership should proceed in the course of musical interplay. In several instances, improvisers suggest that one experiences equality (and enables this experience for others) in collective improvisation by continually engaging in displays of attentiveness which indicate that one is listening to other players. In so doing, players convey a sense of *cooperation* and support in their ways of engaging with each other's decisions and actions in the moment. Practicing this form of egalitarianism means that one continually signals one's attentiveness through actions which other players can easily recognize as a response. This promotes the experience of egalitarianism in that the piece which emerges through the performance is the result of mutual influence among individual players. It is understood to promote an experience of freedom in that players are liberated from interpersonal hierarchies. Conversely, this conception of egalitarianism regards the failure to display attentiveness as an interactive behavior contributing to an imbalance in the ideal: a nonhierarchical sociality.

However, this concept of egalitarian experience is by no means the only conception elicited through meetings with Maxine. Aside from this more cooperative notion of egalitarianism, improvisers' critiques of Maxine prompt them to characterize egalitarianism as an ideal which demands that each participant maintain their *autonomy* from the rest. In this frame of mind, displays of attentiveness are regarded as a kind of interactive behavior which resembles the leader-follower relationships that improvisers aim to avoid. Generally speaking, it can be said that this approach to interaction places a relatively higher value on the experience of freedom than on an experience of egalitarianism. By retaining the right to be unaffected and uninfluenced by the rest of the group, improvisers in this frame of mind may find that this interactive attitude enables a sense of freedom from the bonds and responsibilities which are essential in many forms of social interaction and other kinds of social proximity. Nevertheless, autonomy continues to enable a sense of equality as each player exercises their equal right to ignore the rest (or not). While both approaches involve "listening" in that players may very well be receiving sonic information from their collaborators, this more autonomist conception of egalitarianism complicates any simple rendering of what it means to "listen" in an interaction. Though performers taking this attitude towards interaction may very well be keenly "listening" to other players are doing as the piece progresses, there are few traces in the overall sonic surface of the performance that this "listening" is taking place.

Anthropologies of Ethics

While theorists of egalitarianism have advanced a vast array of *normative, prescriptive* conceptions of how this ideal should be thought of or brought into practice (Arneson, 2013), this

project aims to offer a *descriptive* account of how egalitarianism has been framed and practiced in a particular sociocultural world. The purpose here is not to determine what would constitute the “correct” or “ideal” manner of practicing egalitarianism so much as it is to examine how performers have framed “correct” or “ideal” egalitarian practices and how their experiences with others compare to such ideals. In taking this approach, this study builds on anthropological investigations of the relationship between ethical ideals and social action in various sociocultural worlds (Fassin, 2012c; Heintz, 2009; Howell, 1996; Laidlaw, 2002; Lambek, 2010b; Mattingly & Throop, 2018). Regarding the epistemological orientation of this work, Didier Fassin offers a powerful clarification of the descriptive stance for an anthropology of morality (or as he prefers, “moral anthropology”):

A moral anthropology... does not support particular values or promote certain judgments more than political anthropology would favor a given partisan position or recommend a specific public policy. It does not defend the rights of peoples to define and implement their particular values or, conversely, the overarching authority of universal human rights. It neither condemns so-called genital mutilation and forced marriage nor denounces as imperialist the efforts deployed by feminists to combat them. It takes these moral tensions and debates as its objects of study and considers seriously the moral positions of all sides. A moral anthropology has no moralizing project (Fassin, 2012b, pp. 2-3).

As such, the present investigation abstains from judgments about how various improvisers have chosen to practice egalitarianism. Instead, the focus here is on how egalitarian practice is conceived and evaluated as well as the numerous other concepts which such notions of equal partnership carry within them.⁴

This project contributes to anthropological theorizations of morality and ethics by describing a quotidian form of moral experience which has been given scant attention across the anthropology of ethics. Specifically, this category of moral experience is typified by the kind of sentiment one hears in Torsten’s voice in response not only to Maxine, but to the other improvisers in his past and present who leave him dissatisfied with their conduct with respect to egalitarian ideals. While Torsten wishes to criticize other improvisers for their failure to embody egalitarianism (in his conception of what this is, at least), an egalitarian commitment to suspending the right to criticize others effectively bars him from enunciating such criticisms. As a result, the critique of how others fail to live up to a particular moral ideal — in this case, egalitarianism — remains latent, rarely manifesting itself in word or deed and yet remaining a central element of what improvisers experience in their coexistence with one another.

In other words, *latent moral critique* is a key feature of the experience of being a participant of this particular social world. These improvisers frequently experience a desire to

⁴ Fassin goes on to respond to the reader who might immediately find that what he has expressed (in the passage quoted above) to be completely obvious: “After all, is it not the foundational principle of any social science to analyze rather than evaluate, to understand instead of judging?” (Fassin, 2012b, p. 4)? Despite the self-evident nature of such a critique, however, it is clear that this non-normative stance has not always been the dominant position in anthropology (i.e., Scheper-Hughes, 1995).

correct others' behavior in order to bring it in line with their conception of a specific moral ideal. Nevertheless, they feel that they have no right to do so. Consequently, such critiques remain latent.

Anthropologists of ethics have recently begun to examine the breadth and variety of moral experience across culture and context (Cassaniti, 2014; Parish, 2014; Throop, 2010; Zigon & Throop, 2014). All the same, relatively little conceptual space has been allotted to the discussion of latent moral critique as an element of such experiences. Broadly, anthropological considerations of morality and ethics have outlined three basic forms of moral experience. The concept and practice of "critique" is integral to each of these forms of moral experience in different ways.

The first of these describes various ways in which actors work to *adhere* to the moral prescriptions of their particular sociocultural world. From economic development (Pandian, 2009; Scherz, 2014), to charity and aid work (Fassin, 2012a; Watanabe, 2014), business practice (Weeratunge, 2010), family relations (Garcia, 2014; Mattingly, 2014; Parish, 2014), social interaction (Sidnell, 2010), religious identity and national belonging (Das, 2010; Mahmood, 2005), and the phenomenology of a particular sociocultural world (Cassaniti, 2014; Throop, 2010), several anthropological examinations of ethics document how human beings strive to live up to culturally-bound ideals.⁵ In the case of adherence to dominant moral principle, critique of immoral, or perhaps "not-yet-moral," action is essential as a means of correcting behavior and bringing it in accordance with principle.⁶

Naturally, unexpected contingencies of a given situation demand that actors reconsider the validity of dominant principles of right and wrong. Such cases prompt individuals to improvise and *suspend* their commitment to following one or more moral ideals. Generally, anthropologists have characterized this kind of relationship between action and prescription as "ethics" (Zigon, 2007). The need to hold such commitments in abeyance arises from the fact that following such commitments may lead one to engage in actions which contradict moral principle. For example, Kant's famous example of the question of whether one should answer truthfully when asked if one's sibling is at home by a killer who intends to murder said sibling (Kant, 1797/1949) exemplifies such quandaries, albeit with a rather dramatic scenario. Such

⁵ It must be noted that anthropological work on ethics proposes neither that ethnographic subjects are intrinsically morally-upright beings nor that they succeed or fail in their moral endeavors. As Michael Lambek writes, "ethnographers commonly find that the people they encounter are *trying* to do what they consider right or good, are being evaluated according to criteria of what is right and good, or are in some debate about what constitutes the human good" (Lambek, 2010a, p. 1, emphasis added).

⁶ The forms and mechanisms of such critique are diverse and lie beyond the scope of this project. Broadly speaking, Michel Foucault's work, almost in its entirety, provides numerous ways of theorizing the role of such critiques in the formation of ethical subjects, though the approach to this problem varies considerably across his life's work. For example, as James Laidlaw points out, the "much-cited 'Foucault'" (Laidlaw, 2014, p. 93), typified in works like *Discipline and Punish* (Foucault, 1977), emphasizes that social institutions of one form or another bring individuals to conform to prescribed norms through processes of domination and subjugation. While this is true of many means of "training" publics to act a certain way, Foucault later rejected this thinking (1997) for its exclusion of the possibility that individual subjects also participate in this conformity. In other words, social control is not always accomplished by brute force; subjects work on themselves in order to bring themselves into conformity with prescribed norms. Numerous other anthropologists have described the various ways in which moralities are cultivated in populations (Hirschkind, 2006; Mahmood, 2005; Zigon, 2009b).

responses to the inadequacies of moral principle range from improvisatory adjustments made in the moment (Feldman, 2016; Zigon, 2007)⁷ to longer-term compromises and reconfigurations of personal and local moral priorities (Garcia, 2014; Piliavsky & Sbriccoli, 2016; Willen, 2014). In such cases, actors do not fundamentally reject the principles which shape their worlds even as they find that specific incidents require that they temporarily break with standing ideals. All the same, these small adjustments or temporary solutions constitute a form of “critique” of dominant moral principle.⁸

Beyond these two relations of conformity and amendment, anthropologists have also examined the various ways that the inadequacies of various ideals precipitate more than just an improvisatory response. Instead, the situation demands a more sustained and targeted revision or critique of one or more currently active or dominant moral principles (G. Coleman, 2013; Dave, 2011, 2012; Stoczkowski, 2008; Zigon, 2014). Crucially, while it is often the case that activist goals are deemed immoral by the dominant moral framework they seek to revise, the critiques at the core of such movements are often grounded in a set of alternative moral principles of their own.

These three categories of moral experience encompass a great deal of human moral experience and remain of analytical value for an anthropology of ethics. Still, what about Torsten and other improvisers who wish they could be more honest with fellow players about their playing and interactive styles? In one sense, improvisers abide by an implicit egalitarian proscription against peer critique and in this way their experience corresponds to the various forms of moral adherence described above. At the same time, this proscription means that they silently endure what they cannot critique. For whatever reason, they do not feel entitled to the ephemeral critiques of moral principle inscribed in an impromptu amendment or suspension of one’s routine, habitual obedience to accepted doctrines. Moreover, unlike activist movements, improvisers neither engage in a systematic effort to dismantle the tacit prohibition of peer critique.

By their very nature, latent moral critiques are rather difficult to observe through traditional forms of ethnographic fieldwork. This is precisely because actors labor to conceal the critiques which they wish they could express to others or otherwise openly articulate. However, the encounter with Maxine allows for this dimension of moral experience to be more directly examined.

⁷ Drawing on the work of philosopher Alain Badiou (2002), Marcel Cobussen (2005) has also proposed that the use of judgment and discretion in order to amend one’s blind adherence to moral prescription, or “ethics,” is frequently improvisatory.

⁸ The forms and mechanisms of such critique are diverse and lie beyond the scope of this project. Broadly speaking, Michel Foucault’s work, almost in its entirety, provides numerous ways of theorizing the role of such critiques in the formation of ethical subjects, though the approach to this problem varies considerably across his life’s work. For example, as James Laidlaw points out, the “much-cited ‘Foucault’” (Laidlaw, 2014, p. 93), typified in works like *Discipline and Punish* (Foucault, 1977), emphasizes that social institutions of one form or another bring individuals to conform to prescribed norms through processes of domination and subjugation. While this is true of many means of “training” publics to act a certain way, Foucault later rejected this thinking (1997) for its exclusion of the possibility that individual subjects also participate in this conformity. In other words, social control is not always accomplished by brute force; subjects work on themselves in order to bring themselves into conformity with prescribed norms. Numerous other anthropologists have described the various ways in which moralities are cultivated in populations (Hirschkind, 2006; Mahmood, 2005; Zigon, 2009b).

It may seem that the kind of passive-aggression at work in free improvisation is entirely particular to this practice and its commitment to egalitarian ideals. What reason is there to propose that such latent moral critiques are anything other than a unique social psychological feature of this scene or its specific brand of egalitarianism? The final answer to this question rests on the shoulders of subsequent social-scientists of moral experience. Nevertheless, various widely-observed social phenomena suggest that latent moral critiques may be a feature of moral experience more generally. For example, the hesitation to openly criticize or instruct other improvisers is just one manifestation of the general social behavior of “face-work” (Goffman, 1967). At the surface of the interaction, successful face-work prevents the open exposure of embarrassment and occurs through a variety of mechanisms elaborated in other social-scientific literature (see Brown & Levinson, 1987, for example). It is quite likely, therefore, that what transpires in the internal psychological life of an improviser may have relevance for broader theorization of the nature of moral experience and well beyond the immediate contexts of free improvisation or egalitarian sociality.

Examining Egalitarianism in Social Interaction

As a moral ideal, egalitarianism is typically conceived of as pertaining first and foremost to distributions of economic, political, or legal resources and powers. For the most part, discussions of egalitarianism are concerned with matters such as differentials in wealth across populations, access to and the ability to use various mechanisms within a society’s standard political or legal procedures. According to this typical framing, then, an anthropological account of egalitarianism would primarily be concerned with an empirical assessment of how and to what degree participants of a particular social milieu are equal in terms of their economic, political, or legal powers and resources.

Given the undesirable consequences of inequality in these three domains,⁹ the utility of examining egalitarianism (or lack thereof) as manifested in economics, politics, or law is more or less self-evident. Nevertheless, confining the ethnographic, descriptive study of egalitarian practice to these three domains has significant shortcomings which stand in the way of a more holistic account of what this lofty ideal might really refer to in the hearts and minds of egalitarian practitioners. Framing egalitarianism exclusively in terms of these three relatively larger structures overlooks the numerous ways this value manifests itself, or fails to, in the fleeting ephemerality of face-to-face social interaction. Manifestations of inequality are not necessarily limited to disparities in financial resources, representation in legislative assemblies, or the ability to afford a capable attorney. Inequality easily manifests itself in how individuals participate in a social interaction and how equally their participation is reflected in the outcome of such encounters.

As a complement to the broad array of anthropological studies of egalitarianism in a variety of societies, this study advances the examination of how egalitarianism is *experienced* in the course of human social interaction and how such experiences vary. Beyond its theorization as

⁹ It must be noted that not all scholarly commentators on egalitarianism subscribe to the worldview that this concept is of inherent value (see Frankfurt, 1987, for just one example of many).

an economic, political, or legal ideal, how does egalitarianism take shape as a sensorial, corporeal, and temporal *experience* in how individuals respond to the presence and actions of their interlocutors? What forms of real-time, face-to-face sociality allow participants to experience a lack of hierarchy with their interlocutors? More importantly, is it possible to determine whether another individual is experiencing equal partnership purely based on an analysis of the interaction and its progress?

In anthropological theorizations of egalitarianism, the concept of “leveling” (Boehm, 1993; Fried, 1967; Woodburn, 1982) describes social behaviors directed towards the maintenance of a nonhierarchical arrangement between participants. For free improvisation, leveling takes three forms in interpersonal communications and interactions between performers. Outside of performance, leveling is executed through suspending the right to criticize one’s peers. Within performance, leveling takes place in two basic forms: a cooperative form characterized by displays of attentiveness and an autonomist form characterized by their absence.

In one way or another, these three concepts of egalitarianism are already suggested in prior theoretical work in philosophy or empirical observation in the social sciences. The notion that evaluation and egalitarianism might be incompatible is articulated in the work of sociologist André Béteille (1977), who suggests that it is impossible, or at least infeasible, to maintain equality given the human tendency to evaluate and discriminate between the quality of objects, persons, and other entities.¹⁰ Since evaluation tends to (but does not necessarily) imply differentials, evaluation continually undermines leveling.

Likewise, phenomena resembling the cooperationist conception of egalitarianism have already been described in other domains of human sociality. This may very well be the dominant conception of egalitarianism in social scientific analyses of this ideal. For the most part, anthropological work on egalitarian societies has focused on the various ways in which resources are shared as well as the cultural values and practices that support sharing (Cashdan, 1980; Gardner, 1991; Peterson, 1993). In addition to studies focusing on the economic and political dimensions of egalitarianism, other social scientists have examined the ways in which egalitarianism manifests itself in communicative practices.¹¹ For example, building on earlier work by Marjorie Goodwin (1990), Kyratzis and Tarım (2010) examine how the ways in which middle-class Turkish preschool girls use directives to the rest of their peer group (i.e., “let’s eat ice cream,” “let’s play tag”) constitute a form of politeness (Brown & Levinson, 1987) which promotes a type of egalitarianism.

Much the same can be said for the autonomist conception. While sharing is the dominant approach to economic leveling in many societies, the pursuit of individual autonomy in both

¹⁰ It should be noted that Béteille offers no specific empirical evidence for the claim that this tendency carries in all circumstances. Be that as it may, what Béteille proposes is common sense in the analytic thought of many social scientists. For example, James Laidlaw’s recent monograph (2014) proclaims that the basis for the study of ethics as a universal dimension of human sociality with numerous culturally distinct forms can be justified as follows: “The claim on which the anthropology of ethics rests is not an evaluative claim that people are good: it is a descriptive claim that they are evaluative” (Laidlaw, 2014, p. 3).

¹¹ Niko Besnier’s (2009) study of gossip in the everyday production of politics does address the relationship between egalitarianism and communicative practice. However, that study largely focuses on how egalitarianism shapes the content of speech between individuals. The present discussion is more concerned with the way that egalitarianism is manifest in *how* individuals communicate with one another rather than *what* they say to each other.

access to and acquisition of resources has also been observed as a manifestation of a broader principle of maintaining equality. In this conception, the logic is that if no individual is required to participate in a collective arrangement for the procurement or storage of resources, the disuse of such cooperative approaches affords equal access to resources in the wild (see Gardner, 1991, for a review of theoretical work on this concept).

However, theorization of autonomist notions of egalitarianism is less developed for communicative practices. Foundations for such a theory lie in Erving Goffman's (1966) theorization of social behavior in public space, in which he describes the notion of "civil inattention," which in Stefan Hirschauer's gloss can be understood as "a display of disinterestedness without disregard" (2005, p. 41). Within studies of conversational timing and turn-taking, the phenomenon of simultaneous or overlapping speech and interruptions (Ferguson, 1977; Tannen, 1981; West, 1979)¹² may also be a site for further theorization of this autonomist form of egalitarianism in communicative practice. Still, an explicit articulation of how such interactional behaviors relate to the concept of egalitarianism is yet to be offered.

A Phenomenological Account of Human Sociality

This literature offers beginnings for understanding the various notions of egalitarianism at work in free improvisation. Nevertheless several questions remain, especially regarding how or whether participants *experience* these various as enabling of an experience of equal partnership or status. Under what conditions are displays of attentiveness taken as a cooperative gesture which allows the performance to be a truly collective effort? Can one assume, as a player, that displays of attentiveness will enable co-performers to find themselves experiencing a flat, nonhierarchical leveling of status differentials? Riffing on Kyratzis and Tarım, do all the other little girls really feel that group directives are a polite, egalitarian expression?

Conversely, is the experience of an equal partnership guaranteed if each participant follows their own directions and manifests very few displays of attentiveness to the actions of the rest? Can one predict that the "disinterest without disregard" of civil inattention really facilitates the experience of equality? Will a conversational interruption consistently be regarded as a performance of egalitarian autonomy? Or will it simply be heard as rude? When might a player construe the relative absence of any trace that other players are listening as a gesture which flattens hierarchy out?

In posing such questions, this study takes after a long tradition of phenomenological approaches in anthropology (Desjarlais & Throop, 2011) and ethnomusicology (Berger, 2015) in order to examine what egalitarianism "is" as an experience. Why is a phenomenological approach necessary? Why is it insufficient to take an empirical approach to adjudicating whether a situation exhibits egalitarianism or not? As shall be illustrated through a variety of examples over the course of this thesis, the answer is simply that the *experience* of egalitarianism within the heart, mind, and soul of a given individual is not readily predictable based on mere observation. While one individual experiences egalitarianism in a given practice of listening in

¹² Stivers et al. (2009) note that the belief that interruption is a culturally specific trait (i.e., Tannen, 1981) may not stand to reason after quantitative analysis.

interaction, another finds the same practice to have deleterious effects on the realization of an egalitarian ideal.

A phenomenological approach allows the ontological question “what is egalitarianism?” to be answered not only in terms of how things “are” in a concrete, empirical sense, but how they are experienced. For example, Sarah Willen (2007) persuasively demonstrates the utility of this approach in her study of the phenomenology of migrant “illegality”¹³ in Israel. As she explains, illegality is more than just a juridical or sociopolitical status. In addition to and as a result of the facts of these two dimensions of illegality, illegality becomes a way of being in the world. To focus solely on what it means to be illegal in terms of how it relates to laws and principles of citizenship and residence as well as cultural norms of what kinds of bodies are deserving of inclusion in Israeli society often overlooks how illegality reshapes the way an individual experiences the world. The condition brings about a full reconstitution of the way the person senses the world, relates to their body, and navigates space in the city. Thus these experiences are as much a part of migrant illegality as any formal definition from the point of the view of the state or the society.

In a similar vein, this project offers an experiential account of what egalitarianism is and how this experience arises in the course of social interaction through a particular form of music. In focusing on egalitarianism as an experiential phenomenon in human social encounters, the empirical question of whether egalitarianism between participants has “actually” been achieved is placed next to the question of whether participants experienced an absence of hierarchical difference with others. As ethnographic examples in Chapters 11-13 demonstrate, the question of whether participants experience a lack of hierarchy cannot be answered through an empirical analysis of the nature of the interaction that took place. What one might hear from a recording of musicians improvising together does not offer a clear representation of just what exactly they were experiencing as this piece took shape.

A Central Problem in Phenomenology

A phenomenological account of social abstractions like migrant illegality or egalitarianism enables a deeper social-scientific understanding of these concepts by examining what they feel like for the human beings who inhabit them in the world. As Desjarlais and Throop (2011) demonstrate, this way of working through ethnographic research has enabled numerous anthropologists to better grasp the way that their interlocutors experience their worlds. Nevertheless, despite the several ways in which a phenomenological orientation to ethnographic work can offer a more grounded account of theoretical constructs of human sociality, a central and obvious problem remains in this endeavor. While participant-observation potentially enables

¹³ Willen notes that this term strikes many as problematic in its possible “collusion with hegemonic, and oppressive, ideological forces” (Willen, 2007, p. 11) by branding the human existence of migrants as somehow “illegal” in itself. Nevertheless, this sense of human “illegality” is precisely what these migrants experience in their interactions with Israeli society.

an “experience-near” (Geertz, 1983, p. 57) account, the researcher can never really experience precisely what their interlocutors do.¹⁴

For this reason, several scholars have recognized the inherent epistemological problem of phenomenologically-oriented ethnographic work. On the one hand, this perspective seeks to understand various elements of how participants experience a specific sociocultural world. On the other, the ethnographer is never able to fully access this experience. Philosopher Emmanuel Levinas (1961/1969) developed a theoretical language for describing this tension through his concepts of “face” and “the Other.” Rather than referring to some distant, nearly alien person, Levinas continually referred to intimate, proximate, and familiar interlocutors as “the Other.” The point of this rather provocative description of a close associate was to insist that there is much that remains fundamentally unknowable about such persons despite the intensity of one’s relationship with them. To describe this paradox, Levinas developed the concept of “face” to refer to the way that intimate and lively interactions with another human being simultaneously seem to offer up a wealth of information about the particulars of what the Other experiences while also rendering the Other’s true experiential state fundamentally opaque. As Levinas put it, “the relationship with the other¹⁵ is a relationship with a Mystery” (Levinas, 1987, p. 75) and that “the encounter with a face at once gives and conceals the Other” (ibid., pp. 78-79).

Admittedly, Levinas’ position is rather extreme and leaves little room for the possibility of much more than the most basic level of intelligibility in human communication. Nevertheless, his propositions about the basic inaccessibility of another subject’s experience ring true in the findings of ethnographers seeking the same kind of intimate knowledge of what their subjects feel and undergo (Berger, 2009; Linger, 2010; Throop, 2010). As Robert Desjarlais writes,

You cannot readily tap into the ‘lived experience’ of cultural subjects, be they in Boston or Calcutta. You can *only talk* with and live among them. So *words*, really, are the stuff of meaning and evidence here, along with other manifest actions — a *look* here, a *gesture* there (Desjarlais, 2003, p. 6, emphasis added).

A Possible, Partial Solution

But must it be so? Are talk, words, gaze, and gesture really the *only* way we can surmise what a subject experiences, as Desjarlais asserts? Is it really the case that the Other’s mental state remains inaccessible, as Levinas insists? Are there no methodologies that exist that allow for a better understanding of what others experience? Contrary to the position, shared by Desjarlais

¹⁴ Moreover, Bourdieu (1977, p. 1) emphasizes how the researcher occupies a position in which they are not subject to the same consequences as those they study. Such consequences and their threat is a key element of the experience of the ethnographic subject which remain intrinsically inaccessible through common modes of ethnographic engagement.

¹⁵ The capitalization (or lack thereof) of the term “the Other” in Levinas’ writings varies considerably and the principle by which this variation took place is not clear from his writings. In general, others have recognized a certain lack of clarity across Levinas’ writings, resulting in what some have referred to as “the Levinas effect,” or the way in which “the difficulty of Levinas’s texts permits his commentators to find in them a reflection of their own interests and attitudes” (Davis, 1996, p. 122).

and many others, that such experiences remain fundamentally opaque, this project illustrates how an encounter with a nonhuman social interactant like Maxine elicits the human interactant's account of their experience of musical sociality. Crucially, I argue that such accounts offer a perspective on such experiences which is not possible through other kinds of methodologies in the humanities and social sciences. Though one is still limited to words, I show how these words are far more direct than what emerges in ordinary interactions. Moreover, the subject's verbal account of their experience of the interaction enables a clearer understanding of how specific approaches to musical interplay are interpreted by the subject in relation to their conception of ideal forms of egalitarian practice. In other words, their account enables an analysis of the sound of free improvisation which has not necessarily been possible given the means and methods typically used in musicology to deal with such practices.

By using a synthetic re-embodiment of a human social interactant, this project builds on Hubert Dreyfus' (1972, 1992) critiques of the failures of the first few decades of artificial intelligence (AI) research. On one level, Dreyfus' project was simply a critique of AI on the grounds that its proponents started with flawed understandings of how human beings think and engage with the world. On another, Dreyfus used the failings of early AI as a case study for illustrating the validity of a variety of theoretical positions in phenomenology, particularly the work of Edmund Husserl, Martin Heidegger, and Maurice Merleau-Ponty. Where AI failed was exemplary of just exactly what these three and several others had proposed in their phenomenological work.

This project proposes a very similar relationship between AI and phenomenology while differing radically in terms of its methodology and ultimate outcomes. Like Dreyfus, this project uses the failures of AI as a practical case study for extending the phenomenological endeavor begun by Husserl more than a century ago. Unlike Dreyfus, however, this project does not examine previous failings of AI so much as it actively creates situations in which such failures emerge in the interaction of Maxine and human improvisers. Moreover, while Dreyfus was largely concerned with using AI as a means of continuing to establish the trenchancy of theoretical work of the phenomenological tradition, this project aims to push this tradition further by illustrating that the failure of AI can actively be exploited as a means of ethnographically examining phenomenology.

It should be noted that many would dispute the notion that phenomenology, particularly in its manifestations as an ethnographic project, is concerned with understanding what various individuals experience. For example, anthropologist Jarrett Zigon writes that "phenomenology is not primarily concerned with describing the experience of individuals" (Zigon, 2009a, p. 288). Instead, phenomenology "is primarily an analytical method for describing the multifarious interrelationships that constitute sociality." In this perspective, phenomenology is an attempt to understand the structures and mechanisms of experiences more generally, not the experiences of specific people.

The distinction Zigon draws is certainly a meaningful one. Ultimately this project concurs with Zigon and others who argue that phenomenology is far more than just a quest to understand an individual's experience and that this mode of inquiry instead aims to develop a broader account of the nature of particular experiences more generally. At the same time, the distinction between understanding individual experience and understanding the structure of

experience more generally is one which simply evades a central question: how can one possibly derive a general account of structures of experience if individual experience is mostly inaccessible? For individuals other than oneself, one cannot readily grasp what the other is experiencing at a given time, though there are naturally plenty of clues. To make matters worse, it is also true that one's own experience is also full of sensations, fleeting thoughts, and other ungraspable elements that remain a mystery to the very individual who experiences them.

Despite the relative obviousness that individual experience is inaccessible, phenomenologically-oriented thinkers have routinely shrugged this problem off in the past century of work in this area. Numerous critics¹⁶ have pointed out that the inherent difficulty in knowing what another person experiences and how this is a major barrier in phenomenological inquiry. Others have also pointed out that even one's own experiences are somehow similarly indescribable, especially given the nature of unconscious thoughts. With striking consistency, advocates of phenomenological thinking fail to actually respond to this important criticism. Instead, it is not countercriticism that is offered so much as it is the facile barb that critics simply failed to understand what phenomenology is in the first place. Such is the line taken by Dan Zahavi (2007) in response to Daniel Dennett's (1989, 1991) criticisms about the basic impossibility of doing phenomenology. Zahavi goes so far as to state that Dennett has not "actually read" (Zahavi, 2007, p. 28) the phenomenological work that he criticizes.

Whether Dennett has read the work in question is irrelevant. The fact remains that phenomenology is faced with a fundamental methodological problem. While the immediate focus of this project is the nature of social interaction in a particular art practice, the broader aim is to finally address this methodological problem and overcome the tendency of phenomenologically-oriented thinkers to consistently evade the central problem of this mode of inquiry. There is no question that it is difficult, if not completely impossible, to peer into or inhabit another person's mind as it encounters the world. Nevertheless, should this fact lead us to simply accept that such projects are doomed to failure? What is there to be gained from remaining methodologically complacent with respect to this problem?

The field method developed in this project does not completely solve the problem of understanding the subjective experience of another person as it unfolds. Asking an improviser to comment on how a nonhuman improviser like Maxine compares to its human counterparts is not the same as being able to experience what another experiences at the same time that they do and in the same way. The method still relies on how subjects verbally report their experience to me as an ethnographer after playing with this system. Among other issues, there is always at least a small gap between what subjects may report and what they may have been actually experiencing as the interaction took place. Even so, the encounter with this nonhuman interactant elicits improvisers' commentary on an element of human social experience that they simply do not comment on otherwise.

¹⁶ It should be noted that proponents of phenomenology often refer to critics of this project, but nearly always do so without any particular citational rigor. That is, critiques of phenomenology are often mentioned, but the authors who enunciate them seem to be not worth mentioning. For example, in what is otherwise a very helpful review article on phenomenological approaches in cultural anthropology, criticisms are mentioned but critics are scarcely named (Desjarlais & Throop, 2011, pp. 94-97). Who enunciates these criticisms? How do they enunciate them? In any case, Daniel Dennett (1989, 1991) consistently stands out as one of the few critics who seem worthy of mentioning or responding to (see Zahavi, 2007, for example).

Free Improvisation as a Field Site

On the one hand, the fact that improvisers do not comment on such experiences is very particular to the social world of this musical practice and its commitment to upholding liberal ideals like egalitarianism and freedom. Thus to some it may seem that this method and resultant findings are limited to this particular world. On the other, what improvisers experience is just one example of a common element of human sociality: the effort and labor expended in concealing one's possible frustrations with those one must deal with, whether on a daily basis or just for an occasion. Therefore, what one learns from how improvisers critique Maxine may not be as limited to the context of free improvisation as it may seem. The fact that people often actively work to hide their feelings about others raises the possibility that encounters with Maxine reveals a great deal about human behavior generally and not just improvisers specifically.

The hesitation to describe one's frustrations in interactions with others is a phenomenon experienced by a great many human beings beyond the relatively unknown and obscure artists at the center of this research. Though many have critiqued (see Bargiela-Chiappini, 2003, for example) Erving Goffman's famous concept of "face-work" (Goffman, 1967), it remains the case that across a staggering variety of contexts, individuals labor to prevent the exposure of embarrassment, whether this is their own or that of others. This means that Torsten is not alone. Preventing the disclosure of one's negative sentiments about the actions of others in one's presence is a daily labor that spans human history and geography. Free improvisation is just one possible focus for a study of this element of human experience.

Rather than focusing on a single research site tethered to a specific locality, this project examines such experiences in free improvisation across three locations: Berlin, Chicago and the San Francisco Bay Area. Because each of these localities is distinct, one might first think that this project engages in what many refer to as "multi-sited" ethnography. Formally this is certainly true. However, even as these three "sites" are distinct, they are far more unified than their geographical separation might suggest. This leads me to regard free improvisation as a type of site than it is consider this ethnography to be based in multiple "sites." Indeed, there would be a tremendous amount of information which would be lost or misconstrued if one were to describe this project as "multi-sited" without any qualification or modification.

Over the course of my engagement in free improvisation as a performer and ethnographer, transfer and contact between improvisers in Berlin, Chicago, and San Francisco has been frequent and intense. Musicians frequently traveled and collaborated with other players in each of these three scenes as well as several others. This was such a common occurrence that there have been many occasions in reviewing my fieldwork in which I initially forgot (prior to checking my notes, of course) that I was in Chicago, for example, rather than Berlin with a particular player because they were yet again on tour or just passing through. In each of these three cities, I frequently met with musicians who were based in one of the other two. Moreover, it was not uncommon for musicians based in one of these three locations to regularly record with and maintain active collaborations running for several years with musicians based elsewhere.

The fact that these musicians are so mobile is notable given the lack of financial gain in performing free improvisation. While musicians do often come across opportunities to perform

and do so for a decent rate of compensation, the vast majority of work I saw performers engaged in was the standard “door gig” where all or a portion of money collected at the door went to the artists. Moreover, for the most part, these monies were collected through a “suggested donation” scheme in which concertgoers were not required to pay a specific amount for their attendance. All this readily reveals the fact that these musicians were either of a relatively privileged social class, regardless of their nationality, or had developed other financial strategies in order to support their participation in these scenes (i.e., one or more “day jobs”). As I discuss in Chapter 12, it was rather rare for any performer to earn a living exclusively from performing free improvisation.

The mobility of these musicians makes them emblematic of what George Marcus calls “the world system” in his theorizations of multi-sited ethnography (Marcus, 1995) adopting sociologist Immanuel Wallerstein’s coinage (1974). In its original analytical context, a “world system” refers to any of a number of global networks of exchange, movement, or power regardless of whether the network is primarily economic, political, or cultural. As Wallerstein intended, world systems theory is a powerful antidote to a previously dominant (and still widely-practiced) approach in which the nation-state is taken as the primary unit of analysis. In Wallerstein’s view, the bounds of nation fail to allow the researcher (and thus as well the public or anyone else coming in contact with the results of such analysis) to fully grasp the inherently transnational nature of a great many social phenomena in the world, not just today, but over the past several centuries.

Though free improvisation hardly has the might and power of the many other items analyzed under the heading of “world system,” its transnational nature means that much of what can be said of world systems is true for this musical practice. Much the same is true as a result of Marcus’ framing of the concept of multi-sited ethnography. For Marcus, ethnographic work spanning multiple sites is necessarily an ethnography of the world system inasmuch as it is an ethnography of whatever particular theme or entity (e.g., corn, oil, jazz, etc.) links them. As Marcus writes, “any ethnography of a cultural formation in the world system is also an ethnography of the system” (Marcus, 1995, p. 99).

In Marcus’ formulation then, this project is as much an ethnography of free improvisation as it is an ethnography of the world system which allows musicians to move back and forth across national boundaries as part of their musical practice. Despite this, I have chosen not to make my analysis of free improvisation into an analysis of the world system upon which it rests. This is not to say that doing so was infeasible. The transnational circuits which musicians rely upon in order to perform and develop a prominent reputation (within this scene, at the very least) are very much part of what Wallerstein calls a world system. It is simply that the framework of the world system is not particularly relevant for gaining a better understanding of what happens when an improviser encounters Maxine, compares this system to a human player, and thereby begins to more openly enunciate that which they previously kept more or less secret about their true attitudes about varying ways of playing this kind of music. It may be the case that what one learns about social interaction and these musicians’ experience of it reveals something about the nature of world systems, but this is not, for the moment, the concern of this study.

With all this in mind, Chicago and the Bay Area are relatively coincidental field sites for this project, while the decision to focus on Berlin was more consciously motivated. In the main, I

worked with musicians in Chicago and the Bay Area out of convenience since I had lived in these two cities for a significant period of time. Berlin, on the other hand, was a city I sought to do fieldwork in because the concentration of activity in the area of free improvisation is truly exceptional among world cities. There may be no other city in the world which features such a variety and frequency of concerts of free improvisation. As is evident from the echtzeitmusik.de concert calendar, there are often around a half-dozen concerts of free improvisation taking place on a given evening, regardless of the time of year.

Chicago's scene for free improvisation is just one small part of a large, dynamic collection of eclectic musical activities taking place across the city. Compared to the other two field sites I worked with, it also features significant presence of a variety of forms of African-American music, as is well discussed in George Lewis' (2008) monograph on the Association for the Advancement of Creative Musicians, foregrounds the experience of African-American musicians with a racialization of experimental music in which their presence is overlooked almost a priori. The Chicago musicians discussed in this project are part of a far smaller scene than the broad range of musicians discussed in Lewis' book, which discusses a very different time and place¹⁷ within the broader world of Chicago music scenes.

By comparison to Berlin and Chicago, the Bay Area's scene for free improvisation is rather exceptional in the dominance of Mills College as a hub of activity (see Chan, 2007). Several of the musicians I have worked with in this study are graduates of the institution's Master of Fine Arts program in music, a program of study which for several years has allowed many students to work with well known proponents of free improvisation like Zeena Parkins, Roscoe Mitchell, and Fred Frith. The Bay Area, like Chicago, is also home to its own range of African-American musical practices. However, unlike Chicago, there is remarkably little interaction or overlap between this scene and these various other forms of popular music in the Bay Area. Instead, this scene largely fits within a broader world of experimental electronic music, for which the Bay Area has long been a home (see Bernstein, 2008).

With its significantly larger size, Berlin's scene is also noticeably more complex and varied than these other two. Since the 1970's, Berlin has been a key center of jazz-oriented practices of free improvisation, or "free jazz," across Europe and home to prominent record labels for this practice like Freie Musik Produktion, among others. While free jazz remains a key element of this scene, a variety of other practices which largely eschew any audible influence of jazz are also part of the wider world of free improvisation in Berlin. These practices gradually grew in prominence in Berlin in the years immediately following the fall of the Berlin Wall, the early 1990s. This newer manifestation of free improvisation largely featured a younger generation of musicians compared to the earlier scene of free jazz. Just as well, these musicians sought to distance and distinguish themselves from this older cohort of musicians. Though their practices largely share the same basic principle of leaving the outcome of the performance to be determined as a result of the interactions and impromptu decisions of players as the concert proceeds, this newer scene focused on a variety of more minimalist practices by comparison to the energy and intensity of free jazz and much free improvisation.

¹⁷ See Chapter 10.

It was this group of musicians who first prominently promoted the term “Echtzeitmusik” or “real time music” to describe their practices through the creation of a concert calendar of the same name. Though the meaning of the term remains a matter of confusion and debate (Beins, Kesten, Nauck, & Neumann, 2011), Echtzeitmusik refers both to this scene of younger musicians as well as the concert calendar, which now promotes the work of all varieties of improvised music in Berlin. As Scott Currie notes (2015), the echtzeitmusik.de calendar had not always been receptive to requests by musicians active in free jazz to list their concerts on this website, though it is unclear when this shift towards a more open stance took place. Like the Berlin scene more generally, the Echtzeitmusik scene itself is also quite eclectic and spans from the improvisation-driven compositional work of the clarinet duo of the International Nothing (see Fagaschinski, 2011) to avant-bossa nova and a broad array of experimental electronic music. As is the case for the Bay Area, this scene also overlaps significantly with noise and avant-garde uses of sound technology (Flood, 2016; Heinen, 2013). Despite the clear distinctions between these various genres of free improvisation and related musics, many musicians regularly perform a number of different styles and across the several sub-communities of improvisatory practice in Berlin (Arthurs, 2015).

Overview

This dissertation is divided into four sections, each of which takes a different approach to answering a central question: what do performers of free improvisation expect of one another within and beyond the context of performance?

Before offering an answer to this central question, the first of these sections offers a careful examination of the basic problems inherent in attempting to do so. Chapter 2 provides a broad theoretical overview of the various reasons that improvisers hesitate to comment on each other’s playing and reveals how these reasons are simultaneously specific to free improvisation but also a result of several general tendencies in human behavior. The following three chapters each examine the strengths and weaknesses of various sources and methodologies one might use to gain a better understanding of the nature of peer expectations among improvisers including texts on free improvisation for a popular audience and artist’s writings (Chapter 3), academic writings, artist interviews, and analysis of recordings (Chapter 4), and participant observation (Chapter 5). While these sources and methodologies are not entirely fruitless, I argue that they have inherent flaws given both general tendencies in human behavior as well as specific features of free improvisation as an international cultural practice.

The second section examines the design of systems built to function as a fellow performer of free improvisation. By their design and by the fact that they are built to reembody the actions of human beings engaged in this practice, the construction of these systems implicitly poses a range of hypotheses about the nature of human interaction in free improvisation. Yet for all that these hypotheses may have value or validity in representing how improvisers may conceive of expectations between performers, they remain largely untested. Chapter 6 offers a broad overview of work in this area, how it relates to other work in the increasingly diverse field of computer music research, and the points of agreement these designers reach in terms of how they conceptualize free improvisation as a social practice in music. The next two chapters

analyze the design of these systems for their hypotheses about what improvisers expect from one another in terms of specific practices of listening (Chapter 7), how (and whether) form should emerge in the course of a piece, and whether (or how) one should adapt to one's fellow players over the course of a piece (Chapter 8).

Section 3 details the design of Maxine and the specifics of the methodology used in this project. Chapter 9 describes the details of how this system works. Chapter 10 outlines the precise role that Maxine took in fieldwork. Additionally, this chapter puts Maxine in dialog with work in performance studies on the notion of "ethnographic performance" and argues that Maxine, as a virtual performer, is itself a kind of ethnography of free improvisation as a social practice. The fourth section returns to scenes much like the one which opens this chapter in which improvisers encounter Maxine, play with the system, and then compare the system to a human player. As mentioned previously, improvisers' commentary on how Maxine plays reveal two broad categories of conceptions of what yields the experience of egalitarian partnership: cooperation (Chapter 11) and defiance (Chapters 12 and 13).

The conclusion revisits many of the questions outlined in this introduction in light of the material presented over the course of the thesis. Among other things, the conclusion offers a critique of the tendency of much sound studies literature to disregard the study of culturally specific practices of listening in the context of the contingency and flux of human interaction. While sound studies literature continues to reshape criticism of music and a variety of other sonic practices, I argue that the study of listening as a culturally-variable practice must attend to the way that this form of human perception takes place as a part of human interaction itself and that this is critical to our understanding of listening in other contexts such as sound reproduction, street noise in urban space, or an audience at a concert.

Beyond sound studies, the conclusion sketches a broader outline of the consequences of projects like this one for ethnomusicology and related disciplines. For the musicologies, this means that the study of how human beings dispute the way that a machine engages in musicking is deeply productive for the cultural study of music. For the social sciences and humanities more generally, there is much to be learned about how a designer such as myself fails to design a machine which satisfies what human beings expect of one another in human interaction.

Section 1: Methodological Considerations

Chapter 2: Why Do Improvisers Hesitate to Criticize One Another?

What do free improvisers (really) expect of each other, before, during, and after musical play? As articulated in the introduction to this dissertation, this question (which I shall refer to as “the central question” for this section) is one of the primary empirical foci of this project, and serves as the basis for the more theoretical questions about ethics, performance, and social cognition which the rest of this thesis will address. But before turning to a more direct and thorough answer to this question, this section of this dissertation takes on the necessary preliminary project of assessing the methodological challenges of answering it. For this section, the question is not “what do free improvisers expect of each other?” but rather, “how do we research this question?” Answering this second methodological question necessarily also involves the presentation of answers to the first, as these answers to the first question are the basis for why the second is an interesting question to consider at all.

As I detail further in the remainder of this first chapter of this section, the central problem with answering the question of what improvisers expect of one another is, very simply, that *most* improvisers prefer not to express what they want other players to do in musical play, whether before, during, or after performance. Even when disgusted with how others have played, most improvisers refrain from expressing any direct criticism of how those they have just played with have conducted themselves in the musical interaction. Instead of openly acknowledging their frustrations, these players tend to mask their true sentiments about what has just transpired in pleasantries and obligatory praise — “*That was great! Let’s do it again!*” Again, as the encounter of Torsten, a bass player in Berlin with Maxine illustrates, improvisers have many things they would love to tell each other about how others should listen and play differently, but simply never do. Reminded of the numerous times when improvisers did similar things to annoy him, Torsten concedes that improvisers by and large simply do not talk about what they want others to do in musical play and regarding his comments about Maxine tells me, “I *wish* I could tell other people things like this!”

On one level, the tendency to tolerate the errors one’s interlocutors may have committed in social interaction and refrain from calling them out is a basic behavioral proclivity of human beings in diverse contexts.¹ On another, however, the tendency to silence one’s criticisms of others and to refrain from instructing them is a type of social behavior resulting from three cultural processes very specific to free improvisation:

- 1) a commitment to a variety of forms of “freedom” (e.g., aesthetic freedom from the norms of jazz practice, tonality, rhythmic organization; freedom from the micro-political structures of most music making such as bandleader and band, soloist and accompanist, etc.),
- 2) a 50-year history of harsh dismissal of free jazz and free improvisation by musicians and critics,
- 3) the cognitive and phenomenological realities of free improvisation itself,

¹ See Goffman’s theorization of “face-work” (1955) or Brown and Levinson’s “politeness” theory (1987), as well as the many reverberations of these theories across social-scientific research

- 4) the tendency of improvisers to avoid recording their private playing sessions as well as their general skepticism of the veracity of recordings.

Regardless of its cause, the tendency of improvisers not to criticize or instruct their peers leads to the appearance that the *discourse* which claims that free improvisation emancipates players from the constraints of other forms of music-making is realized in its *practice*.

Returning to one of the central questions of this dissertation, it would seem that free improvisers, as a group, do *not* have specific expectations of how their peers should play. Or at the very least, improvisers by and large avoid acknowledging that they do have expectations and preferences for how others should behave in musical interaction. As the rest of the chapters in this section will argue, the extant methods of musicological and social-scientific research are inadequate in answering the question of what these musicians expect of one another. While certainly still useful for answering questions related to the one at hand here, I argue that the data resulting from these traditional methods for researching such questions leads one to conclude that there are, just as its discourse promises, no normative expectations of how one should perform “free improvisation.” Or, even if one senses that such expectations do exist in the minds of other improvisers, improvisers tend to not disclose such expectations or make them obvious to other improvisers.

In the end, the central methodology for locating improvisers’ expectations was not the result of a logical process of discovery so much as an accidental result of my artistic practice. Prior to my work in designing the system described in subsequent chapters, my own engagement with free improvisation in Chicago was both as a frequent concertgoer and less frequently, as a performer (primarily on the saxophone). Through the implicit participant-observation of playing free improvisations with others and going to shows, my own experiences often indicated that, explicitly at least, there is no specific action that one is expected to take at any given time in a free improvisation. As it is for many musicians, the sensation of such radical liberty was one I found perplexing and exciting as a performer and truly distinct from the vast majority of other experiences performing other forms of music, whether mostly composed or improvised. It did seem that improvisers by and large seemed to believe, as one experienced improviser had insisted to me, that “there’s no such thing as a ‘good’ improviser.” On the surface, it seemed as though everyone respected the principle that free improvisation should not be a form of music where anyone feels compelled to conform to a norm of musical practice. No one told you what to play or when, and afterwards it was just drinks, laughs, and talk about many topics beyond music.

Nevertheless, while players openly performed their allegiance to anti-normativity in principle, certain players seemed to implicitly receive more respect and interest than others, both from performers as well as those few concert goers that were not also performers. Even if no one wanted to really admit it, each participant of this scene had their own clear idea of how this kind of music *should* be made and what “good” improvising really consisted of. Nowhere did the sunny vision of free improvisation as an art form in which practitioners are free of any inner voice which tells them that what they are doing is wrong or right fall apart more quickly and strikingly than when I started asking improvisers to play with an improviser made from software, microphones, amplifier and a sound card. By stark contrast to the friendly open-minded attitude

of tolerance most improvisers exhibited with regard to aesthetic norms, improvisers suddenly become very willing to discuss what irritates them about fellow musicians and how this system reminds them of such interpersonal musical behavior. Indeed, the very same individual who instructed me to abandon any illusions that there are “good” or “bad” ways of improvising freely was among the most virulent in his criticisms of how the system behaved in his interactions with it and how its ticks reminded him of other players with similar tendencies.

In other words, the myth that improvisers have no expectations for how others should engage in this practice is shattered by the ease and depth of criticism of my system by these players. In the rest of this section, I will argue that criticisms of this artificial improviser are a far more effective means of discovering what improvisers really want their peers to do in musical interaction than close reading of artists’ writings or writings for a popular audience, interviews with these musicians, participant-observation and fieldwork among them, or analysis of recordings of free improvisation. Each of these methods generates important and relevant insights. Nevertheless, they each fail (or at least succeed rather inefficiently and only with excessive effort) to provide a means of questioning the central thesis of the discourse of free improvisation that each player is now at liberty to play as they wish and that no choice they make can be evaluated as right or wrong. Thus, while subsequent sections detail the results of my research methodology, the present section (consisting of a series of chapters) offers a critique of other relevant methodologies for probing the question of what improvisers expect of one another in musical interaction and whether they expect anything at all.

Causes of Reticence

The tendency of improvisers to silence their criticisms and avoid directing the musical actions of others arises from several basic social processes, as noted above. One of these, face-work, is common across situations of human social interaction generally while the remaining three are processes emanating from the specific cultural history of free improvisation as a movement. Several of these forces are at least partially causally related to the others though I will not necessarily comment on the meaning of these causal relationships. None of them can really be said to be primary, in terms of being a cause of the habitual reticence of improvisers, though each force contributes to each moment when a player refrains from expressing their opinions of the conduct of others in improvised musical interaction.

Face-work

Face-work, which permeates the other three social processes, was so named by the sociologist Erving Goffman (1955). Broadly, this is the general tendency of human social interactants to avoid exposing the embarrassment or loss of face of an interlocutor in face-to-face encounters. Goffman recognizes that there are, naturally, some cases in which individuals do not hesitate to openly expose and acknowledge the embarrassment of others (or their own, perhaps). Still, the general point of his theorization of social interaction is that everyday human intersubjectivity is full of moments in which one engages in minor labors to keep others and oneself from “losing face,” or experiencing openly acknowledged embarrassment. Similarly, drawing directly on

Goffman's work, Brown and Levinson's (1987) theorization of politeness strategies in speech outlines the many ways that individuals work to express themselves on socially awkward topics while also preserving a modicum of respect for the dignity of their interlocutor.

While the transcultural validity of face-work has been duly disputed (Bargiela-Chiappini, 2003), the concept is apt as an analytical explanation of why improvisers tend to avoid confrontations with other musicians rather than challenging them directly about any possible frustrations. Confronting another player about one's perception that they are too loud, not assertive enough, or simply boring to play with for whatever reason is an action which would quite likely cause an exposure of embarrassment and a loss of face. If anything, the fact that improvisers are clearly irritated with how other players but never directly speak of it is evidence of, at least for the transnational cultural milieu of free improvisation, the fact that face-work is in fact a phenomenon at work.

My deployment of Goffman's concept of face-work is not unique in ethnomusicology and, as Ingrid Monson's (1996) analysis of musical interaction in jazz indicates, its relevance extends beyond free improvisation (see Lee, 2009; Scarborough, 2012). However, in free improvisation there is a register of face-work distinct from that which Monson's analysis focuses on at work. Monson productively uses Goffman's concept to explain the tendency of musicians to avoid exposing to the audience that their fellow bandmates have made a mistake. This is certainly a classic example of face-work. However, it is also worth noting that the tendency to keep the audience unaware of another player's flubs and gaffs is also related to a more specifically musical value shaping performance practice and the tolerance of errors: musicianship itself. In turn, in addition to face-work, Monson's interlocutors themselves indicate that it is not just a solidarity of concealing errors that pushes them to help each other cover up mistakes, but the concept of musicality itself. As drummer Ralph Peterson explains to Monson:

It's more musical to be wrong and go with everybody else's wrong and make it right from that point...than it is to stay *right* when everybody else is wrong...just to prove that you know where you are...That's actually a very arrogant attitude...because in trying to show your knowledge you're really exhibiting your ignorance...in terms of your musicianship (Ralph Peterson, qtd. in Monson, 1996, p. 169).

Again, the tolerance of musically "wrong" playing Monson highlights in Peterson's account is distinct from the conceptions of musical right and wrong in the case of free improvisation. Monson writes of exposure or concealment of right and wrong as they occur in performance itself as opposed to discussions about music outside the actual moment of music-making. Nevertheless, it is possible that Peterson's sense of the term "musical" is at work in free improvisation. That is, perhaps it is more musical to not call other musicians out for their errors and to simply deal with them in the moment rather than pedantically pointing them out. While jazz is certainly distinct from the kind of improvisation I focus on in this dissertation, Peterson's comments also point to a sense of egalitarianism at work in jazz as well.

A Particular Ideology of “Freedom”

In addition to face-work, causes more specifically related to the cultural history of free improvisation contribute to the hesitation to call out other musicians. As the name of the practice suggests, one key cause of this reluctance to point out others’ “errors” stems from the deep commitments of this form of music-making to the enactment of a variety of “freedoms” in musical practice. In a word, what these musicians desire is a freedom from the possibility of error itself inherent in most forms of aesthetic norm. Falling into two basic categories, the emancipations purportedly realized in the practice of free improvisation include:

- 1) an effort to liberate performers from specific expectations for musical practice (e.g., genre, tradition, musical conventions such as pulse, meter, or harmony) and
- 2) a desire to locate performers in a nonhierarchical relation to one another, thereby “freeing” them from the many interpersonal hierarchies (e.g., leader and ensemble, composer and performer, soloist and accompanist/ensemble, teacher and student, critic and performer, etc.) organizing most forms of making music.

As will be outlined in more detail in coming chapters, these two efforts at enacting freedom in musical practice stem from the emergence of free improvisation from the earlier practice of free jazz and its association with the African-American Civil Rights Movement as well as the Black Arts Movement (Kelley, 1997; Thomas, 1995). Specifically, regarding the goal of eliminating normative expectations for musical practice such as genre, tradition, or the like, the Black Arts Movement constituted a broader cultural manifestation of artists working within and beyond music to move away from normative conceptions of artistic practice. As a kind of aesthetic self-determination (Neal, 1968) running alongside the socio-political drive for autonomy of Black Power, the Black Arts Movement sought to liberate African-American artists from a feeling of obligation, often imposed by critics, teachers, and other cultural enforcers, to adhere to either Euro-American/Western concepts of beauty or aesthetics or canonically “black” aesthetic tendencies (e.g., blues, jazz, African-American vernacular English, etc.).

Similarly, the goal of removing interpersonal hierarchies of art-making emerges not only because it delegitimizes the social role of those who enforce norms of practice (i.e., teachers, critics, etc.) but also (and more obviously) because the Civil Rights Movement is one of several iconic struggles for human equality of the past century. Fittingly, then, just as African-Americans sought to cut out the explicitly institutionalized inequalities of Jim Crow (as well as the implicit inequalities of structural racism), African-American vanguardists began to work beyond the limitations of canonical hierarchies of interpersonal organization in music-making. For example, as George Lewis describes in his monograph on the Association for the Advancement of Creative Musicians (Lewis, 2008, p. 38), this included the “liberation” of rhythm section players from the chore of establishing a point of reference in pulse and harmony anchoring the flights of fancy of other players. Instead, the approach adopted emphasized the possibility that instruments typically associated with “accompanying” roles need not accept these roles because of certain assumed affordances of the instrument, the same logic applying to those players working with

traditionally “melodic” or otherwise foregrounded instruments (see Steinbeck, 2010b; Wilmer, 1980).

While the musicians engaged in the fieldwork for this dissertation are not themselves African-American, the origins of their social practices of (avoiding) critique lie in the political struggles of postwar African-American life and its aesthetic manifestations. In addition to these specifically African-American pursuits of freedom, the avoidance of peer criticism also has its roots in the many other emancipatory projects of the postwar era (e.g., the free speech movement, the “sexual revolution,” the hippie counterculture, Parisian student riots of 1968, etc.). The precise historical pathway and metamorphosis of these principles of freedom from their African-American origins to the practices of those not affiliated with this cultural location is beyond the scope of this thesis, though it is surely a fruitful path of future research. Nevertheless, the tendency to avoid peer criticism stems from the fact that these musicians share the same goals of creating a nonhierarchical improvisatory musical practice and eliminating the presence of aesthetic normativity from their work.

Therefore, aside from the general human tendency of face-work, peer critique in free improvisation becomes essentially a taboo practice as a result of the pursuits of these two types of freedom (interpersonal/nonhierarchical and aesthetic). The avoidance of peer critique in the social world of free improvisation, to be discussed further below, is part of what anthropologist Christopher Boehm (1993), following James Woodburn (1982), calls “leveling” behaviors. As a general concept, leveling refers to any behavior which works to prevent the emergence of interpersonal hierarchy. As Boehm and others (Begler, 1978; Leacock, 1978; Wiessner, 2002) have shown, a variety of social practices across the ethnographic and social-scientific record have been used by individuals to work towards the enactment of a flat egalitarian sociality.

In the case of free improvisation, one very basic leveling tactic at work is simply the fact that improvisers do not criticize each other even if one is disgusted with another player. Such restraint is in keeping with the commitment of free improvisation (in both discourse and practice) to the lofty ideal of egalitarianism (Beins et al., 2011; Borgo, 1997; Corbett, 2016; Lange, 2011; Rodriguez, 2016; Stanyek, 1999; Zorn, 2000) and reflects the fact that many of musicians are drawn to the practice of free improvisation because of the fact that it purports to liberate them from a number of hierarchies of music-making (Bailey, 1980/1993; Cardew, 1971; L. Smith, 1973). More specifically, the egalitarianism of free improvisation is best conceived of as a means of distinguishing the practice from musical practices in which a number of traditional musical hierarchies organize how musicians or other relevant parties interact with one another (e.g., composer and performer, soloist and accompanist/ensemble, teacher and student, critic and performer, etc.).

As a result of these commitments, performers are hesitant, to say the least, to criticize one another. Again, this is a very specific interpretation of egalitarianism and a particular assumption of the necessity of avoiding critique as a tactic of leveling because in many other pursuits of egalitarianism, peer critique is regarded as an asset, and not a threat, to egalitarian ideals. Examples of approaches to egalitarianism which positively value peer critique include college writing instruction (Badger, 2010), addiction recovery mutual-aid groups (Snyder & Fessler, 2014), and naturally, the academic peer review process itself. Free improvisers, however, seem to regard peer critique as a threat to egalitarian ideals. For such egalitarians, engaging in direct

face-to-face criticism of another player's conduct in musical interaction is antithetical to the pursuit of nonhierarchical relations (see Freeman, 1972, for a discussion of the effects of this thinking in nonhierarchical activist collectives). For free improvisers, to instruct or criticize others is to no longer be their peer as this speech-act is regarded as unavoidably having the effect of elevating a speaker to a status of authority regarding the rectitude of the addressee's conduct. As improvisers themselves readily admit, such imperative, directive speech is precisely what they seek to avoid by taking up the practice of free improvisation.

For example, as cellist and improviser Tristan Honsinger explains in an interview by fellow cellist and improviser Frances-Marie Uitti, the appeal of free improvisation lies at least partially in the fact that this social milieu liberates one from the controlling influence of teachers and other musical authorities who say "you can't play like this; you have to play like *this!*" (Honsinger & Uitti, 2006, p. 477). Since these musicians seek to create a culture in which such voices of musical and aesthetic authority are dampened, it then makes sense that most improvisers would be hesitant to criticize others. Indeed, the consequence of such speech is likely serious as it essentially calls into question a person's commitment to egalitarian ideals. At their surface, these ideals are often presented as a practical objective of overcoming the disadvantages of practices where interpersonal hierarchies are assumed necessary for musical practice. More likely, however, the offense of an anti-egalitarian speech act like peer criticism is also the result of the historical relationship of free improvisation to diverse socio-political struggles for equality in the United States. That is, to enunciate criticism is not simply to openly disclose that one is in favor of hierarchical approaches to interpersonal music, but perhaps also implicitly puts the speaker in a position similar to those of the anti-egalitarian bigots and sexists who made the American Civil Rights Movement and feminist political agitation necessary, respectively.

History, Memory, and the Dismissal of Free Improvisation as Nonsense

However, in addition to the commitments to freedom and face-work as causes for the culturally-specific habitual hesitation of improvisers to criticize one another, I would like to suggest that their reticence also arises from the fact that free improvisation has been a form of music producing reactions from musicians and critics ranging from skepticism to outright dismissal. Simply put, because critics, both past and present, have often regarded free improvisation as a refuge for musicians too incompetent for more conventional forms of music-making, this discursive backdrop creates a condition in which it is taboo to express criticism of one's peers. While this certainly affects musicians, I suggest that the history of such harsh criticism also prevents some manifestations of "critical improvisation studies" from taking a more critical, balanced, and dispassionate approach to free improvisation. That is to say, like musicians themselves, scholars working in this domain have often emphasized the moral and aesthetic value of free improvisation as a corrective against decades of critical distaste from many observers.

In any case, the implicit logic at work here is one in which any critical appraisal of another player's work is heard as a kind of reverberation of critics dismissals of free improvisation throughout its history. Free improvisation emerged over the period of the late

1950's to the early 1970's in the work of modernist jazz experimentalists (e.g., Ornette Coleman, Cecil Taylor, Archie Shepp) frustrated with the assumptive constraints of bebop jazz performance practice. Though bebop itself was already a modernist, progressive reaction against earlier forms of jazz practice with a diminished focus on solo improvisation (DeVeaux, 1997), numerous jazz musicians in the 1950's and 1960's felt that even bebop had becoming a form of artistic practice which severely limited their creative aims. While conventional improvisatory practice in bebop still allows for a great deal of melodic and rhythmic liberty, this liberty is implicitly constrained by the harmonic structure of a given composition, its cyclical harmonic rhythm, and form. By contrast, early pioneers of free improvisation sought a practice delivered from the constraint of improvising consonantly with the given harmony of a tune, in which dissonance, significant deviation from pulse-based rhythmic delivery, and disregard for the overall form of the composition were permitted as expressive resources.

As is well documented (Lewis, 2008, pp. 43-50; Monson, 2007), to the ears of jazz critics and musicians of the time, free improvisation sounded like nonsense and artistic failure. Despite the progressive intention of experimentation beyond the constraints of pulse, harmony, and form, critical ears heard nothing more than a lack of basic musical competence in keeping a steady beat, improvising which adhere to the harmonic structure of a composition, and maintaining the temporal regularity of a given cyclical compositional form. Dismissal of the new practice was severe. Though his work was distinct from that of other players, reactions to saxophonist Ornette Coleman are illustrative of the contempt with which most jazz critics and musicians regarded free improvisation. Drummer Max Roach was reportedly so disgusted with one of Ornette Coleman's performances that he wanted to punch the saxophonist in the mouth (Ake, 1998, p. 26; Litweiler, 1992, pp. 86-87). Similarly, though typically more mildly, other musicians expressed serious skepticism of Coleman's competence as a musician, complaining that every note he played was "miserably out of tune" and calling him "an unmitigated bore" (Sales, 1984, p. 188). Though harsh criticism of this kind was pronounced and focused at the emergence of free improvisation, contemporary representations of the practice continually reflect a sensation that the practice amounts to nothing more than noise and results from a lack of musical skill. For example, a widely disseminated internet meme comparing free jazz to a baby hitting piano keys (bite.ca, 2012) and Stephen Colbert's (2006) mockery of the choice of avant-garde saxophonist John Zorn as a MacArthur Foundation fellow capture a widely held judgment that free improvisation is nothing other than pretentious, overhyped absurdity. In a far more public and controversial statement of canonization, episode 10 of the otherwise informative Ken Burns' documentary mini-series *Jazz* (2001) largely pans free jazz experimentalists as prodigal sons who spurn their origins.

Just as jazz musicians often performed a resolute solidarity with one another when cultural outsiders in the press and the public criticized their artistic practices at the time of their emergence in the early 20th century (Becker, 1951; Jost, 1982/1991, p. 182; Lewis, 2008, p. 45), the critical dismissal of free improvisation has had a similar effect. The moral imperative to silence one's frustrations with other musicians arises not only due to the libertarian ideologies of these players. Rather, this solidarity is also a product of the cultural memory of reactions against free improvisation in the 1960's endures as a contemporary moral principle governing the social interactions of improvisers. The wish to tell others what one thinks of their playing is taboo not

merely due to the emancipatory goals of free improvisation itself, but due to the fact that were one to criticize others, it would recall the insults of the now hundreds of teachers, concertgoers, critics, and other musicians who have mocked free improvisation over the past half-century. As has already been suggested in genealogical approaches to the anthropology of ethics (Faubion, 2012), current habits and norms of conduct are living traces of particular histories. Just as laws are an inverse recognition of the legacy of certain pernicious social behaviors (e.g., laws against hate crimes themselves evidence their routine occurrence and social acceptability), social performance of moral principle often functions as a routine practice of memory for specific cultural histories.

How the Phenomenology of Improvisation Conspires Against Critique

But beyond the ideological and historical causes of the contemporary improviser's hesitation to criticize their peers, the phenomenology of free improvisation is itself a practical impediment to the expression of criticisms of other players. Whether the context is a private session or public performance, improvisers typically play together in small groups, typically from a duo to an octet, without interruption for anywhere between twenty minutes to an hour. During this time, these musicians play without a score guiding the progress of the overall interaction. In addition to providing them with a liberty from canonical parameters of musical practice (e.g., harmony, pulse, form, etc.), it also creates a situation of what sociologist Talcott Parsons calls "double" (or really, multiple) contingency (Haenisch, 2011; Parsons, 1951/1991; Vanderstraeten, 2002).

Parsons uses this term to describe the basic fact of social interaction itself in which one interlocutor is often unaware of precisely what the second will do at a given time or at a given turn in an interaction. This constitutes the first contingency. The second contingency arises from the fact that the first interlocutor is not only unable to predict what the second will do, but also is unable to fully predict what they themselves will do in response to the second. Thus for Parsons the situation has a "double contingency," though it should be noted that this double contingency occurs at every turn of the interaction and so perhaps is more accurately described as an "endless double contingency." Despite a shared culture of recordings, venues of performance, and trends of musical practice — in short, a common culture — improvisers often point to the fact that what excites them about making music in this manner is the fact that even if they are well acquainted with another player's style and interactive personality, they are simply unable to predict what they will do in at a specific moment in their play together (Beins, 2011). Within a broader range of unpredictable behaviors, such unforeseen events in musical interaction also include what might be regarded as mistakes, errors, blunders, or bungled actions. However, as anthropologist Eitan Wilf (2013a) convincingly argues for the practice of jazz, "errors" for free improvisers are often regarded as resources in the ongoing fight to continue to produce creative action in the face of a tendency for practices to congeal into orthodoxies. Contingency is not only exciting but is also a vital asset in the pursuit of aesthetic novelty and innovation.

Aside from the lack of predictive foreknowledge of other players' actions, the absence of a score affects a player's ability to recall what happened at the end of the improvisation. Whereas players of a string quartet may easily remember another player's error in performance because of its discontinuity from the score, remembering what another improviser might have actually done

at a given moment in the midst of a forty minute improvisation is more challenging. Among other functions, the score allows performers of composed music to orient each other to each other's errors and adjust to discontinuities. Without a score, the perception of errors becomes more complicated, if not infeasible.

Furthermore, improvisers tend to avoid organizing their playing around a pulse or its subdivision.² As a consequence, the ability to recall or register another player's error (or just their actions) is compromised by the fact that a temporal grid structure is rarely in effect. Despite the irregularity of the approach to time in free improvisation, the temporal density (i.e., notes or sound events per unit time) is often roughly the same as performances of other genres of music. In the case of a group greater than a duo, an improviser's attention is drawn to a number of different objects simultaneously. Just as in other forms of ensemble improvisation (Berger, 1999; Berliner, 1994; Duranti, 2009; Wilf, 2014) one listens to several other players each playing independently but all at once. While musicians often develop a strong ability to listen to several independent streams of sound simultaneously (Bregman, 1994), the asynchrony and arrhythmia with which most improvisers play reduces the degree to which such composite listening is possible. Therefore, these irregular temporal features possibly contribute to the tendency of improvisers to not have much to say to each other after play in terms of criticism, feedback, or evaluation of musical choices. To play out of time is to already create a situation where one is less likely to have the mental record of events necessary to evaluate another player's performance.

Moreover, the overall cognitive task of collective improvisation includes not only paying attention to others, but one's own playing as well (Keller, 2001). This effort includes the mechanical task of playing one's instrument but also the cognitive and cultural task of composing in real time (Nettl, 1974; Pressing, 1988). Besides the ongoing work of choosing what sound actions to execute next, improvisers have the unavoidable task of producing sounds with their instruments or voices as "correctly" (i.e., as closely in line with one's own intentions) as possible. Given the modernist aesthetic ambitions of many improvisers, many privilege the exploration of novel techniques of sound production beyond common practice. This includes "extended techniques" such as multiphonics (Riera, Proscia, & Eguia, 2014), the production of more than one pitch at a time on a typically monophonic instrument. Alongside or instead of extended techniques, improvisers also often use any of a number of "preparations" (Cage, 1961) of an instrument, or the application of small non-musical objects (e.g., rocks, balls, styrofoam, etc.) for creating sounds atypical in the canonical performance of the instrument. This can be achieved either by mounting such objects onto an instrument (for example, directly on top of piano strings), or by using an object to block or modulate the sound of the instrument (for example, shoving a beer bottle down the bell of a saxophone).

² This claim is not based on analysis of a corpus of musical recordings of free improvisation but rather on my own experience as a player, listener, and subsequently my occupation of both these roles in a more formal ethnographic context. Grooves occasionally appear in free improvisation, though they are generally rare. Looking ahead to the next chapters on methods, one very important and likely fruitful focus for a large-scale formal analysis of a corpus of recordings could be the question: how often do pulses occur? Just as educated speakers of a language often engage in speech patterns in spontaneous discourse of which they themselves are not aware, so improvisers might actually be found to play grooves or pulses more often than they realize. Such questions are beyond the scope of this dissertation, but are lines of inquiry I highly recommend to analytically oriented scholars of music.

Both the use of instrumental preparations and extended techniques are cognitively and mechanically cumbersome tasks. For neither extended techniques nor for preparations of an instrument, best practices for achieving consistent sonic results for these practices have not been formalized to the same degree of precision and accuracy possible for the common practice uses of musical instruments (i.e., playing a clear, in tune middle C). Preparation adds mechanical complexity of its own, as objects affixed to or simply stacked upon an instrument to modify its sounds often produce a structurally unstable configuration. In addition to paying attention to others, a player's cognitive resources are pulled to the task of making sure whatever preparation they have put before themselves literally does not fall over before the audience. Apart from the contingency of not knowing what other players will do, an improviser might not often know exactly what sounds their instrument will make for a given operational input (Borgo, 2014, 2016). Indeed, throughout my own experience as a saxophonist fascinated with multiphonics, it has often been the case that a given keying of the instrument hardly produces the same sonority each time, though a reasonable degree of consistency of sound output remains. Hardly a magical process, the behavior of multiphonics are even described as "chaotic" in the proper mathematical sense (Keefe & Laden, 1989). The variation of the resulting sonority both in time and from time to time is itself a product of numerous factors, from the previous sonority produced to the deterioration, thickness, and moisture gradient of the reed, to "embouchure" (lip pressure and placement), to the shape in which one holds one's throat.

A Techoustemological Cause of Reticence: Infrequent Recording and the Problem of Memory

As a result of the several cognitive and physical demands of improvising in this manner for forty minutes at a time, many players find it is difficult to recall precisely what happened in play itself, unsure who initiated what musical idea (e.g., jagged staccato playing, long tones, pitchless noises, etc.) at what point (Corbett, 1994, pp. 201-208). While one player may feel that they were merely "responding" to another player's suggestion, others feel that that "response" was actually an initiation (Wilson & MacDonald, 2015). Despite such challenges, however, improvisers occasionally attempt to discuss what happened at the end of an improvisation. As one player, Uwe, explained to me, even though they are talking about things that just happened, they often cannot agree on what actually took place. Nevertheless, players often come away from the experience of improvising together with strong impressions of what happened in the lengthy interaction. However, in those relatively rare cases when one player or a professional recordist produces an audio document of the interaction, these post-improvisation impressions often do not compare to what's captured in the recording and improvisers often find themselves surprised by what they hear in the audio document. In other words, the way things felt is often different than the way they really transpired.

Though remembering details of an improvised interaction is difficult task without a recording as a reference, few players habitually record their sessions or gigs. To borrow from Thomas Porcello (2005) and Steven Feld (1996), in addition to other causes of reticence, there is also a "techoustemological" cause. That is, the recording of a sonic interaction might allow for greater knowledge of the sequence of events. For most people, having a knowledge of what happened is the first condition necessary for then having an opinion or evaluation about that

course of events. Therefore, this cause is techoustemological in the sense that Porcello's term describes the fundamental role that technologies of sound recording often play in sound's ability to serve as the basis of an epistemology. More accurately, perhaps, the cause at work here may even be described as anti-techoustemological in its nature.

As a saxophonist in such scenes over several years, I have made a number of recordings of sessions and gigs. While a handful of musicians I have played with made a habit of recording improvisations, the majority of other players intentionally avoid doing so or just do not bother. In numerous cases, my use of a recording device was regarded as a pedantic encumbrance and interruption of the natural flow of the event as a human social interaction. On more than one occasion, in trying to record a session players have playfully mocked me for trying to get my digital audio recorder set up before we start playing. In some cases, these players have even just laughed as I try to set up and chosen to begin playing without waiting for me to finish and then pick up my instrument. While this is a more confrontational approach to the matter, it reflects a broader ambivalence about recordings (Bailey, 1980/1993, pp. 103-104); namely, that they are cheap and partial reproductions of authentic liveness and inherently distorted due to the richness of sound diffusion that even a decent professional array of microphones will fail to capture accurately (see Meintjes, 1990; Plourde, 2008).

The distaste for casual recording is yet another feature of the sociality of improvisers standing in the way of the possibility of critically commenting upon one another's behavior. Ultimately, before judgment — whether moral or aesthetic — is possible, a basic certainty of what has actually happened is required. The epistemological validity of this knowledge, basic for most situations in which an individual calls out another for their errors, is questionable at best. Perhaps intuitively recognizing the fact that this epistemological barrier to judgment is inherent to their practice, improvisers prefer not to directly confront one another about their misgivings about playing and interactive styles, instead opting to simply avoid the conversation entirely and choose different players in the future.

The Inefficacy of Criticism: Manfred

Even when improvisers are certain they do not like another player's way of improvising, they do not feel comfortable confronting them to explain what should happen differently. Such was a frequent experience case for Manfred, a Berlin-based improvising percussionist. Like many improvisers, a lot of his experiments with various ensemble configurations of musicians begin from the experience of chance meetings with other players in the time spent drinking and socializing with other concertgoers and musicians before and after performances themselves. Though idealists defend the notion of free improvisation concerts as a space open to any newcomer (Corbett, 2016), such spaces are structured, whether intentionally or not, to privilege and make concessions to an insider group of musicians and listeners (Plourde, 2008).

Principally, despite the fact that many concerts occur in a space one walks into right from the street (e.g., bar, art gallery), advertising and publicity for concerts is scant and most people only know that concerts are taking place if they take the time to peruse websites listing concerts of free improvisation. In the case of my fieldwork, such websites were essential resources for locating musicians and concerts and constituted the principal means by which I encountered

most of them. Though most concert listings include basic information (opening time, concert time, price of admission, address), numerous listings omit the address, mainly because the venue operates with dubious legality (i.e., without permission to hold concerts or serve alcohol). Hardly fringe or one-time events, venues with omitted addresses are often host to regular concert series frequently attended by many members of the scene. Even when one manages to obtain the address by contacting the host, other musicians, or concertgoers, arriving at the venue itself can be a feat in and of itself when one must walk from the street address, through several courtyards, into a warehouse at the back, then climb several flights of stairs, all the way to a small dirty room where one first sees a scrawling on the wall indicating the name of the venue (if lucky). In such cases there is no guarantee that other people in the building are aware of a concert taking place, and given the legal limbo of the venue, one feels fearful to ask and raise the question of unauthorized activities taking place.

While those few that make it to such tucked away spaces for concerts are likely a core group of insiders or aspiring members of the community committed to making the effort to turn up, the scene remains, like other scenes (Straw, 1991), a spatial point of convergence of distinct and divergent cultural practices and notions of right and wrong as well (Straw, 2015). Meeting other players in such spaces is a strong indication of an interest in similar practices, but as Manfred shared with me, one really has no idea what kind of playing that musician is really keen on until one actually meets again to play. Just like Torsten, many of the experiences he has had playing with musicians met by chance in such situations were disappointing for a number of reasons.

In the actual moment of playing, Manfred recalls persistent frustrations with other musicians who had a tendency to play continuously, hardly pausing and actively producing sound without break for the whole time they would play together. Wishing for a minimalist approach, Manfred would simply remain silent, hoping that this would communicate to the other player that he wanted to reach a moment of quiet, or even inaction, as a change of pace in the midst of the piece. Inevitably, Manfred was irritated with how other players would react to this moment by filling the space left by a pregnant pause. A recent formal investigation (Wilson & MacDonald, 2012) has shown that staying quiet does not necessarily send a clear message to other improvisers in the course of interaction, as they may interpret inaction as anything from the feeling that the other player is so impressed by what they hear that they have nothing to add, to the feeling that the player is disgusted and simply waiting for the other to shut up. Despite the possibility that he might have tried to communicate what he wanted in such moments, Manfred, like any egalitarian free improviser, preferred not to disclose what he really wanted other players to do and to leave them to play as they wish, move on, and play with others next time.

This chapter has surveyed a range of causes of the fact that improvisers tend to be very hesitant to criticize one another. While it may seem likely that the principal and overwhelmingly dominant cause of this behavior is the discourse of free improvisation and its emphasis on liberty and equality, I have tried to demonstrate here that a number of causes also work against a situation in which peer critique is a common practice. Again, as subsequent chapters will further establish, the lack of open interpersonal critical discourse in scenes of free improvisation presents serious methodological challenges for addressing the question of what improvisers expect of one another.

Chapter 3: A Critique of Methodologies and Sources, Part 1: Texts for Popular Audiences and Artist's Writings

In the preceding chapter, I have outlined several reasons for improvisers' hesitancy to criticize one another. The most obvious of these is that criticism (so far as these musicians seem to understand it) stands in the way of the pursuit of aesthetic and social freedom promised in free improvisation. However, as I have tried to demonstrate, a range of other factors conspire to make it taboo (and not merely difficult) to actually enunciate a criticism of one's peers as an improviser. These factors include 1) the general human tendency to avoid conflict which Goffman calls "face-work," 2) the history of harsh criticism of free jazz which then makes interperformer awkward, 3) the embodied realities of doing free improvisation which make it more difficult to remember what happened and therefore more difficult comment or critique, and 4) a particular cultural bias and aversion to recorded documentation which exacerbates the cognitive and psychological realities of human memory of factor 3).

Building on these observations this chapter argues against the efficacy of various canonical methods in the humanities and social sciences for answering the central question: what do these musicians really expect from each other (despite their pronouncements that they do not expect anything in particular)? Over this chapter and the next, I will examine four basic methodologies: textual analysis, interviews with musicians, participant observation (of multiple forms), and analysis of recordings. Again, as I suggested at the beginning of this series of chapters on methodology, each of these methods has its own utility, but ultimately only provides a weak answer at best to the basic question of whether the normative expectations of other practices (e.g., conventions of genre, tradition, or style) exist in free improvisation.

Naturally, for this central question of interperformer expectations in free improvisation, there are a range of texts on this practice that one can turn to in order to try to answer this question. These include 1) texts for a popular, non-academic audience, written primarily by journalists or other observers, 2) artist's writings, and 3) academic writings on free improvisation.¹ Despite their lack of utility in answering the central question, they provide several perspectives on how various participants in these scenes subjectively define and understand the notion of musical interaction and expectations therein.

Texts for a Popular, Nonacademic Audience

Written by journalists and other cultural critics, "popular" texts often aim to spark the readerly audience's interest in free improvisation as a practice. In addition to stimulating interest in listening to recordings or attending performances of free improvisation, these texts often aim to encourage participation in such scenes. In other words, despite a longer format than the typical column or feature in a periodical, these texts function essentially as lengthy versions of arts journalism since their authors are quite often journalists who regularly write for a range of outlets on this kind of music. As with any form of arts journalism, a reader can certainly gain some factual knowledge from the perspective offered. At the same time, the function of this form

¹ Academic writings will be addressed in the next chapter.

of writing never quite eschews the tendency to provide at once a platform for informing an audience about a particular artistic activity while also promoting its commercial viability (however limited this may be in a fringe art-form like free improvisation).

More importantly, in light of the fact that the jazz establishment (comprised of musicians and critics) was so dismissive of free jazz at its inception and from then onwards,² the role of these texts as promotional tools cannot be ignored. For all that they may serve to inform an audience or examine a musical practice, they do so in a context in which the practice in question is under attack and they therefore function as an early means of its defense in a cultural climate of dismissal. Moreover, given the associations of free jazz with the Black Arts Movement and its role as an aesthetic manifestation of Civil Rights era goals of sociopolitical change, these texts also tend to emphasize the liberationist promise of free improvisation as a musical practice.

Returning to the central question, the majority of these texts suggest that free improvisation, in principle, avoids any aesthetic normativity (such as genre, tradition, or convention) and that all participants (including critics, performers, and audience) are also obligated to work to make sure that this happens. At the risk of oversimplifying an otherwise well-researched text, the title and much of the content of John Litweiler's *The Freedom Principle* (1984) is by itself illustrative of this trend. In one of the most prominent texts of its kind (and one frequently cited in academic treatments of free improvisation), Litweiler presents what can be seen as one of the iconic representations of free jazz as a practice liberated from constraints of artistic practice. To be fair, Litweiler occasionally hedges the intensity and simplicity of this depiction. Referring to saxophonist Ornette Coleman's experimentations with jazz-influenced improvisation in which harmony, pulse, and swing are no longer obligatory guidelines for extemporization, Litweiler observes, "the harmonic-rhythmic features of Freedom have been anything but liberating to many musicians" (ibid., p. 13). To what or to whom "anything but liberating" would refer is of great interest. Nevertheless, a perspective on how and for whom the freedom of free jazz is not experienced as liberating is quite muffled by Litweiler's more frequent emphasis on the practices of early free jazz pioneers as acts of liberation which release musicians from the confining expectations of canonical jazz practice.

Similarly, other texts of this kind also emphasize the liberation of musical practice afforded through free improvisation at the expense of calling into question how effective these liberations are at eliminating constraints from practice. For example, while extending the work begun by Litweiler to offer a biographical portrait of many key musicians, the narrative of Valerie Wilmer's *As Serious as your Life* (1980) is anchored by a basic sentiment that free jazz liberates, though she also recognizes the problematic manner in which this musical movement fails to overcome the oppression of gender difference for women. Like Litweiler, Wilmer stresses the fact that these musicians do indeed extend and surpass the conditions of possibility of jazz, blues, and African-American music broadly. At the same time, this leaves little room for considerations of how the exit from customary practices produces certain implicit norms in their stead. In a word, these new norms are essentially the old ones inverted. That is, while jazz practice of the mid-twentieth-century demanded that players honor the harmonic and rhythmic of

² See Chapter 2.

a given composition, the innovations of free improvisers were informed by an implicit drive to avoid adherence and conformity to such constraints.

Similar in orientation to Wilmer's book, A.B. Spellman (1966/2004) offers a profile of four jazz musicians with experimental leanings. While Spellman offers some discussion of the nature of musical interaction for these players (particularly the early nonhierarchical musical interaction experiments of Cecil Taylor), this work primarily deals with the issue of how such avant-garde music is handled, presented, and ultimately stymied by the anxieties of club owners trying to keep their doors open and avoid alienating their audience with music which fails to immediately relate to casual listeners. Likewise, Frank Kofsky's writings (1970, 1998) on free jazz and African-American experimentalism focus largely on the relationship between economic constraints and the manifestations of Black nationalism in musical practice. Like Spellman, Kofsky's work is less focused on the details of musical practice taken as the focus of this chapter and dissertation than the practical realities of making experimental music in an environment where potential commercial viability is the main factor contributing to the dissemination of particular forms of music.

With a level of analytical rigor, German musicologist Ekkehard Jost's diachronic analysis of the evolution of free jazz practice in his English-language text *Free Jazz* (1974/1981) demonstrates just how far such innovations can extend beyond roots in jazz. Jost's account is a compelling narrative demonstrating an incremental progression from the early innovations of those like Ornette Coleman to subsequent jazz experimentalisms of Sun Ra and "the Chicagoans" (as he calls them). All the while, it also becomes more obvious to the reader that an implicit bias against tonality- and pulse-based playing informs both Jost's analysis and perhaps the work of these innovators as well. Additionally, the narrative of aesthetic evolution in Jost's portrayal suggests, especially as he writes at the very same time when these stylistic changes were occurring, that the trajectory of these developments will continue infinitely into the future and that a path of progress away from constraints has been commenced through the work of these musicians. Again, Jost is well justified in tracing a series of incremental innovations in the work of these players and analytically, he demonstrates that these changes do suggest a sequential set of shifts over time. Still, as innovative as these moves were, Jost does not pause to consider the possibility that such innovations can, just like the constraints that came before them, become new hegemonic norms of practice, ones which leave some musicians feeling confined, as Litweiler (1984) alludes to.

Writing from a different perspective, commentators more oriented towards the African-American origins of free jazz and subsequent innovations of free improvisation emphasize the general role that this music plays as an expressive form of a broader socio-political struggle for racial equality and the hopeful and eventual transcendence of the legacies of chattel slavery. In Jean-Louis Comolli' and Philippe Carles' *Free Jazz/Black Power* (1971/2015), for instance, the musical resistances to convention are overwhelmingly characterized as acts of expressive activism, artistic reproductions of protest against dominant power structures of the time. In this view, the self-determination of Black culture is construed as a symbolic gesture of resisting control from the racialized hierarchies of postwar American society specifically and black Atlantic (Gilroy, 1993) life generally. More importantly, however, like other quasi-journalistic texts, a major objective in Comolli's and Carles' presentation of this music is to rectify what the

duo takes as a major misrepresentation and misunderstanding of free jazz by a number of American and European jazz critics. To a significant degree, the objective of their text is less to present the work of free jazz musicians from an analytical or individual biographical approach and more to argue that the work of these African-American musical innovators has artistic value despite frequent dismissal by music critics in the US and abroad. The value of these practices stems from the fact that they represent a latter-day manifestation of the artistic worth of African-American cultural practice, practices which have been historically and systematically marginalized for much of American history. Indeed, given the history of such oppression, their project is surely of value, a contribution recently recognized in the production of an expanded republication and translation of this classic text (Carles & Comolli, 1971/2015). All the same, the two French authors of this work overemphasize the notion that free jazz, and all music to come in its stead, intrinsically constitutes an effacement of any obligation by free improvising musicians to adhere to constraints or conventions of practice.

In short, the will to defend these practices from their detractors obstructs any real ability to recognize the possibility that free improvisation is susceptible to the formation of new constraints and implicit expectations for how musicians should perform and improvise their artistic “freedom.” Perhaps of all the writers of this period championing the practices of these experimentalists, Amiri Baraka (LeRoi Jones) (1963, 1967, 1984) goes the furthest in celebrating the transcendence of musical constraint by these musicians and avoiding much discussion of how these developments lead to the formation of new expectations. More than the other authors mentioned here, Baraka was himself a participant in the activities of cultural production which sought to renovate or even smash the stereotypical expectations that cultural critics had developed at the time for how black bodies should express themselves on stage, in print, on canvas or celluloid. Nevertheless, like the others, Baraka overemphasizes the notion that the radicalism of these practices prevents the formation of new canons which artists may find just as constricting as those that came before. Regarding the question of expectations, Baraka presents the same utopian version of this practice that proclaims that it has liberated musicians from such restrictions.³

Moving away from the African-Americanist foci of the above texts, Ben Watson’s (Watson, 2004) hagiographical biography of guitarist Derek Bailey largely tasks itself with using Bailey’s life history as a means of narrating the chronology of free improvisation itself. While Bailey is certainly central to the development of free improvisation both as a historical movement and musical practice, the biography’s narrative structure ultimately focuses far too much on the work of just one musician, often making statements that minimize and marginalize contributions of those other than Bailey. Watson’s primary interest in demonstrating how the guitarist shatters one orthodoxy after another leaves no room for considering the fact that he

³ However, Benjamin Piekut (2010) also raises the point that Baraka indeed had certain expectations for what the ideal representation of blackness through freely improvised musical performance could be. Specifically, in his comparative appreciation of trumpeter Bill Dixon versus Albert Ayler, Baraka is decidedly far more of a champion of Ayler’s sonic style over Dixon’s. As Piekut points out, Baraka’s preference for Ayler is largely due to the fact that he hears something far more masculine in the power and aggression of Ayler’s playing compared to the gentler playing style of Dixon. In so doing, Baraka creates an axis of associations of social identity categories mapped onto sound, with “black-loud-aggressive-manly” on one end and “white-quiet-timid-feminine” on the other.

became a prototype for others, a model to be emulated in much the same way that iconic stylists of previously “innovative” genres are emulated.

In a different plane, other writings for a popular audience on this practice are presented as an introduction for those completely unfamiliar with the practice. For example, Stephen Nachmanovitch’s (1990) extended personal essay on free improvisation is an invitation to the reader to explore these practices on their own instrument. Drawing parallels between everyday life and free improvisation, Nachmanovitch’s perspective on the practice does as much to emphasize its liberating qualities as it does to stress the fact that it creates creative challenges distinct from and perhaps more demanding than those of other forms of improvisation. This view is perhaps more useful than other writings as a critical perspective on the open-ended task of free improvisation as it implicitly takes the constraints of other genres not as barriers but as assets.

But among texts for a popular audience, John Corbett’s recent (2016) introduction to free improvisation presents what might be one of its most utopian depictions yet. The book is full of proclamations that free improvisation is hardly the province of a small group of musical specialists and the author really wishes the reader to believe that all are truly welcome. Flying right in the face of recent ethnographic perspectives on the closed, insular, and exclusive nature of free improvisation scenes (Plourde, 2008), Corbett over and over again invites the reader to understand such scenes as inherently welcoming and never interested in turning new listeners away. At times, Corbett (almost) seems to catch himself on the gaslighted cognitive dissonance of his sunny representation of free improvisation, offering “a basic rule of thumb: all interpretations are valid, but some are better than others” (Corbett, 2016, p. 4). Nevertheless, these small moments of doubt regarding the possibilities of openness are almost always dismissed with a strong assertion that anyone is welcome. To be fair, it seems that Corbett’s agenda is not necessarily to present free improvisation as if it is free of a segment of its practitioners and observers that wants to codify its activities into an orthodoxy, but rather to quietly enact a revolution against the problematic activities of this element of the scene globally. In the end, however, Corbett does not realize that this cannot simply be done by fiat alone and that this kind of cultural change needs more than a placid representation of the practice stamped with the authority of being published by a major American university press.

Broadly, the texts reviewed above present a relatively uncritical conceptualization of free improvisation as a practice beyond aesthetic boundaries. While problematic as a source of material to address the central question, they do so for reasons which are relatively easy to understand and logical given the historical context of the oppression of African-Americans and the concomitant critical disregard for free jazz. Nevertheless, as I shall also note in the section below on academic writings, these texts are not very helpful in offering a critical answer to the question of whether or not improvisers are simply free to play as they wish.

Artist’s Writings

At first blush, it would seem that an artist’s writings on their own work is the best and most authentic perspective one can possibly have. Who could possibly better articulate what they are doing and its parameters than the musicians themselves? Indeed, compared to the popular texts surveyed above, artist writings fare marginally better as a source of information for answering

the central question. Still, much like those popular texts, artists' own perspectives frequently recapitulate the view that performers of free improvisation are liberated and liberate one another from any expectations from peers in the midst of musical interaction.

Returning to the work of the previous chapter of this dissertation, it should be noted that any analysis of these texts should be filtered by a consideration of the several factors contributing to improvisers' tendency not to directly criticize one another. The difficulty of clearly remembering what happened in approximately 40 minutes of improvisation, the fact that many musicians do not record the majority of their playing sessions with others, the basic human tendency of face-work, the ideological commitment to freedom, and the history of harsh jazz criticism which makes peer criticism feel taboo: all of these factors should really cast a shadow of doubt about the claims made about the musical practices made therein, especially with regard to the notion that players are free of any expectations from their peers. Taking the factors listed in the previous chapter into consideration, any reading of these texts as clear, transparent, or even faithful representations of what actually happens when playing music with others should be seriously questioned, if not simply dismissed.

By and large, Derek Bailey's account (Bailey, 1980/1993) of the practice of free improvisation in *Improvisation: Its Nature and Practice in Music* avoids the topic of emergent expectations and norms in free improvisation. Much like Jost's evolutionary account of innovations from free jazz onwards, Bailey's writings on the subject paint a picture of a gradual progression from the jazz-based improvisations of his earlier group Joseph Holbrooke to the more abstract work of his later groups. However, unlike the historical arc presented by Jost, Bailey peppers his thesis with recognitions of the fact that the goal of freedom through improvisation is one that all wish to achieve but never really do. Such recognitions occur through the frequent placement of the term "free" in scare-quotes as well as through more explicit statements.

For example, writing about the group Joseph Holbrooke, Bailey describes a number of ways that the group starts by working with modal jazz forms (a manner of improvising already somewhat liberated from its bebop-based predecessors). But as he fondly reminisces about the group's early experiments, he abruptly pauses to remark: "Except, of course, that it wasn't free. It was modal" (Bailey, 1980/1993, p. 87). In addition to recognizing the inefficacy of the goal of realizing a total freedom in improvisation, Bailey also acknowledges certain basic aesthetic goals in free improvisation. Quoting from an interview he conducted with fellow improviser and percussionist Tony Oxley, Bailey recognizes that for improvisers, the "search was always for something that sounded right to replace the things that sounded predictable and wrong" and that "the exclusion of the jazz vocabulary was an emotional act of feeling" (ibid., p. 89).

In descriptions of subsequent groups, Bailey adopts a similar stance towards the impossible yet desirable goal of a total freedom in improvisation. As he describes a group called the "Music Improvisation Company," Bailey refers to the "continuation of the search for a style-less, uncommitted area in which to work" (ibid., p. 94). without necessarily implying that this uncommitted territory was one the group actually found. Bailey describes the emergence of a style or tendency of group interaction as the result of a larger historical process in free improvisation rather than the result of the fact that any group that spends time together gradually develops certain implicit expectations and habits of social interplay.

Drawing on a published interview with fellow group member and live electronics improviser Hugh Davies, Bailey points to the fact that Davies reportedly felt “secure” that other players would know that one player was “aiming at” another and that quite likely, they “would react to you in a particular way” (ibid., p. 95). Seemingly confused or surprised by Davies’ experience of the group, Bailey followed up and pressed Davies to explain a bit further. In Bailey’s conversation with Davies, then, the electronics improviser reports an incident in which he felt that a particular choice by saxophonist Evan Parker indicated to him that Parker was “expecting another musician to join him [...] almost as if he was asking one of [the other players] to do so” (ibid.). This is one of the few times that Bailey explicitly recognizes the notion of interpersonal musical expectations in free improvisation.

However, Bailey concludes the treatise with a pithy deferral of the possibility of attaining the kind of freedom that many improvisers desire, though he does not give much space to consider the nature of the forces that obstruct the achievement of this freedom. “Freedom for the free improviser is, like the ultimate idiomatic expression for the idiomatic improviser, something of a Shangri-la” (ibid., p. 142). Still, while Bailey steers clear of an analysis of the interpersonal genesis of expectations for musical interaction in this practice, he draws from his longtime collaborator Evan Parker’s words to recognize a similar force at work: “I think we accepted long ago those aspects of each other’s playing that we were never going to be able to change and we work upon the parts that are negotiable” (ibid., p. 141). How this “negotiation” was accomplished, however, is left unclear by Bailey’s account.

Moreover, Bailey’s account of free improvisation does discuss certain playing tendencies of the groups he was involved in, and this does in fact give a sense of how the task of indeterminate musical interaction was approached. One passage, quoted from Bailey’s interview with bassist Gavin Bryars, is rather rich in the issues it raises on this and other matters:

Solos were usually completely solo and what accompanying there was would be more like prompting but it wasn’t a question and answer thing. It was, I think, much more subtle than that. Even now I have a lot of respect for the music we played and it had qualities which I haven’t heard in other improvised music (ibid., p. 92).

Bryars explains what tended to happen in musical interaction. What he describes seems to foreshadow at least a portion of the autonomous type of interactivity that musicians engaged in the fieldwork for the present dissertation seem to prefer (see Chapters 12 and 13). Less likely in their interactions are an obvious antiphonality while parallel streams of relatively independent action are greater tendencies in their interactions.

However, while we know what tended to happen, we do not know from this passage what the musicians might have wanted otherwise. So much is also suggested by Evan Parker’s comment quoted above, which indicates that the musicians here did not necessarily correct one another’s playing and chose to accept these traits as givens, working with or around them instead. Additionally, Bryars briefly recognizes the questionable certainty of his own memory (“I think...”) which alludes to the problem I discussed in greater detail above. This brief hedge flags the fact that these are Bryars’ after-the-fact recollections and he himself revises the way he

characterizes the form of interactivity of the group (“wasn’t a question and answer thing.”) Finally, he ends his remarks by affirming the aesthetic value and superiority of the group’s music. Bailey’s selection of Bryars’ self-laudatory comments is especially interesting given the fact that Bailey himself was at the center of the group that Bryars’ describes.

Where Bailey’s text already attempts to weave a multivocal or “polyphonic” (Clifford, 1983) depiction of free improvisation, saxophonist John Zorn’s *Arcana* series (2000) takes the attempt to represent the “diversity” (Bailey, 1980/1993, p. 83) of perspectives of improvising musicians to another level. Now in its seventh volume, *Arcana* is an eclectic collection of verbal musings on free improvisation and related practices (i.e., performance art, avant-garde composition, video art, etc.). Contributions range from essays in the style of the traditional artist statement, in which a musician discusses their approach, its genesis, influences, etc., to more substantive attempts to deal with a single theoretical issue, to bizarre and somewhat illegible experiments bordering on concrete poetry (pianist Anthony Coleman’s contribution to the first volume, for example). In terms of their ability to answer the central question, to say nothing of the recognition that improvisers do expect certain things from other players, the utility of these writings is limited, though for some (including myself), these pieces may make for exciting and perhaps even playfully inspiring reading.

In many ways, the collection’s inability (or refusal, even) to discuss the fact that performers of free improvisation may not be so free from the reality that fellow players and audiences may expect something in particular from their concerts is due to the fact that, like the popular writings surveyed above, *Arcana* retains an agenda of defending these practices. That much is made clear in Zorn’s preface to the first edition. Citing his deep frustrations with music critics trying to make sense of his work in the New York downtown experimental music scene of the 1980’s and ’90’s, Zorn explicitly positions *Arcana* as a textual corrective to (what he sees as) the continual tendencies of journalists to misrepresent or simply not pay much critical attention to his work and those of his cohort. As Zorn writes, “not one single writer has ever come forward to champion or even to intelligently analyze exactly what it is that we have been doing” (Zorn, 2000, p. v). Thus, in the face of what Zorn finds to be journalistic and academic lethargy in adequately dealing with this music, *Arcana* aims to revise the inaccuracies he perceives representations of the music of his peers was represented.

While pieces collected in these volumes offer a glimpse into the creative thinking of an impressive range of artists, the vast majority of these pieces hardly clarify what most of these artists do, let alone address the question of constraints, expectations, or conventions of free improvisation. For example, electronic music pioneer Pauline Oliveros’ contribution to the fifth volume of the series, “The Collective Intelligence of Improvisation” (Oliveros, 2010) suggests a possible meditation on the emergent composite intellect resulting from the interplay of individuals. Instead, Oliveros begins with a discussion of former U.S. President Barack Obama’s adroit use of social media and its culmination in his first inauguration in 2009.⁴ Citing the fact that Obama spoke from memory on the occasion, she claims that he has “created an

⁴ There are a few inaccuracies in her presentation of this material. Oliveros indicates at the beginning of the paper that it was delivered on “January 21st, 2008.” This may be true, but the first line of the essay reads “two days ago” in reference to the inauguration, which customarily takes place on the 20th of January. Lastly, Obama’s first inauguration took place in 2009, not 2008.

improvisational shift in the world energy field” (Oliveros, 2010, p. 292). Then leaping to the subject of “music improvisation,” Oliveros runs through a number of broad, plausible, and yet wholly unsubstantiated claims about human nature and musical action: “Whether an individual soloist or ensemble is improvising, there is a mining of musical information stored deeply in the collective consciousness of humanity.” Later on, she claims further that “through their music, musicians are the harbingers of world community and planetary consciousness” (Oliveros, 2010, p. 293).

The piece is moving and evocative of several deep potentials in the act of music-making. As a musician myself, I hardly dispute any of the claims made in this piece. Indeed, I am inspired as I read it. Nevertheless, one cannot come away from reading such material and find oneself asking whether the original mission of Zorn’s *Arcana* series seems to have gone astray. How does such writing do a better job of clarifying musical practice than the journalists that Zorn vilifies in the preface to the first edition of the series?

Similarly, Franco-Martinican trumpeter Jacques Coursil’s contribution to volume III, “Hidden Principles of Improvisation” (Coursil, 2008), attempts to offer a discussion of the topic suggested in the title. Indeed, Coursil draws on his interest in linguistics, philology, and folklore to make a handful of intriguing arguments about the relationship between improvisation in everyday speech and improvisation in music. However, yet again, it is unclear how Zorn’s conceit that going to the individual human source of artistic production really does better than the observation of the third-party non-musician critics he dismisses as poor commentators on the details of what these artists do. Like Oliveros (though perhaps with a greater degree of citational rigor), Coursil runs through a series of general claims about the nature of music, the nature of language and their relationship.

Again, as is true with Oliveros, what he writes is fascinating and worth investigating. Alas, that is not accomplished in this piece. Instead, aphorisms are offered, presumably to be taken at face value: “as opposed to language, music is a value system without signs” (Coursil, 2008, p. 63). Intuitively, I agree, and as some have recently suggested, the lack of intentional clarity of music makes it difficult to accept as a system of clear signs (see Ariza, 2009). But Coursil hardly substantiates this claim. Ultimately, the piece does less to clarify what Coursil does or even the “hidden principles” the title hints at than it does to offer a set of provocative and intriguing observations about the relationship of musical and linguistic improvisation in everyday life.

In contrast to the overwhelming majority of the pieces collected in Zorn’s series, which share the obfuscating tendencies of the two just mentioned, George Lewis’ “ethnographic memoir” (Lewis, 2000a) of learning and teaching improvised music offers a truly generative and illustrative discussion of the nature of social interaction in free improvisation. In many ways, this piece sets out precisely the objects of inquiry of this dissertation as a whole, even as Lewis’ primary topical focus is the problem of how one approaches pedagogy for something like improvisation. On several occasions, particularly in his accounts of teaching at the University of California, San Diego, Lewis recounts the unavoidable fact that free improvisation opens musicians up to the possibility that their actions will be judged by others. Moreover, it also creates a type of collective action in which one will not be necessarily able to access those judgments for they may very well be concealed or otherwise rendered inaccessible. Though basic

and perhaps pedestrian as an observation about how one should conduct oneself in a context of collective improvisation, Lewis refers to a student's journal entry turned in at the end of the class: "People are playing the same thing all the time and never listening" (ibid., p. 104). The very same problem or critique is registered over and over again in the several musicians described in the rest of this dissertation. In the course of working with students on the practice of improvisation, Lewis really brings to the fore one of the central questions of this thesis: "Is there a right or wrong way to play when involved in free improvisation?" As I shall also demonstrate in later chapters, the answer to this question given by Lewis' own students really reveals a shade of the "diversity" that Derek Bailey described. In other words, his students really demonstrate that an answer to this question is very much reflective of the outlook and worldview of the individual offering a response.

Though it occasionally has the same tendencies as the Arcana series, the German/English *echtzeitmusik: selbstbestimmung einer szene (self-defining a scene)* (Beins et al., 2011) raises the bar in terms of the kind of clarity that a collection of artist's writings from improvisers and other experimentalists of music and performance art can offer. The collection provides a space for artists of the post-wall Berlin scene to articulate in greater detail what they do and why, much as Arcana does. Quite often, the perspectives are concrete descriptions which allow the reader to more easily understand the conceptual and mechanical processes behind what she does with her instrument and sound-making apparatus. For example, with didactic clarity, Andrea Neumann's piece, "Playing Inside Piano" (Neumann, 2011), explains many of the details of what it is that she actually does as a musician, the materials she uses, their genesis in her personal and musical life, and even the filter settings she uses for her mixer.

Similarly, percussionist Burkhard Beins' piece "Entwurf und Ereignis" (translated as "Scheme and Event") (Beins, 2011) is an insightful discussion of the phenomenology of living, being, and playing with others as a free improviser. It recounts how these experiences change over time, and why these experiences are exciting for musicians. Indeed, this piece is a great source of ideas (but not necessarily clear answers) relating to the central question. Astonishingly clear and frank, Beins describes a basic element of the social phenomenology of playing music of this kind with another person: "At the outset...either I may wait until someone else starts, thereby creating a situation that already offers possible courses of action, or I may decide to set down one of my own possible choices independently" (ibid., p. 167). As he elaborates, one really never knows who will start: "the only thing I know is that they cannot know which decisions I will make either."

However, Beins also recognizes that, despite the inherent uncertainty or "double-contingency" of the situation (see Parsons, 1951/1991, and previous chapter), foreknowledge and expectations are unavoidable, especially for players who have played together extensively. At the same time, the foreknowledge is only general in nature. Players only know what other players are able to do, but have little capacity to predict at any given time what precisely they will do. More importantly, the situation becomes more and more mixed between foreknowledge and mystery as the musicians in a group have independent musical lives, playing with others and having other experiences which influence them in the intervals between group meetings.

Above all, Beins recognizes the inevitable foreclosure of open possibility which emerges as a group gets to know itself through several meetings. Regarding the central question, this

implies both that other players begin to expect players to enact relatively stable personalities over time, but also that other players expect, or at least desire, some deviation and breakage of the fixity of those personalities and their interactive dispositions. The rupture of this stasis is also achieved as players play with other musicians not of the group in separate contexts in between the groups meetings. In several ways, Beins more frankly and clearly articulates the more theoretical ideas developed by German musicologist and saxophonist Matthias Haenisch in his systems-theory driven piece on emergence in the same collection (Haenisch, 2011).

Besides these pieces by Beins and Haenisch, Diego Chamy's discussion of his subtly provocative "Interaktion Festival" describes how an experiment to create a "contest" among improvised duos elicited the audience's sense of aesthetic norms for how improvisers should play together (Chamy, 2011). Festival attendees were asked to judge and rank the duos they heard and how well they felt the duo interacted, with the winning duo and runner up offered a cash prize of 1000€ and 500€, respectively.⁵ In his piece, Chamy is unspecific about what kind of interaction attendees ultimately seemed to prefer, but the exercise he created through this staging of free improvisation as a competition is perhaps a productive future strategy for answering many of the questions of this dissertation through another approach.

Despite these useful/informative aspects, the essays collected in this volume, do not really provide much information to answer the question of what specifically another player wants from a fellow improviser at a given moment in time, as is the case for Arcana. At this point, some may feel that I am demanding too much in terms of the artist's ability to answer the question of normative expectations governing musical practice in free improvisation. All the same, it is really in response to John Zorn's own contention that an artist's account is better than the critic's or academic's that I offer this analysis. Curiously, for Zorn's claim, one postmodernism seems set against another. That is to say, the postmodern tendency of skepticism towards academic knowledge (Lyotard, 1984) as more refined and of greater utility than its lay counterpart is what drives Zorn to assert that journalists and "so-called thinkers" (Zorn, 2000, p. v) fail to properly comprehend what he and his cohort are doing musically. Oddly enough, what these writers seem to fail to understand is itself what many refer to as postmodernism in music, as many of Zorn's interlocutors are known for their eclectic, counter-intuitive approaches to music which freely rove across genre.

In the end, my critique of these artists' writings expresses anthropological attitude of skepticism towards such materials as reliable documents of behavior or culture rather than offering a close reading of them individually or as a collection. As Bronislaw Malinowski outlined nearly a century ago (Malinowski, 1922/2002), ethnography surely benefits from conversations with informants about what they are doing, its meanings, its limits, and its details. But as he argued in *Argonauts of the Western Pacific*, the self-reported account of an informant must be complemented by the ethnographer's own participation in and observation of the social

⁵ Curious about sound of the winning (or losing) duo performers, I followed up with Chamy via email in 2014. He explained that the winners of the contest were on the more "plinky-plonky" side of the spectrum of interactivities between improviser. An onomatopoeic representation of the kind of rapid-fire, quick interactivity it refers to, the term "plinky-plonky" tries to sonically depict a particular manner of improvised musical interaction in which players partially mimic and slightly diverge from what others are playing and in which one hears quick and obvious interactivity between players overall.

lives in question. This is not merely so as to understand better by acquiring the sensory and physical experiences of these cultural worlds, but because “we know more than we can tell,” as Hungarian-British polymath Michael Polanyi famously wrote (Polanyi, 1966/2009, p. 4). In other words, for all their expertise in what they do as musicians, there is often a basic cognitive limit to how much a skilled actor can tell us about the actions she takes. Such self-reported accounts cannot be taken at face value, especially given the distorting effects of memory due the nature of the practice of free improvisation itself. Therefore, additional methods and sources are required in order to understand what improvisers expect of each other in musical interaction and what these expectations might mean.

Chapter 4: A Critique of Methodologies and Sources, Part 2:
Academic Writings, Interviews with Musicians, and Recordings

If the artist's own accounts are only weak sources of information for answering the central question, then what of academic writings? On the whole, these perspectives do offer greater clarity with regard to the limits of liberty inherent in free improvisation. At the same time, as I suggested in the previous chapter, they also fall prey to repetitions of an idealistic image of free improvisation as a practice free of constraints like genre, tradition, and other accrued normative ideals shaping musical practice. On a more general level, the issue of musical interaction in free improvisation is itself not one that is directly or intentionally problematized and targeted as an object of inquiry in this literature. As I showed in the review of artists' writings, the lack of explicit focus on musical interaction in this body of research is not a fault of this work as a whole, as its objectives are simply different than those of this chapter and dissertation.

Academic Writings

Much of the literature on free improvisation focuses very specifically on the nuances of racial politics at work in these practices. While some claim, as Derek Bailey does, that "free improvisation wasn't 'started' by anybody" (Bailey, 1980/1993, pp. 85, fn. 82), it is clear that the practice was at least initially developed through the musical activities of African-American artists in the 1960s and 1970s. For this reason, works dealing with the relationship of African-American culture, racial politics, and free improvisation have played a key role in the development of the academic bibliography on free improvisation over the past two decades. For example, Charles Hersch's (1995) early contribution to this bibliography offers an exposition of the basic point that free jazz and other manifestations of avant-garde African-American culture (e.g., the Black Arts Movement) experimented with and creatively reconfigured key forms developed over the course of African-American cultural history (e.g., blues, jazz, spirituals). Hersch argues that these elements of a cultural *armoire* were used as the basis for experimentation in order to symbolically demonstrate that this repertoire of expressive cultural practices need not be only deployed in the manner that they already had at that point and that these elements have a plasticity and potential that goes far beyond their uses till that point. With a different but related focus, George Lewis' (1996) article, which was later republished in an influential collection (Fischlin & Heble, 2004b), examines the problematic relationship between the legacy of John Cage and the parallel developments in improvised music in the wake of early jazz experimentalists like Charlie Parker. Similarly, Robin Kelley's (1997) contribution to this bibliography examines the relationship between African-American activist politics, particularly with its focus on liberation, and a variety of forms of avant-garde cultural expression including free jazz.

Building on work dealing with the interplay of cultural production and racial politics, Jason Robinson (2005) takes up Stuart Hall's criticism (1996) of the manner by which Black nationalist movements problematically and ironically attempt to counter essentialisms of black

culture by presenting monolithic conceptions of a “real” blackness in response.¹ Taking issue with Hall’s criticism of an essentialism of these anti-essentialists, Robinson articulates a number of ways in which blackness is interpreted by African-American experimentalists, reflective of both a multiplicity of African-American experiences and also a heterogeneity of interpretations of what constitutes the core of that cultural location. Considering the notion of nonhierarchical musical interaction in free improvisation in light of the struggles for equal rights is of critical importance to understanding the meaning of the practice itself. Quite likely, the historical legacy and cultural imaginings of the meaning of this struggle for racial equality play a role in how musicians conceptualize egalitarian principles of musical interaction. Looking ahead to Chapters 12 and 13, the cultural separatism and autonomism of Black nationalism is possibly manifested in the form of an ethic of face-to-face musical interaction in which players prefer that others do not directly engage and each line of musical action remains mostly independent from the rest. Nevertheless, other than recognizing that the political principles at work in the Civil Rights era arguably contribute to the fact that improvisers highly value freedom of personal expression and the equality of the participants of a collective ensemble, these treatments do not make the issue of musical interaction itself into an explicit object of inquiry.

Taking a look at a very distinct form of free improvisation (and one not necessarily immediately relevant to the practices examined in this dissertation), Jason Stanyek’s (1999) essay on “intercultural” free improvisation signals a slight turn towards a more explicit foregrounding of the micropolitics and ethics of musical interaction in this practice. “Intercultural” refers to experiments in creating ensembles in which the musical backgrounds of the performers stretch far beyond the Western instrumentarium and implicit cultural background of the performers. This “strong” interculturalism, as I would like to call it, must be distinguished from the “weak” interculturalism of much free improvisation. To be sure, the personal cultural backgrounds of various improvisers are often distinct and individuated. Nevertheless, these are generally significantly less varied than those at work in strong interculturalist free improvisations like the Evan Parker ensemble Stanyek examines.

Away from the weak interculturalism (or perhaps the cultural homogeneity or intraculturalism) of much typical free improvisation, Stanyek turns attention to a later project of saxophonist Evan Parker, “Synergetics” (1996), which throws together an eclectic grouping of musicians inclined toward free improvisation and unstructured cross-cultural collaboration. As Stanyek puts it,

a list of the performers will bear this out: Jin Hi Kim, a Korean player of the komungo (a zither played by striking it with a piece of bamboo); George Lewis, an African-American trombonist and computer musician; Thebe Lipere, a South African percussionist and player of the imbumbu (an African aerophone which has a close resemblance to the Australian didgeridoo); Carlo Mariani, an Italian player of the traditional Sardinian launeddas (a polyphonic reed instrument played by using circular breathing); Sainkho Namchylak, a vocalist from Tuva; Walter

¹ This kind of “anti-essentialist essentialism” is exemplified in Baraka’s preference for Albert Ayler’s loud, ferocious playing over Bill Dixon’s more subtle and less aggressive style. See previous chapter for comments on this matter.

Pratti and Bill Vecchi, two electronic musicians from Milan; and Motoharu Yoshizawa, a bass player/vocalist from Japan (Stanyek, 1999, p. 44).

As Stanyek points out later on in the essay, both Lewis and Parker are skeptical of the notion that the cultural identity and subsequent labeling of these performers does much to tell us what they actually do or how they are from “distinct” cultures at all. All the same, as the historical records of discography and concert listings will tell us, some of these musicians are identified (and identify themselves) as free improvisers while the rest have a less clear to relationship to this term in other parts of their musical careers. In other words, free improvisation is not, as some would rather idealistically have it (Lewis and Parker, as quoted by Stanyek, but also Corbett 2016), a transcultural world in which there exists no boundary between insiders and outsiders. Despite constant proclamations of openness in free improvisation, it is a culture which has insiders and outsiders, like any other culture, as Lorraine Plourde (2008) has done an excellent job of articulating through an ethnographic account of Tokyo’s free improvisation scene.

While the kind of free improvisation Stanyek looks at in this piece is very different from the kind I examine in this dissertation, it is a highly productive choice for the fact that the very nature of such an ensemble raises the questions of ethics which Stanyek rightly borrows from music sociologist Simon Frith (1996). In the midst of an improvisation of this kind, each player’s thinking in the moment inevitably ponders questions of the ethics of cultural diversity as a contemporary experience. That is, if and when one chooses to put forth sounds associable with a culturally-specific musical practice into the ensemble’s ongoing sonic activity, one implicitly raises the question of how others should respond. If we are hearing komungo, then must the other ensemble members respond with material that complements the komungo according to the principles of accompaniment habitual in its cultural origin? Or are they free to set culturally distinct musical ideas from afar against the komungo’s sound? And returning to the issues of the lack of metamusical discussions common in scenes of free improvisation, when will we ever really know if the komungo player appreciated how we responded or not, whether it was culturally divergent or consonant? Even though these questions are especially perceptible in the way Parker’s ensemble interacts on the group’s recording, these are questions very relevant to the weak interculturalist improvisation which is the mainstay of the several musicians I have worked with in my fieldwork. Likewise, these are also the questions implied in Burkhard Beins’ account of the phenomenology of musical interaction in free improvisation. There is a basic question which goes far beyond the merely aesthetic and is unavoidably ethical in every action: am I imposing my musical ideas on others? How would I know that this imposition is possibly desired or considered helpful by the others?

For all that Stanyek’s piece foregrounds these issues, the basic substance of their answers is only hinted at. An investigation of how these and other performers actually deal with these issues would be a great focus for transcription and analysis of this recording. All the same, analysis is not a part of Stanyek’s consideration of these questions so much as a general theoretical outlining of their relevance to this kind of social interaction through music. In the end, for Evan Parker’s Synergetics, several questions remain: what happened when one player introduced musical materials that clearly referenced a specific musical tradition? Did certain non-Western tropes attract greater attention or support from fellow players than others? Perhaps

due to the historical moment in musicology in which this piece appeared, formal analytical approaches to these questions do not appear to be foregrounded.² In any case, Stanyek's work on this topic includes a discussion with Sainkho Namtchylak that foreshadows her later on-stage quarrels with other improvisers (see Fischlin et al., 2013, pp. 203-219), who says about free improvisation that "a lot of it doesn't sound very free to me" (Dutton & Raine-Reusch, 1997, p. 7, qtd. in Stanyek, 1999, p. 45). Notwithstanding proclamations of free improvisation as a "non-idiomatic" (Bailey, 1980/1993) practice, Namtchylak concedes that she, at least, feels an implicit sense of normativity that begs the question of how free and open free improvisation may be as an experience.

Stanyek's critical view of the complexity of "freedom" as an experience in free improvisation resonates with David Borgo's more ethnographic accounts of the limits of freedom in this practice. At the level of journalistic criticism of free improvisation, Borgo finds a tendency in these evaluations of the practice to focus upon the issue of how well the group interacted with itself. Like the case of Chamy's account of the "Interaktion Festival" mentioned in the previous chapter, however, it is still unclear what "interaction" would mean. Moreover, as Chapters 11, 12, and 13 of this dissertation will show, this is not a term that is necessarily transparent and consistent in meaning for improvisers. At the level of interaction among performers themselves outside of third-party journalistic observation, David Borgo (2002b) describes the life history of a free improvisation ensemble he himself participated in. He recounts the group's conflicted stance with regard to whether or how outsiders should be allowed to participate in or even join the group. While many improvisers frequently seek out a diversity of musicians to work with for a variety of reasons (see Beins, 2011), Derek Bailey's account of his own groups already registers the fact that integrating new members is complicated at best and often quite frustrating. Even though newcomers potentially offer a freshness of perspective and practice to an extant group, current members often remain reluctant to integrate new members because they are not interested in the time it may take them to adjust to the group. This is both due to the fact that new members will need time for acculturation, but also because their very presence immediately starts to destabilize the "collective language" that naturally starts to develop (see Bailey, 1980/1993, p. 92).

In Borgo's ethnographic experience, such issues emerge around the addition of "Paul," a saxophonist primarily interested in jazz, but intrigued by the experiments in (strong) intercultural free improvisation of "Surrealestate," a group of improvisers based in the Los Angeles area. As Borgo relates in the aforementioned article (Borgo, 2002b), Paul's tendencies as a player become an element of the group experience that diminishes the quality and pleasure of the ensemble's playing. This is both due to Paul's interest and fascination with jazz, but also due to the fact that his manner of interaction with the ensemble was regarded by many, including Borgo himself, it seems, as selfish because he often simply plays over and above others.

² Ingrid Monson (2009) notes the skepticism with which analytical approaches to musicological questions are often regarded, almost as if musical structure itself is irrelevant from any discussion about the music's cultural meaning. Monson's essay is just one acknowledgement of the ambivalence that many musicologists experience with regard to musical structure and analysis as a valid topic of inquiry or method of research. See also, for example, the debate between Joseph Kerman and Kofi Agawu over analytical methods in historical musicology (Agawu, 2004; Kerman, 1980).

Gradually, longstanding members of the group start attending rehearsals less frequently. Eventually, this comes to a turning point as an awkward discussion with Paul about his participation in the group becomes necessary. Thus, building on previous work dealing with the practical challenges of enacting egalitarianism in free improvisation (Borgo, 1997), Borgo uses the interactions between Surrealestate and Paul as the basis for a very necessary claim that “the ‘freedom’ inherent in free improvisation is not an ‘anything goes’ type of anarchy, but involves collective discovery in a communal environment and a mode of personal liberation made possible through cooperation and mutual respect” (Borgo, 2002b, p. 19).

Like Stanyek, Borgo offers a frank recognition, substantiated by ethnographic detail, that a limitless freedom is not desired by free improvisers and that tensions between individual and group do arise, occasionally leading to confrontations and even explicit requests for dissociation. Therefore, beyond the emancipationist tendencies of the discourse on free improvisation, this work suggests that, at the very least, improvisers do in fact have expectations for how other players should listen and play in the midst of their interactions. Still, a recognition of the existence of such socially shaped constraints of freedom in improvisation does not necessarily offer a map of *what* improvisers expect of one another.³

These expectations are diverse among free improvisers, as Chapters 11, 12, and 13 will show, falling into two broad interpretations of how the experience of freedom should be enacted in musical interaction. Indeed, it is an objective of this dissertation to continue to find ways of representing this diversity of approaches to the concept and practice of free improvisation. Most importantly, in order to better represent this diversity of practice it is essential that scholars writing on free improvisation avoid indulging in aesthetic judgments of the artistic merit improvisers’ performances or engaging in moral condemnations of certain approaches to free improvisation. In principle, I do not necessarily object to such evaluations per se, especially by non-academic commentators. However, academic considerations of this practice must be cognizant of the fact that the authority of an academic’s opinion can and will be used by artists or other participants of a scene to police the work of their peers. From a social-scientific perspective, such judgments are highly unproductive for they effectively silence human lives and experiences rather than allowing them to be more clearly understood.

Rather, these kinds of evaluations have epistemological consequences for allowing an observation of the many *other* fascinating aspects of human existence that are contained within the practice of free improvisation. For example, evaluations of certain forms of interactivity in free improvisation serve as a powerful means of examining a plethora of questions *beyond improvisation* though still through it. What, for instance, do the diversity of expectations for how improvisers should play with one another do to disclose each player’s conceptualization of personhood? Of machines? Of politics and its relationship to practices of sensation?

Positive or negative judgment of certain forms of improvisatory sociality is problematic because it does not leave room for a breadth of ways of understanding what that particular improvisative approach signifies for participants. Regardless of whether they please one or not, these judgments directly obstructs any inquiry into what these practices might mean for

³ Borgo does address this issue in his later monograph (Borgo, 2005). See section below on transcription and analysis for further discussion.

performers themselves or with regard to the larger social phenomena they may refer to (e.g., African-American struggles for equality, egalitarianism as a general social value, etc.). Nevertheless, Daniel Fischlin and Ajay Heble consistently and implicitly assert that it is their right as academic commentators to evaluate the moral and aesthetic worthiness of certain practices within free improvisation.

While these two have made significant theoretical and infrastructural contributions to the consideration of improvisation as a research topic,⁴ their framing of the relationship between improvisation and emancipation appears to remain rather uncritically reminiscent of the original utopian cry of politicized readings of free jazz. For example, in his introduction to a published interview with trumpeter Wadada Leo Smith (Fischlin, 2012), Fischlin repeatedly stresses the potential of improvisation not just as a tool of social change, but as an approach to practice that necessarily lends itself to social change. In particular, and much like Derek Bailey, Fischlin understands collective free improvisation as a practice in which players welcome difference and strive towards the accommodation of pluralism. Again, as I establish through a range of examples later in this dissertation, while there certainly is a diversity of approaches, not all players are equally welcoming of other ways of engaging in free improvisation.

Similar thinking is at work in Fischlin's more recent collaboration with George Lipsitz and Ajay Heble (Fischlin et al., 2013). Particularly revealing is a section of a later chapter of that book that looks at a very specific incident of confrontation between performers during a concert at the Guelph Jazz Festival on September 10th, 2004. Heble is both the founder and current artistic director of this annual event. The incident in question is a concert of the aforementioned Tuvan vocalist Sainkho Namtchylak with percussionist Hamid Drake and bassist William Parker. Despite numerous accounts of the event both in popular and academic press, it is difficult to come to an objective account of what happened at the event even as it took place on a stage for a sizable audience. Further complicating the analysis of the event is the fact that no recording exists, as with many other performances of free improvisation.

What can be gleaned from the dizzying variety of versions of what happened on that occasion is that Namtchylak is reported to have sung what is described as either a "tuneless wail," "drone," "eight-note motif," or "single, braying phrase" for at least 20 minutes and perhaps as long as 45 minutes (depending on the source) while Parker and Drake engaged in a more dynamic interaction which changed in mood over time. Many interpreted Namtchylak's response to the occasion as a kind of defiance, with most (including Lipsitz, Fischlin, and Heble) characterizing her choice of playing approach negatively and opposed to *their* ideals for the practice of free improvisation. Though it is unclear who actually initiated the action,⁵ a festival MC apparently gestured to communicate some sort of intervention in what was already being heard as a confrontation by some and is reported to have attempted to remove Namtchylak from the stage. The audience, offended by the festival's staff interfering with the artist's right to

⁴ In addition to monographs, articles, and edited volumes, these two are major forces behind the development and ongoing impact of the International Institute of Critical Studies in Improvisation (IICSI), a major research institution that supports both the performative practice of free improvisation as well as scholarly investigations thereupon.

⁵ The authors recognize that their insider perspective could potentially allow them to settle and clarify this matter, but object to doing so citing the need to maintain a "confidential" relationship between artist and organizer.

perform as they pleased, responded in turn with either booing or some vocal dismissal of their own. Elements of Namtchylak's behavior on that occasion, as reported, are at least suggestive of an intentionally disruptive or defiant stance with regard to the other performers and the concert as a whole. This is most iconically represented in the repeated description of her as having folded her arms and occasionally glancing at her watch with what viewers describe as a distinct sense of irritation or disgust. As she suggested in her comments referenced in Stanyek's essay (1999), it does seem that she found the progress of this event to be significantly incompatible with her personal understanding of the concept of freedom within free improvisation.

Despite the uncertainty of what actually happened in this event, the authors attempt to articulate a judgment of the situation, ultimately suggesting that Namtchylak's behavior was offensive and that the action of removing her from stage would have been potentially justified. They characterize Namtchylak's behavior as in opposition to a number of qualities they assume to be necessary for successful or valuable improvisation, so far as they define it. Again, I do not dispute their right to such opinions. Indeed, the fact that they have them and acknowledge them is a welcome change of affairs from the continual pretension that improvisers do not have opinions of what is good and bad playing.

What I do object to is the epistemological consequence of their judgments for a social-scientific study of music. There is little attempt, unfortunately, to sympathize with her perspective on the matter, nor do the authors integrate commentary from any of the three performers or their recollections of what happened and why. The authors view Namtchylak's actions as those which "undermine" collective creativity. They do so without pausing to consider that her actions in this context are part of a broader range of conceptualizations of interactivity in free improvisation which value, rather than dismiss, such approaches to action and do not condemn it in the way these authors do. Given their moralistic view of the situation, it is of even greater importance for scholarly communities interested in these practices to consider the sentiments of improvisers elicited in musicians' criticisms with my interactive systems in Chapters 11, 12, and 13.

In other words, the crucial error of their analysis of this event is to assume that there is no valid interpretation of freedom or interpersonal responsibility at work in Sainkho Namtchylak's choice of actions in this event, to say nothing of the two men also involved, whose actions seem to attract no scrutiny in any of the published accounts. The three *male* authors deploy a highly problematic and rather extreme rhetoric for describing a lone female vocalist's actions, likening her to an autocrat. Curiously, while much of the book (like the broader IICSI project it occurs within) promotes improvisation as a tool for positive social change, this is one of the few passages of their writing which recognizes the role of improvisation in repressive behavior (*ibid.*, 216). But instead of investigating the fact that, as they suggest, improvisation is as much a component of the benign as it is a practice of the malevolent, their recognition of the role of improvisation in the actions of those with harmful intentions is used to denounce Namtchylak's performance. It must be noted that while the three give a momentary glance to the broader gender differential at work in this situation (Fischlin et al., 2013, p. 215) — one problematically active in the fact that a man (the festival's master of ceremonies that evening) tells a woman (Namtchylak) to shut up in this case — it hardly gives them pause in comparing her approach to improvisation with neoliberal capitalist greed, corruption, and the abuse of power. Citing the fact

that “freedom” has in fact been used as the basis and motive of many anti-liberal and fascist movements (Fischlin et al., 2013, p. 216), these three academics unanimously condemn a woman of color for her exercise of freedom in this situation, barely considering whether they really have the right to do so without asking her what her experience of the situation was.

Regardless of the moral question of whether these authors deserve the right (ironically, in a book about “rights”) to angrily denounce Namtchylak, the main fault of their account (for the purpose of this dissertation) is their disinterest in her side of the story. They seem disinclined to investigate what conception of the moral values they associate with improvisation (freedom, cooperation, autonomy, etc.) is at work in her actions. We can understand what Lipsitz, Fischlin, and Heble think these values are, but they do not bother to solicit Namtchylak’s opinion of what these values might mean for her and how her experiences in this music complicate them.

Due to the dramatic intensity of the event, their discussion of this incident raises several interesting questions: what did the performers want from each other? What did they wish the others might have done otherwise? How would it have been clear or not to the other performers that certain actions or responses would have been desired? How would Parker and Drake, for example, know that Namtchylak was frustrated? For all that Namtchylak’s behavior may have seemed extreme, it is likely that the two other improvisers were unable to pinpoint the sentiment behind her actions and chose to simply plod on with the performance.

From a more empirical perspective, music psychologists Graeme Wilson’ and Raymond MacDonald’s recent studies (Wilson & MacDonald, 2012, 2015) of improvisational interaction indicate that players are unable to exactly determine the intentional states of their fellow performers. That is, following John Searle’s discussion of intentionality (1983), they are not necessarily able to assess from another musician’s actions exactly what those actions may be *about*. Highly relevant to the example with Namtchylak, their earlier (Wilson & MacDonald, 2012) study shows that staying silent in the midst of the improvisation is a choice that has no clear meaning, even in context, and that silence could indicate a range of possible intentional stances in relation to the situation at hand. Similarly, the subsequent (Wilson & MacDonald, 2015) investigation beautifully documents how improvisers misinterpret the intentions of others. For example, while player A may intend to initiate a new musical trope, player B may understand A’s actions to be actually a response or continuation of B’s ideas. In short, cognitive framing of the situation and the intentions at work is not so easily shared. All the more reason to question the confidence and certitude of the judgments by Ajay, Heble, and Fischlin on the occasion discussed above.

In an attempt to address the problem of intersubjective mutual understanding in free improvisation, one of Clement Canonne’s several papers on the topic (2013) takes a game-theoretic approach to the problem of coordination in free improvisation. For Canonne’s investigation, “coordination” refers to the basic indeterminacy of not knowing how the other will act at a given point in time compounded by an ever-shifting calculus of positive and negative valences of the results of those coordinated or uncoordinated outcomes. With improvisers in Oslo and Lyon, Canonne creates two game-theoretic experiments, one of which I will focus on here. In the first experiment, improvisers play with a tape designed by Canonne in which an “accident” occurs at around 90 seconds and then disappears. The accident chosen is the occurrence of clearly pitched material popping out in the midst of otherwise noisy sounds. Referring to the

volatility of saxophone multiphonics and extended techniques mentioned above, this sort of “accident” is believable in that it reproduces a kind of unintended action that occurs often in instrumental practice. Moreover, it is often easily heard by others as a “mistake,” all pretensions of the possibility of mistakes in free improvisation left aside. In any case, the point of the stimulus is to see how an improviser might respond to this type of event within a performance. Generally speaking, Canonne finds that for “experts” in free improvisation, the discontinuity is more often than not exploited in order to solve the common problem in free improvisation of how to create form spontaneously and in agreement with others. This suggests that responses to discontinuities of this kind is expected as a skill of social interaction in free improvisation.

Based on my own ethnographic study of free improvisation, I would concur that Canonne is correct to suggest that such discontinuities are moments that improvisers exploit in this manner. However, the social psychology of these situations may not be as simple as Canonne suggests (and he offers his study as a preliminary investigation of these issues). For example, Souad, a Middle-Eastern improviser living in Berlin, explained to me that in his work with more experienced improvisers they have often stressed the point that it is important that when one regards one of one’s own actions as a “mistake” to not react to it in this manner. This is for the relatively obvious reason that exposing the mistake constitutes a loss of face (Goffman 1955a; see Monson 1996b for a musical example of this effect). However, Souad also suggests that this recommendation came from the principle that one should not react to “mistakes” as such since this sort of contingency in interaction becomes a source of inspiration and a solution to the problem of generating novelty and creativity in the face of ever-increasing consistency and fixity (Wilf, 2013a). Likewise, Brian, an American saxophonist based in Berlin, says of his experience playing in large ensembles of free improvisation that the fun of such groups is the feeling that one cannot really make a “mistake,” as one or more members of the ensemble is quite likely to exploit the “mistake” as an inspiration for a new musical idea.

In sum, academic literature on free improvisation certainly advances an understanding of how improvisers expect others to respond to certain musical situations in free improvisation as well as how they would ideally want them to. At the same time, much of this literature still indulges the idyllic images of constraint-free improvisation proposed in early discourses on free improvisation. Nevertheless, as this survey has shown, more recent literature on free improvisation reflects a growing skepticism toward utopian visions and the last handful of publications I have discussed suggests very productive questions for field research. However, there is simply not enough prior literature specifically discussing this topic to suggest clear answers. Moreover, while other fields like linguistics and social psychology may offer some insights into how expectations play out in interactions, these fields have yet to work on domains of human behavior of clear and immediate relevance to the topic of this dissertation.

Interviews with Musicians

If the texts surveyed above do not offer clear enough answers to the question of what improvisers expect of one another, then perhaps interviews may serve as a clearer indication of these expectations. While interviewing musicians may appear to be the next best alternative as a source of information on this question, several factors conspire against the reliability of this mode of

research as a means of answering the central question. Principally, while interviews, much like artists' writings, offer a first-hand insight into many levels of detail in what improvisers do, those conversations occur in the same universe in which the five factors contributing to the habitual reticence of improvisers to criticize their peers are still at work. If one asks an improviser to comment on their preferences for how others play, the typical response is either to defer the notion of expectations or desires altogether or to articulate expectations which clarify a portion of what an artist may want. An artist may describe a preference for players who are strong-willed or capable of making what others play sound good. Still, these answers do not necessarily clarify when and in response to what situations these kinds of expectations should be enacted. If one wishes for a strong-willed collaborator, how should this indefatigable spirit be shown? Are there cases when one does not want this from a peer? As I make clearer through later ethnographic examples, while players express certain preferences for improvised interactions, many also hedge these claims by expressing their desires for opposing behaviors as well, thus complicating any simple understanding of their desires for how others should respond in the moment.

For example, while it really ranks as one of the most substantive contributions to a sociology of music (whether on free improvisation or music generally) Tom Arthurs' recent (2016) doctoral dissertation relies quite heavily on interviews. To be clear, I would not dismiss interviews as a method entirely as these, just like artist's statements, are important moments in which these musicians articulate their views of their practices. Likewise, as Zorn himself concedes, "musicians do not like to write about their work" (Zorn, 2000, p. vi), and so, all the more reason that an interview with a smart interlocutor like Arthurs would be a better opportunity to articulate what one feels and wants as a musician. Indeed, what Arthurs achieves is much like what the prolific jazz drummer Arthur Taylor does in *Notes and Tones: Musician-to-Musician Interviews* (1977). Both Tom Arthurs and Arthur Taylor are musicians well-known to the musicians they interview, both as members of the same scene and often as previous bandmates.

By and large, Arthurs' interlocutors are more generous than Taylor's. Nevertheless, the sincerity of their comments does not necessarily yield greater specificity or clarity. While much of his dissertation focuses on the very necessary task of providing a clear sense of the personal background of the many musicians of the Berlin scene,⁶ Arthurs also allows a few chapters for discussions with musicians about musical play itself. Like Zorn's *Arcana*, the opportunity to speak (and not write) to a fellow musician like Arthurs allows many musicians to explain their thought process in the moment of improvisation, or lack thereof as violinist Biliana Voutchkova insists; (Arthurs, 2016, p. 185). In many ways, interviewing these many musicians on their process of thinking in improvisation is a more efficient way of generating the sort of material John Zorn sought to develop over the years.

The self-reported accounts of these musicians in dialogue with a researcher (and one who is also often their peer as a performer at that) does suggest at least a broad sense of what they might expect from another improviser. At the same time, these conversations cannot tell us what they would really expect of other players because they do not ground the articulation of these

⁶ In this way, Arthurs work mirrors a similarly crucial angle of analysis practiced in Lewis' monograph on the AACM in Chicago (2008).

expectations in specific contexts of interaction. These thoughts and reflections occur outside of the heat of the moment of actually playing with another individual. They are, therefore, just an articulation of their general preferences. They cannot speak to how a musician would actually behave or how they would actually want others to behave.

In a later chapter of the dissertation, a section on “Mistakes” is quite revealing. Arthurs acknowledges a breadth of perspectives on mistakes from improvisers in his study. These range from 1) the opinion that only the performer (and no one else) can recognize or identify when they have made a mistake, to 2) bassist Jan Roder’s view that it is “impossible to make a mistake” (qtd. in Arthurs, 2016, p. 229), to 3) views that mistakes are what creativity thrives upon to 4) that mistakes are, in fact, very simply mistakes. On this last point, Arthurs references his interview with guitarist Olaf Rupp to discuss the very specific mistake that the destruction of a particular “direction” (qtd. in Arthurs, 2016, p. 230) of musical action leads to “musical failure.” As an improviser myself, I agree and indeed, as later chapters demonstrate, many improvisers share similar views. But what is a “direction”? How intersubjectively clear is a “direction”? And how often do musicians call one another out for these failures to preserve a direction? What are the specific examples that prompt Ruff to say this? Is the rupture of certain types of “directions” more acceptable or tolerable than others?

Arthurs dissertation stands as one of the most thorough contributions to this literature, particularly in the innovative use of social network analysis as a means of understanding how personal and aesthetic connections play out in actual choices of who one works with over time as a musician. Still, for all the value there may be in soliciting these “emic” interpretations of improvised practice, all of it must be taken with a measure of doubt given the several issues outlined in Chapter 2 which stand in the way of an improviser’s (and perhaps any human musician’s) ability to talk through these kinds of materials. For an approach to interviews that would really allow for a greater understanding of expectations of how others should conduct themselves in musical moments, a method similar to ethnomusicologist Richard Widdess’ (1994) might illustrate a great deal more. Very similar to the way that digital releases of film often include a separate track of the entire work with the director offering an audio commentary on each shot throughout, Widdess listens to recordings with the performers involved as a means of eliciting their discussion of certain issues and to understand norms of practice in the process. A similar process could be applied in the analysis of free improvisation, but again, this would possibly invite improvisers to negatively comment on how their peers play, a type of commentary which they typically refuse out of solidarity with one another.⁷

In sum, interviews are an important source of information about *ideologies* which respond to the central question of expectation. Like any form of self-reporting on behavior which is not always fully conscious or of which one could not be fully conscious, it is doubtful that they really tell us what specifically one expects of another player. This point is very clearly made in music theorist Benjamin Givan’s recent re-theorization of the concept of musical interaction in

⁷ To my knowledge, there exists no such publicly available recording which features an additional audio layer of commentary upon it. However, online platforms like soundcloud.com allow users to comment on specific moments within a track and leave these remarks viewable to other listeners. This type of online platform would make it possible to collect this sort of feedback, though anonymity would likely increase the ability of commentators to be more candid.

jazz (2016). Looking at interviews across his career, Givan shows that saxophonist Sonny Rollins has repeatedly claimed repeatedly that as a soloist he does not appreciate it when the accompanists (i.e., the rhythm section) continually repeats or embellishes the soloist's musical phrases or rhythms. By contrast, Givan demonstrates that on some of Rollins' most iconic recordings this type of interactivity is the norm. In any case, the generality inherent in the kind of discourse elicited in an interview simply demands the use of other methods which overcome this vagueness in answering the central question.

Transcription and Analysis of Recordings

If interviews are a weak source of information for answering the central question, then perhaps the analysis of a corpus of recordings may offer stronger indications of what improvisers tend to expect of one another. While flawed, it is the case that this method may offer some indications of what improvisers tend to do. However, even though this may demonstrate that there are certain audible trends in improvised music over the past 50 years, as David Borgo observes (2002a, p. 184), this may not necessarily offer a very clear indication of what improvisers really want others to do, to say nothing of how they may have wanted other performers (or even themselves) to have done it all otherwise. Similarly Evan Parker notes that ““I think we accepted long ago those aspects of each other's playing that we were never going to be able to change and we work upon the parts that are negotiable”” (qtd. in Bailey, 1980/1993, p. 141). This attitude indicates that transcriptions, analysis, and recordings generally tells us *what* happened, but that this cannot be confused with what one would have *wanted* to have happened.

Of course, before even considering an *analysis* of such materials, what is first necessary is a transcription of them. These are quite rare, though they have been attempted. Michael Pelz-Sherman's transcription of a duo recording by trombonist George Lewis with saxophonist Roscoe Mitchell is an example of this very infrequent type of experiment in representation (Pelz-Sherman, 1998).⁸ Transcription of any material is an onerous task, particularly if one is interested in accurately representing the performer's *actual* event/note-timings and not quantizing onsets to whatever pulse or subdivisions may be in place or at least implied.

Transcription of free improvisation is far more challenging as there is almost always a complete lack of a sense of pulse organizing how improvisers choose to produce material in real-time. Moreover, unlike the decades-long activity of transcribing improvisation in jazz or Indian classical music, there is simply no pre-agreed pitch-based structure that one can use to make sense of the choice of notes produced in the performance. This has not stopped some analysts from making valiant efforts to notate and analyze free improvisations where pitched sounds dominate (Block, 1990; Porter, 1998; Westendorf, 1995). However, it should be noted that though these works offer insights into trends in this kind of performance, they are unable to really clarify the nature of expectations in musical interaction as they tend to focus on transcriptions of one performer alone. Moreover, the primacy of pitch in these analyses is misleading given the overwhelming tendency of improvisers to focus on timbre as the primary parameter of musical exploration. Pitch-based analyses obscure this fact.

⁸ For a video including transcription of this piece, visit <https://www.youtube.com/watch?v=BjUezEW3drA>

All the same, there are certainly some ways that analytical approaches, especially those using updated methods such as spectral analysis, may prove useful in making sense of recordings of free improvisation. For example, returning to the issue of “directions” referenced by Arthurs above, an analysis of a recording may examine the degree to which a particular sound-type (e.g., noise vs. tone, harmonicity vs. inharmonicity) or other spectral feature initiated by one performer is either emulated or deviated from by the rest. If one player chooses to focus on noises, it may be revealing if the other player then chooses to juxtapose these sounds with clearly pitched materials, for instance. Another use of the sonogram may also be to track the degree to which noisiness (vs. tonefulness) or inharmonicity (vs. harmonicity) rises or falls over the historical arc of free improvisational practice over several decades. Certainly in the case of the Berlin-based improvisers at the center of this dissertation a progression towards noise and inharmonicity is quite audible. But beyond the issues of representing and analyzing sounds which lie somewhere in the chasm between the pitch-centered staff and the timbrally-focused improvisation of many of these players, a massive archive of analyses of these performances cannot necessarily tell us what these players would have wanted their fellow players to do at any given moment in the performance. It will only tell us what they have done and tended to do. This should never be confused with their notions of how one should do it.

For example, David Borgo (2005, pp. 75-80) attempts a schematic analysis of a performance of the Sam Rivers trio, segmenting the recorded performance as a whole into broad sections. His analysis is not based on a note-for-note transcription, but instead makes overall comments about the kind of playing in each section and what musical actions seem to have precipitated them. Overall, Borgo finds that trills, repetitions of the same note, and repetitions of descending (pitch) lines are often consistently accepted cues for certain changes from section to section. However, Borgo hedges the claim that these ways of playing trigger new sections in every case noting that the same playing produces “dramatically different results over the course of an extended performance” (ibid., p. 76). Borgo’s analysis is efficient (in that it is legible to those who cannot read music and avoids the labor intensive task of transcription of each event) and gives a helpful guide of what happened in this performance. Nevertheless, the analysis cannot tell us what performers expected or wanted from each other at a given moment in time.

Given the growing abundance of video-recorded performances of improvised music, however, it would seem that something might be gleaned of expectations (and the failure to deliver them in real-time) from an analysis of moments in which one performer gazes at another. In general, these moments are rare. This is in part due to the fact that improvisers are often engrossed in the physico-mechanical complexity of their instrumental practices, have their eyes closed, or prefer to allow the interaction to remain more or less exclusively within the domain of sound. However, despite their infrequency, such moments may very well prove to be a productive site of inquiry for an efficient investigation of what kinds of playing other players appreciated and other kinds which they really would have wished that others just did not indulge in.

To illustrate, I offer an analysis of a video of a concert I attended during my fieldwork in Berlin. The concert features four musicians: a trumpeter, keyboardist, and drummer all based in

Berlin, and a cellist, Carl,⁹ visiting from the United States. In particular, I will focus on the interaction of the drummer and Carl. By his silence and bodily gestures, the cellist appears disgusted with the actions of the drummer, particularly at the beginning of the performance. Nevertheless, though Carl's demeanor suggests some mild to serious form of disapprobation, it is unlikely for several reasons that he would have ever confronted the drummer about the incident. Moreover, it is also unclear whether this kind of gaze amounts in fact to the open expression of disapproval at all.

With the audience almost but not yet fully quiet the drummer chooses to begin the performance. He chooses to play a pair of small bells to begin the concert, creating what might likely be described as a meditative mood. None of the other musicians choose to join in for next 30 seconds, leaving the drummer space to set the mood with the sound of slowly-decaying bells and a few taps of his fingers on the side of the snare drum.

Just before beginning the performance, the drummer and cellist exchange a glance. The drummer hunches over to reach for something and as he returns to an upright position, Carl sees that he has the bells in his hands. Carl then squeezes the ridge between his eyes, very much in the way many people do when they are either tired or have come to a feeling of futility. Carl's response is not yet clearly a gesture of disapproval. After all, he is traveling from abroad and has arrived only recently and is perhaps still adjusting to the significant time difference. Additionally, it is the evening of New Years Day and perhaps he is still recovering from the world-famous nightlife of Berlin on such an occasion.

After a few seconds of the bells, Carl brings his bow to playing position and seems to ponder a possible response or complement to the drummer's introduction. A few moments later, however, he lowers the bow to his side, apparently choosing, as the others clearly still do, to allow the drummer to initiate the concert alone with the ringing metallic percussion sounds. Carl then stares at the drummer although the drummer does not return this gaze. Carl makes a series of facial expressions or even twitches, washing his tongue over his teeth, pursing his lips slightly from side to side, poking his tongue slightly into one cheek, and perhaps even silently whistling for a fraction of a second. All the while, the keyboardist looks at her keyboard and the trumpeter glances at no one at all, faced towards the audience and away from the drummer.

Reminiscent of Evan Parker's comment on "accepting" the ways of others in improvisation, Carl's demeanor changes significantly approximately 15 seconds into the episode. Instead of glaring at the drummer, Carl closes his eyes, possibly as a result of the exhaustion of traveling to Germany's dirty, uncomfortable, northern, post-wall capital and European capital of revelry, but equally possibly in resignation at his inability to beg the drummer with his eyes away from the exotic sound of resonant bells. After a few moments with his eyes closed, he resumes his quest to clean something off his teeth with his tongue with his mouth closed, possibly also silently mouthing words into the air. Finally, approximately 40 seconds into the set, Carl enters, producing a slow glissando harmonic sliding up approximately a minor third from its initial pitch-height. The trumpeter, working with a version of the instrument fitted with a sliding valve, enters with a similar sound.

⁹ This is the same Carl I discuss in Chapter 13.

Was Carl frustrated with the drummer? I would argue that it hardly takes an affect-theorist to say, at the very least, probably. I focus on this one incident in particular because of the fact that at several other points Carl's demeanor expressed similar sentiments. Nevertheless, in true solidarity and musicianship, the performers all stood together at the end of the performance in a line, arms over each other's shoulders, taking a bow for the crowd and their enthusiastic applause.

Is it possible that after the evening's concert when chatting with his fellow bandmates Carl might have mentioned whatever disapproval he experienced during the performance? Yes, though as I have tried to demonstrate, there are many factors that stand in the way of this likelihood, ranging from simple Goffmanian face-work, to the fallibility of human memory, or the commitment to freedom. Additionally complicating the matter is the simple fact that these musicians need one another and that any damage to the relationship is a direct threat to their ability to work with others. As the touring musician, Carl is the guest of the others. His opportunity to play depends upon the others to work with local venues to arrange the event. Moreover, as Carl is on tour, the few beers they have at the end of the concert may be the only opportunity they have to talk at all before he must leave town again. Negative feedback may not be the best choice for a topic of conversation if time is limited. Lastly, even as I stayed for at least an hour or so after the performance, the room was completely full of musicians and others staying to chat and hang out. This further raises the possibility that the four of them simply did not have the opportunity to engage in a post-mortem discussion of the concert afterwards.

As Clifford Geertz reminds us in his comments on the opacity of the difference between a wink, a *wink*, and a twitch (Geertz, 1973, p. 6), this kind of behavior presents a major challenge for the any kind of social scientific analysis. Though many improvisers refrain from such gazes, there are occasions when they do look up from their instruments at one another. These may or may not indicate, however, that the gaze connotes an expression of disapproval. All this is to say, ultimately, that further analytical attention to musical interaction in free improvisation *may* offer insights into the ineffable level of what improvisers truly desire from others, but it is still the case that such analysis of moments of gaze may be just another long path to nowhere.

Chapter 5: A Critique of Methodologies and Sources, Part 3: Participant Observation and its Limits

As most ethnomusicologists and other ethnographic researchers will already have concluded while reading this review of mediatized sources — texts, recordings, interviews and even discourse mediated by human memory — it seems more likely that one would learn what improvisers expect of other performers by engaging in thorough, varied, and sustained participant-observation with improvisers. To be sure, participant-observation as a concertgoer and fellow improviser reveals a great deal more than a survey of literature, interviews, or analyses of recordings. Nevertheless, as observed in Chapter 2, Goffmanian face-work, the improviser's ideological commitment to freedom, the phenomenology of improvisation and the practical realities of remembering 40 minutes of play, as well as the tendency of improvisers not to record their sessions all contribute to the hesitation to be frank with other players about specific expectations for musical play. This combination of factors has major consequences for participant-observation and places serious limits on its validity as a method for answering the question of what improvisers expect of one another. The results of participant-observation do suggest that improvisers have expectations of one another and that just as David Borgo writes, the freedom of free improvisation is not an “anything goes” (Borgo, 2002b, p. 19) type of liberty. Yet, as I have been trying to emphasize, knowing *that* expectations and preferences are in effect is very different than knowing *what* those preferences are and what other values they reflect.

For the most part, my experience as an improvising saxophonist (first in Chicago, then in the San Francisco Bay Area, and later in Berlin) indicates that improvisers are very hesitant to openly criticize their peers. Very rarely has another player directly criticized my own playing. In those cases when someone chose to do so, the criticism was of such a diffuse and unspecific character that I would not necessarily have known what to have done otherwise. Even if other players are frustrated with other musicians and their improvisatory whims do not suit them, most individuals are very hesitant to directly comment to you on what they would have preferred for you to do differently. They prefer instead to maintain a pleasant collegiality in the interaction. This is as much due to the fact that improvisers rely on one another for helping to set up gigs both locally and internationally (as in the case of Carl the cellist discussed in the previous chapter), as it is to what seems to be a genuine desire to maintain a friendly atmosphere in interactions with others. Of course, taken alone, my own experience of hearing no criticism from other musicians does not necessarily indicate that other improvisers experienced the same lack of evaluative feedback from their friends and colleagues. However, as I discuss further throughout this dissertation, there is ample evidence that other improvisers have often experienced the same lack of criticism coupled with a vague but palpable sensation that others preferred something specific and yet were not willing or comfortable to speak up about it. I offer an account of my own experiences here as they are experiences I know in detail, while experiences of those I have spoken with about such matters is included elsewhere.

In the course of my fieldwork involving testing the virtual improviser at the center of this project, I also frequently played with various configurations of improvisers, both in private “sessions” and public performances. This was as much for my own interest and enjoyment as a

saxophonist as it was for the purpose of very carefully observing over a series of interactions how likely other improvisers were to comment or critique the music that had just been played, or to offer instructions of what they wanted beforehand. In the vast majority of cases of playing with improvisers over the past several years (reaching back to as early as 2008), there have been only a few instances when an improviser I had played with expressed their dissatisfaction after playing with me. In those rare instances, the comments the individual offered were very few and not really enough for me to necessarily have known what to do differently.

For example, during my fieldwork in Berlin I saw a fascinating performance of a quartet of trumpet, bass, drums, and an electronics artist from Japan, Shinji, whose “instrument” consisted of a small microphone and loudspeaker. As an avid fan of saxophone multiphonics, Shinji’s setup struck me as a set of sounds that would be excellent (to my ears, at least) in combination with the kind of saxophone multiphonics textures I was so interested in at the time. After the group finished, I did what many improvisers do when they are interested in playing with someone they have just seen play and asked Shinji if he would like to meet sometime for a duo session.

A few weeks later and after checking schedules, we finally met to play on a Monday afternoon at a very bare and resonant art gallery Shinji was affiliated with, located on one of Berlin’s numerous *Landwehrkanäle*.¹ More or less as I had desired, the session, which consisted of two improvisations of approximately forty minutes with a break in the middle to chat, focused on very loud and complex sonorities, both from the saxophone and Shinji’s feedback setup. To me, Shinji’s playing created the perfect context for the exploration of slowly evolving saxophone multiphonics. Moreover, since many multiphonics are difficult to produce at a low volume (see Riera, Proscia, and Eguia 2014) and Shinji’s setup was by its very nature also rather loud and often resembled saxophone multiphonics, it seemed to me that our duo was a productive pairing of like concepts. From both saxophone and feedback, the session focused quite a lot on the production of inharmonic sounds, or complex timbres in which spectral energies are unevenly distributed (B. C. J. Moore, 1987; B. C. J. Moore & Ohgushi, 1993).

In the break, Shinji and I came up from the gallery’s location below street level to chat and enjoy the sunny afternoon by the canal. At that time we did not discuss the music we had just made. Instead, I used the opportunity to ask Shinji if he had any recommendations of what to do with my parents as they were coming to visit in a few weeks. He recommended a visit to the nearby town of Potsdam. After the session, Shinji and I sat by the canal for a quick espresso, during which we again talked about many things other than music. For the most part, we spoke about the Berlin scene and the various other scenes each of us had previously participated in over the years. Like many conversations I have had with musicians before or after musical play, the topic of music itself was absent from our chat.

At home after the session, I was quite pleased with the recording, especially since the resonant qualities of the nearly empty concrete gallery space really seemed to make a great acoustic home for the sounds we produced during our session. For my tastes, the gallery’s acoustic properties allowed for an easier perception of the inharmonicity of our playing. Collectively, the long tails of resonance which accompanied each sound also allowed one to

¹ This is a canal that diverts the flow of Berlin’s river Spree.

more clearly here the constructive and destructive interference between our two sounds, in which the features of one sound embellish or even trigger perceptions of auditory roughness in the other player's outputs.

Looking forward to playing again, I wrote to Shinji to inquire if he was interested in another meeting or even expanding possibilities by including another player. Politely but flatly, Shinji declined. He did not offer much specific commentary on what it was that did not suit him about the session (and in general, it was hard to make sense of his email since his English was not so clear and easy to follow in writing).

Though he referenced very clearly the fact that it is quite difficult to ever have full confidence in one's own evaluation of such things (especially since he had not yet had a chance to hear the rudimentary recording I made), he found the duo to lack "tension." To this day it puzzles me to think what he might have really meant by that term. Perhaps he found that the combination of sonic possibilities between the two of us was too homogenous, too evenly prone towards loud intensities and complex sonorities. However, for most ears, the duo would probably have been experienced as overflowing with tension: extreme volumes, piercing sonorities juxtaposed with those that would be otherwise lush,² awkward silences, stretches of toneless noises, etc. Personally, I experienced the interaction as being full of tension as well. On one level, this was due to the very usual tension of making music with a recent acquaintance, a fresh experience resulting in one's inability to predict how they will respond at a given moment in time, what they want from the interaction. On another level, Shinji's presence also created a certain tension by the fact that I could not always tell what he was paying attention to or how he might have been reacting to my playing, if at all. As mentioned in Chapter 2, players working with a mechanically cumbersome instrumental setup are tasked with physically managing the stack of objects before them. This necessarily distracts from their ability to pay attention to others (though as I will show in Chapters 12 and 13, this is not inherently regarded as a problem). In any case, for most of the interaction, it was hard for me to tell how Shinji was reacting and yet the entire improvisation was filled with sonic intensity. In a word, tension seemed quite abundant. Though there was no audience for the session, I could have imagined that many who might have attended would either have left, feverishly looked for a bowl of earplugs that might have been offered to the audience, or awkwardly debated whether to leave or where to stand or sit so as not to be in pain (especially if tempted by the sunshine and urban vitality immediately outside the dark sunken gallery space).

After his response, I found myself lacking the energy (emotional or otherwise) and interest to follow up with him to understand what he meant by "tension" or how I could find a way to play in a manner more in line with his need for this kind of experience. I should mention, then, that my overall interaction with Shinji indicates one of the fundamental problems with giving and receiving critical feedback in such situations and perhaps one of the reasons that

² Again, as others have noted (Keefe & Laden, 1989; Riera et al., 2014), saxophone multiphonics are often unstable in practice. This means that quite often in the midst of producing a complex sonority which sounds as though it were several pitches a clear single pitch may pop out of the mixture. My own tastes in exploring multiphonics often bring me to focus on producing a single pitched sound and gradually manipulating my embouchure in order to slowly make other inharmonic tones emerge next to it; hence the lush sounds set against the piercing sonorities mentioned here.

feedback is so routinely not given. Considering Shinji's side of the situation, he was already relatively established as a player in various scenes of free improvisation and did not necessarily have much need for another potential partner like me. After all, I am a saxophone player, a type of instrumentalist often in overabundance in such scenes.³ Moreover, since he did not like the dynamic of our duo, it was fairly easy for me to understand that the subsequent conversation of clarifying to me what he did not like about it would demand an effort that was beyond its payoff for him. Since we had no relationship prior to all this, there was not much of an incentive to clarify these matters to me. On my side, I must admit that I felt snubbed and even hurt by his disinterest. For this very same reason, I also felt that there would not be much point in chasing after Shinji to find out what he did not like and how it might be fixed in subsequent meetings.

My point here is that there is a basic human awkwardness of soliciting, giving, and mutually comprehending such criticism in this context that is likely a significant component of why improvisers do not comment on each other's playing. Even if English were not very audibly and visibly not Shinji's first language, it would likely have required quite a lot of effort for him to specify how I should have played otherwise. Verbalizing the kind of complex cognitive procedures necessary for producing the tension or relaxation he may have wanted might not even have been possible. This would require him to articulate clearly to me, for example, when and how I should have responded to certain types of sounds. This would be easy if there existed a commonly agreed upon language to refer to such sounds, but for most improvisers, to say nothing of those interested in timbre more generally, describing timbres specifically is far from easy (Fales, 2002; Porcello, 2004). More generally, there are likely no clear rules that define exactly how he would want me to respond to his playing. Thus, instead of offering an explanation, he chose to simplify his disinclination to meet again to a single attribute, one which I will never really be able to clarify with him.

Over nearly a decade of playing this form of music, a lack of "tension" was the only direct complaint I have ever heard from another player. There have, however, been other cases when fellow players and other participants have expressed more diffuse forms of disapproval. But unlike the experience with Shinji, these sentiments have been expressed without offering a specific reason. In some sense, then, as much as I found myself irritated by Shinji's pithy explanation, it was more than most had bothered to ever explain. Perhaps I should be thankful.

For example, both for the purposes of my field research and also for my own interests, I had planned prior to arriving in Berlin to attempt to form a regular working group during my time there for fieldwork. As it turns out, the particular moment that spurred me to finally form such a group actually came in response to an invitation from Julian, the owner of a club called "Irgendwann" where I had performed with my interactive system Maxine. While Julian seemed displeased by my performance with Maxine and two other improvisers, he felt very positively about my saxophone playing itself and indicated interest in offering me a multiple-night engagement were I to form a trio of saxophone, bass, and drums. Partly blindly following his

³ The surplus of saxophones is best depicted by an exchange with one informant for this study. After a session that had further confirmed my interest in playing with this musician again, I told him "let me know if you need a saxophone player!" In an email, he replied that: "Saxophone players are not a 'need'. They appear out of nowhere regardless of you needing them or not :))."

suggestion, but also out of my own interest in such a combination, I formed a trio with this instrumentation and arranged a session with a bassist, Harald, and a drummer, Sten.

And so, we met for a session at Sten's rehearsal space in an up and coming neighborhood of the former East Berlin to get acquainted with each other's playing and make some music. In two 40-minute improvisations, we freely explored a range of interactive approaches, each of these emerging tacitly and without verbal coordination. These ranged from playing focused on timbre and texture (and beyond the production of pitch), to minimalist passages in which we each stayed within a small range of sounds or pitches, to jazzier playing in which harmonies and their functional relationships were implied, to the classic full energy forte-playing associated with much free jazz.

After the first improvisation, we did not talk about the music, and I waited very deliberately (as I often did in my fieldwork) to see if reflections on what we just played would become a topic of conversation. Other than quick pleasant comments of "that was nice!" or "glad we got to meet to do this..." the improvisation itself was not the subject of conversation. Instead, Sten and Harald discussed their recent troubles with back pain and various ways that each of them had tried to deal with it, with Sten seriously encouraging Harald to try yoga or other meditation practices in addition to typical allopathic or chiropractic care. At the end of the second improvisation, Harald was tired and wanted to return home to his wife and child, I wanted to go to the gym, and so there was not much time to talk. In any case, we did not talk about music after the session. Furthermore, neither of the two of them mentioned their desire to hear the recording.

As it turns out, I hardly saw either of them in advance of our gigs later that year. Shortly before our weekend of performances together at Irgendwann, Harald suggested that we add a trumpet player to round out the group. I never followed up with Harald to find out why he suggested this and it is possible that the recommendation to add a fourth member came from his doubts that our trio would give us enough to work with for two whole evenings. Then again, it is also possible that he suggested this for unrelated reasons. For example, he may have suggested adding another player purely out of the interest in networking or adding a new (and therefore unpredictable) element to the dynamic of our trio improvisations. Though Harald's first choice of trumpeter was not available for that date, he was able to get his good friend and frequent collaborator Udo to join for the first of our two nights at Irgendwann. For the second night, however, Udo was not free and instead a friend and mentor of Sten's, Anders, joined instead.

Since Udo is a favorite player for the Berlin scene and usually attracts a decent audience, there was a sizable gathering of concertgoers in attendance for our first evening together. As is often the case in such situations, there was no time or space to talk about music between the first and second sets as we were all variously occupied with getting another drink from the bar, saying hello to friends who had come to see the show, or rolling a cigarette and stepping outside for a smoke (as is Harald's style). After both sets were done the first evening, the four of us did have a chance to have a quick chat while we were still on stage. As the audience carried on their conversations, Harald chose not to talk about music as the first topic of conversation following the set. Instead, he told us a rather awkward story of a disturbingly violent, but uneventful personal conflict he experienced (and seems to have instigated himself) some time before. The details of that incident are, of course, simply irrelevant for my present discussion — my point is

only that we did not talk about music at that time and Harald's choice of topic took us very clearly immediately away from music. A bit after the four of us chatted, I put away my saxophone and had a brief exchange with Udo. As he and I had never played together, he expressed a positive sentiment of encouragement, giving me a hug and telling me he was happy that we had finally had a chance to do it.

The next evening was similar in flow, though with fewer attendees since Anders was not as well known to Berlin audiences as Udo. However, after the musical portion of the evening was concluded, the club owner, Julian, in his characteristically brusque manner, expressed his preference for the second group with Anders. Specifically, as Julian explained to me, "I just don't like the combination of you and Udo." I was slightly disappointed by this opinion since I have been and remain an admirer of Udo's work and had hoped that our playing might make a fruitful match. In any case, Julian was pleased enough with the second group that he immediately discussed dates with us for arranging another engagement at Irgendwann, though this time for just one evening instead of a "weekend."

A month or so after the first evening at Irgendwann, Harald had invited me and my partner over for dinner with him and his wife. Generally speaking, Harald is a rather outspoken individual. In the milieu of free improvisation, which is largely (explicitly, at least) politically-correct, respectful, and tolerant of diversity of religion, ethnicity, race, gender, and sexuality, Harald often pushes the boundaries of what is acceptable discourse. To be fair, however, this is mostly in the domain of what are openly acknowledged and relatively benign matters, such as the ongoing slight resentment (which never really manifests as a serious international matter) which Germans occasionally feel about their typically wealthier Austrian neighbors.

I bring up Harald's outspoken character to contextualize his underwhelming comments on our evenings at Irgendwann. Whereas he typically does not filter his thoughts, he had little to say, positively or negatively, about those evenings. In the middle of other topics, he told the three of us that "now it was clear after we did the second evening with Anders that we should do it again." Not wanting to interrupt a longer flow of his thoughts, I simply agreed: "yes." This detail he included about his opinion of the relative quality of the two evenings was in the middle of a larger discussion of the issue of what exactly constitutes "real" improvising (see section 9.1. of Arthurs 2016). While many find that improvisation is more "real" between players who have never played together previously, Harald finds himself frustrated by this conception. He feels irritated because making a statement of relative value between improvisations by strangers versus those by individuals well-acquainted with one another often leads to a disinterest in groups where the individual players have really gotten to know each other over time. In other words, this concept of "real" improvisation overlooks the benefits emergent in how a group's playing changes for the better as each individual become accustomed to the others and their behavioral tendencies in that specific social situation.

In the end, Harald's relative evaluation of our two groups was likely not directly targeted as a comment to dismiss the group with Udo. He seems to have been saying more simply that based on our first meeting with Anders, it resulted in an improvisation which to him suggested a strong potential for experiments and development. Moreover, given how full Udo's schedule tends to be, he may have also made this suggestion through a practical consideration of who would actually have time, an easier schedule to match, and thus a greater potential for

developing a rapport over time. Additionally, Anders and Harald do not know each other well and to my knowledge, had never met or played together prior to the second evening at Irgendwann. Since Harald and Udo have been friends for more than twenty years and have done numerous tours and concerts over the years, Harald's keenness to play with Anders again could have come from his interest in creating fresh new connections (despite his preferences about "real" improvisation mentioned just above).

My point in narrating through my experiences with this configuration of improvisers is not just to share some of my exploits as a musician in Berlin. Rather, it is to demonstrate that when these musicians do engage in critical commentary with one another about one another, it tends to be limited to such a general level. One still has no idea what the basis of the opinion was (explicitly, at least), although one is made aware that the opinion exists. I will not say that I had no guesses about what Harald might have found more appealing in the second evening because I myself found the second quartet more moving on a personal level. Given that Udo's playing tends towards abstraction (and in particular, very often tends to avoid the production of pitch or tone altogether), Anders's playing allowed for sounds which many, including Harald and I, often find more emotionally affecting. But regardless of what the cause of Harald's sentiments may have been, the only discursive options elected or available seem to be a basic binary of either pleasure or its lack, interest or its lack, an inclination to meet and play again or a lack, etc. One learns that there *are* preferences but never really learns *what* exactly they may be.

In most of my interactions with improvisers in my fieldwork, I have passively waited for criticism or instruction from others to appear. On a few occasions, however, I have solicited feedback actively. This has been partially out of a desire for self-improvement as a musician, but also out of respect for others and a sense that I may be leaving them dissatisfied for some reason. For example, at a session with a Japanese trumpeter Kei, who was visiting Berlin, German bassist Joachim (who also has a serious non-musical day job and career), and an elderly American cellist Francis,⁴ I asked for a little feedback as we had coffee between our two 40-minute improvisations one afternoon at Joachim's flat and studio.

Specifically, I asked if I was too loud. For whatever reason, my self-criticism was roundly and unanimously dismissed as unnecessary. "No, not at all," said Francis, the Japanese trumpet player nodding along in agreement, and the friendly German bassist simply laughing, smiling, shaking his head and handing me my espresso. The question is as much based in my own naive sense of how a primary form of sonic real-estate — loudness — should be properly shared between participants, as it is in the fact that wind players generally, and saxophonists notoriously in particular, are derided for an inability to control and limit their volume such that others can still hear themselves. Listening to the recording Joachim made of the session, I did not hear myself playing as loudly as my self-critical question suggested, but at times I did rise to the typically dominating volume level of saxophone players that seems to drive many other instrumentalists mad.⁵

⁴ This is the same Francis I discuss in Chapter 12.

⁵ In fact, the tendencies of saxophonists broadly in free improvisation are such a strong source of irritation for many players that one large ensemble whose members I worked with in my fieldwork explained that the basic rule for admitting new members is very simply "no sax players."

Returning to the four-part analysis of why improvisers are hesitant to comment on how others play, a few general points are worth considering specifically in the context of my question to this group. Principally, before they can be able to comment on whether I was too loud or not, they must have a memory of what it was I was doing while they were playing with me. In this basic task of memory and cognition, there is likely a fundamental interference effect between the fact that each musician is engaged in two tasks that both demand significant attention. On the one hand, musicians work to play their instrument as best they can, a task that requires significant cognitive resources even for experienced players and manual dexterity often trained over years. On the other, most players strive to listen to others (even if this “listening” does not manifest in direct responses). This means that even if I ask them to evaluate what I was doing (and whether it was too loud), they may not really know what to say as the cognitive demands of their own playing require them to reduce the amount of attention they would pay to a matter like this. Moreover, at the level of face-work, egalitarianism, and avoiding conflict, even if they may have noticed something, there is still a durable set of forces working in tandem to keep them from addressing this matter directly or frankly.

The more general point is that in what I call the “culture of critique” of free improvisation, solicitations for peer feedback are usually declined. By this term, I do not refer to the fact that certain cultural milieux are more prone than others to criticism by peers or others. Instead, culture of critique refers to the relative level of comfort that inhabitants of a given social or cultural location feel in their right to give and receive criticism as well as their habits, rituals, and protocols of giving and receiving criticism. For my purposes, “culture of critique” denotes to culturally-specific attitudes about the expression of criticism. In the case of free improvisation, the culture surrounding critique is one in which such evaluative discourse is relatively infrequent in comparison to other egalitarian cultural locations. For example, in many social situations in which egalitarianism is a dominant value that affects social relations, peer critique is a frequent conversation and thus the culture of critique is one in which attitudes towards such conversations is more tolerant, relaxed, and appreciative (Badger, 2010; Snyder & Fessler, 2014).

The particular culture of critique at work in free improvisation creates major limitations to the efficacy of participant-observation as a means of locating expectations and conceptions of norms of social interaction for these musicians. More immediately relevant to the field of ethnomusicology, however, it also results in a culturally-specific condition in which the well-worn traditional field method of taking music lessons with experts is rather ineffective, if not just impossible. Taking lessons with master musicians is a time-honored research activity in ethnomusicology because it is one of the most effective ways for scholars of musical performance practice to quickly gain insights into those practices and the cultural politics surrounding them.

But how does an ethnomusicologist learn a musical practice when no one will teach it? What does one do when the teaching of a particular practice is considered an affront to the moral values of that practice, as is clearly the case in free improvisation (Lange, 2011; Lewis, 2000a; Steinbeck, 2010a)? Far beyond free improvisation, there are many musical practices in which musicians tend avoid instructing or advising their peers on how they ought to go about making music. For example, Howard Becker (1951) observed long ago in his fieldwork with professional jazz musicians in Chicago that even when musicians had a difference of opinion about aesthetic

matters, most players erred on the side of keeping their criticisms to themselves. This is not to say that there is no way of “learning” for practices which no one is said to “teach.” Often, one learns other “a-pedagogical” practices (as I would like to label them here) by just participating without receiving formal orientation to the practice. In that respect, there is nothing unique about the a-pedagogical stance of free improvisation as it is common in rock and many other related popular musical practices for musicians to have no training before starting to perform for audiences.

Regardless of similarities between free improvisation and other practices, improvisers are generally reluctant to take another individual as a student. The culture of critique in this musical practice is distinct from that of other practices which ethnomusicologists have studied by taking lessons with local masters. This particularity is illustrated in the numerous times I have admired another saxophone player in performance and subsequently asked them for a lesson. In the case of one individual in the Bay Area, I was fascinated by his control over multiphonics and other extended techniques. Like many improvisers seeking a new range of sounds to add to what one can draw from spontaneously in performance, I wanted to learn more about what Mark was doing and so I asked him for a lesson. “Yeah, sure, we should *meet*.” At the time, it had seemed obvious to me that he was not entirely interested in offering me a lesson. This could have possibly been because he just did not have time and that this request, like any other, was one that would require effort and attention that he needed to spend elsewhere.

But for most saxophonists, a potential student is a potential gig and easy money that does not directly interfere with one’s ability to take other opportunities for performance or other work. Moreover, the location in which this exchange took place adds an important economic context to the pressures to accept or decline such requests. Specifically, the whole interaction took place in the San Francisco Bay Area, a metropolitan region known for its prohibitively expensive cost of living. Since the time I requested a lesson from him a few years ago, Mark has explained to me that he has needed to take up a more financially substantial line of employment to deal with the costs of remaining in the area. Despite the fact that his primary professional identity is as a musician, this job has also led him to decline many gigs because of the time and energy it demands. Thus, given his economic needs, his disinclination to take me as a student is likely based in something other than just a concern for his own financial well-being and long-term solvency. Additionally, most saxophonists, including Mark, began their relationship with the instrument through jazz. While some jazz saxophonists decline taking students, especially those who approach them at gigs, most at least entertain the option of meeting for a lesson, and many famous players regularly take students on this basis. In my own experience with jazz players, it has been rare that a player declines to work “for” you as their teacher unless they are so busy that no time to meet can really be found.

For improvisers, however, the very idea of taking a paying student still seems somewhat strange and is a kind of invitation that most would prefer to politely decline. In the very different but still related scene of free improvisation in Berlin, I approached another saxophonist, Brian, so we could meet for a lesson. Dazzled by his virtuosic control of the instrument, I wanted to gain from his knowledge of various extended techniques, especially multiphonics. Compared to my relationship with Mark, my rapport with Brian was distinct. At the time of my request for a lesson, Mark and I had already played together at least once for an audience, he had come to see

me play with another group, and had already expressed seemingly heartfelt compliments of my consistent technique.⁶

Over the time of my stay in Berlin, the two of us met several times to play improvised saxophone duos. On several occasions I had initiated the communication in order to arrange a meeting and clearly expressed the intention and desire to structure the meeting as a lesson. Aside from the fact that one of our meetings included elements superficially similar to the teacher-student relationship⁷ found in Indian classical music, what we did was mostly just play, though he did give me some advice about how to develop a “slap-tongue” technique.⁸ But other than some pointers about how to consistently produce a good slap-tongue, he has never given me any other advice about how I should play my instrument. Moreover, he has never volunteered a suggestion of what we should play or a critique of what we just have. We have always just played. While it should be noted that this has never led to us performing together in public in this duo configuration or another one since our meetings, it is just as likely due to the fact that I was still a relative newcomer and it was unclear how long I would actually remain in Berlin. Therefore, the value of investing the energy in forming a group with me was likely less than what he would gain from playing regularly with the same group and letting those relationships develop over time. As he explained one time when we met to play, he was ambivalent about forming a group with me. He did not openly reference the possibility of a poor aesthetic or interactional fit between the two of us. Rather, he explained that it was more due to the fact that he was never clear about just how long I would be in Berlin and also the fact that he was now quite overwhelmed and busy with the duties of taking care of his newborn child and still managing his performance calendar. It is hard to say whether his aesthetic judgment of me as a player was a factor since he never directly referenced this as a reason for his hesitation. Instead he has mainly emphasized that he already feels burdened with the organizational tasks demanded by his role in extant groups. Therefore, spending the time to organize things for a group with an individual who may not be around for that long (such as myself) was a way of investing his energies that would lead to results that were unclear to him.

Despite the ambiguous utility of exploiting teacher-student relationships in order to better understand the norms of musical and social practice in of free improvisation, participant-observation does reveal, beyond the utopian discourse of this practice, that musicians hold certain preferences for how others should engage in musical interaction. Whereas other methods surveyed in previous chapters for locating improvisers’ expectations for how others should approach the indeterminate open-ended nature of free improvisational musical interaction may

⁶ It is possible that these were backhanded compliments. He emphasized that I, unlike other players, do not move around very much as I play, though this is not always true for me and likely a result of the fact that I was unsure of my position within the group I was playing with when he saw me. He seemed to envy my stillness for the same reasons that stricter pedagogues of woodwind techniques do: standing relatively still allows your body to more effectively continuously produce the airstream needed for a good sound, no matter what that sound is supposed to be (i.e., common practice or extended technique).

⁷ I mentioned that I love making kabobs and he seemed excited. After one of our meetings we threw some kabobs I had brought over in the oven for lunch. He did the dishes. All I did was marinate some meat.

⁸ “Slap-tongue” refers to a single-reed woodwind extended technique which produces a relatively loud percussive sound with an infinitesimally short tone at its beginning.

be less effective, participant-observation as a fellow performer does suggest, even if only minimally, that the proclamations that one is freed of any particular musical constraint are to be questioned. At the same time, it still remains unclear *what* exactly performers do expect of one another. What other forms of participant-observation might still allow a researcher to understand such norms more clearly?

In addition to playing improvised music with others, I have also attended numerous concerts as part of my fieldwork. As is likely true for virtually any type of music, the size of the audience for a given concert can vary widely, even at the same venue. Of course, this fluctuation can be a result of several factors, but the popularity and aesthetic appeal of a given artist is often what determines the size of an audience on a given evening. For free improvisation, this popularity factor has the same effect it does for any other type of live music scene. Still, aside from this popularity factor, another component which influences the size of an audience is the tendency of at least some performers to make the effort to hear performers who are new to the scene. For example, Brian made it a point to come hear me play one evening just after I had arrived in Berlin. Similarly, another improviser, Udo, regularly makes the effort to go and hear new groups on the rare occasion that he has an evening free. This is just as much out of curiosity as it is for the purpose of expanding professional networks and locating new players for possible collaborations. In any event, however, the variable size of an audience for certain artists versus others is a phenomenon which could be investigated more systematically. For example, what might one learn from a careful examination of relative levels of attendance shift for performers given the other events on offer for the same evening in the same city? To what degree do social networks, and not aesthetics, play in the relative popularity or obscurity of certain artists in the scene?⁹

I raise the issue of variable audience interest in various acts as a means of offering some final words on the need for further investigation of the implicit expectations improvisers have for how other improvisers perform. Throughout my experience as an improviser, I have encountered players who emphatically express to me that despite whatever implicit constraints there may seem to be, there is no normative conception of this practice that is shared across an entire scene. In 2008, very early in my experience with this form of music, I asked Carl, a cellist and noted Chicago improviser,¹⁰ *what* he felt constituted a “good” playing in a practice of this kind. Roughly twice my age at the time and perhaps therefore prone to offering wisdom to those who appear less knowledgeable than himself, he took my humble question as an invitation to disabuse me of my repressive, ignorant, backwards view of musical normativity sewn into my thinking on such matters by my previous experiences in classical music and jazz. “There’s no such thing as a ‘good’ improviser,” he proclaimed. As we shall see in later chapters, it was this same individual

⁹ This method could potentially illustrate something about what preferences exist for the practice of free improvisation in a given scene. However, like the broad and diffuse kinds of data gained from the other encounters described in this chapter, this kind of audience tracking only indicates *that* an audience had an interest in the performance, but not necessarily *what* they were interested in hearing. Moreover, interest in a particular performer cannot necessarily be confused with an appreciation for the aesthetic value of their work. In any case, a more systematic study of how audiences react to such performances is perhaps a fruitful future line of investigation so long as it takes into account these caveats.

¹⁰ This is the same Carl I refer to in Chapters 4 and 13.

who also found that there was plenty that was “bad” about the system I asked him to play with. Similarly, even in the midst of spending the whole of one morning in Berlin playing with my interactive system and telling me how irritating it was, Brian maintained rather doggedly at lunch that no such normativity is at work in free improvisation. To my assertion that “you can’t just do whatever you want,” Brian simply insisted “you *can* do whatever you want!”

To conclude, then, many of the methods typically available to a social-scientist or musicologist examining free improvisation do not allow the researcher to effectively investigate or offer a critique of the widely disseminated assertion that free improvisation liberates performers from culturally-elaborated constraints of musical practice like genre or tradition. Some methods and sources, however, such as participant-observation and some academic writings on the subject, do offer clearer indications that expectations are in fact at work in shaping how performers and audiences react to these experiences. Nevertheless, the need for a study such as this dissertation lies in the fact that a simple confirmation that such expectations exist does not begin to offer us the insights to be gained from understanding more specifically what those expectations are. Furthermore, the nature of those expectations tends to be highly indeterminate and general in character. Therefore, further investigation is needed in order to understand what those general principles actually look like when practiced in real situations. In other words, they demand an investigation of highly variable sense of practical judgement¹¹ involved in knowing when those principles are applicable or not and how one should go about ascertaining and meeting others expectations.

¹¹ Looking ahead to the conclusion (Chapter 14), “practical judgment” refers to the ability to know when certain ideals of improvisational interaction are to be elected over others.

Section 2: Virtual Performers of Free Improvisation

Chapter 6: Locating Norms of Musical Interaction in Free Improvisation in the Design Rationale of Virtual Free Improvisers

As the past few chapters have established, the use of textual, analytical, and ethnographic methods for answering the question of what improvisers want their fellow players to do in musical interaction is likely to lead to ambiguous answers. By and large, texts for popular audiences tend to insist that such expectations do not and should not exist between performers. However, artist's writings, particularly those of Derek Bailey and the Berlin Echtzeitmusik scene, are more frank about acknowledging the existence of such expectations and the role they play in shaping interactions between performers. Still, these sources do not necessarily allow us to understand *what* players want from each other and mainly illustrate *that* such expectations are active.

One might assume that academic writings on the topic of free improvisation would take a more critical approach to this question. However, because these sources are still committed to defending the practice of free improvisation from its detractors, critical acknowledgment of the nature of these expectations is still lacking. Likewise, interviews with artists, particularly those collected in Tom Arthurs' recent dissertation (2016), feature several moments when musicians recognize that they have certain expectations for how other players should play, yet it is unclear what those expectations are.

Music analytical approaches to this question may be promising, though they have rarely been taken by the majority of researchers. The main issue with this approach is that it is more likely to show what has tended to happen between performers than it is to tell us what performers would want to happen. As is suggested by the opening ethnographic vignette of this dissertation, what happens between players cannot be equated with what they might have wanted to happen. This is a topic that improvisers mostly avoid discussing directly.

As the previous chapter established, participant observation as a fellow improviser and concertgoer does allow for a more critical answer to the question of expectations between performers. That performers have preferences is clear both from the fact that the same players repeatedly work with the same set of individuals over again as well as the fact that certain performers consistently draw a crowd while others do not. But again, *that* performers have preferences for certain players does not tell us *what* the specific attributes of those players personalities or tendencies as improvisers are desired. Moreover, as I have also tried to establish, many of the conventional ways that ethnomusicologists have used participant observation to understand the norms of a given musical practice prove ineffective for free improvisation. Ethnomusicologists can typically (but not always) assume that asking musicians of a given musical culture to teach or correct them will elicit instructional remarks that are indicative of what musicians deem to be standard practice. By contrast, free improvisers avoid this kind of instructional interaction. All the same, there are still fleeting moments when someone will acknowledge that they had a sense of what they wanted (and that someone did not deliver that ideal).

There remains another type of source and methodology that I have not yet examined which allows us to understand such expectations at least a bit more clearly, namely, the numerous virtual performers of free improvisation which have been developed over the past two and a half

decades since George Lewis' famous *Voyager* system (1993, 1999, 2000b). These systems represent a distinct approach to this problem that affords a more precise consideration of what improvisers expect of each other. More precisely, designing a system of this kind *forces* research on the practice of free improvisation to deal with the problem of what musicians want from each other in real time musical interaction in a way that other methodologies are never really obligated to do. While sources and methodologies surveyed in these past few chapters do offer a glimpse into what these expectations consist of, such materials do not necessitate a direct reckoning with the question of how an improviser responds to sonic materials from their peers in real time.

Conversely, building a system to do what these human players do is a task in which the researcher simply cannot avoid a consideration of how improvisers listen to each other and how they respond to what they hear. The very act of creating such a system necessitates that the designer make decisions, judgments and implicit assertions about how improvisers respond to sonic stimuli from their peers and themselves. It demands that the designer make conjectures about what happens in the mind and body of a free improviser as they encounter others and deal with the influence of their playing on the outcome of the overall performance. It is a practical engineering task that compels one to investigate the perceptual, cognitive, and embodied underpinnings of this musical practice. Whereas other methodologies are able to avoid this task, designers of such systems simply cannot. This is not to dismiss the contributions of those writing on free improvisation from other perspectives. Indeed, in order to fully understand what the designers of these systems are doing, understanding the context of African-American political struggle and the myriad concepts of freedom and equality that float about various discursive realms is necessary. At the same time, a study of such discourses and contexts cannot and does not as yet offer an account of what happens in the mind of an improviser. Thus, despite the important contributions of numerous authors, two key questions remain:

- 1) How does an individual mind and body translate the hefty and knotted concept of “freedom” into ways of sensing, feeling, thinking, interpreting, ignoring or disregarding (perhaps), and responding to the presence and actions of other players?
- 2) How do improvisers expect others to engage in these activities such that both their conception and phenomenological experience of “freedom” are upheld? In other words, beyond what improvisers tend to do, what do they actually expect of one another?

Far more explicitly than any of the other sources I have reviewed so far, the designers of these systems repeatedly take on the task of theorizing what performers expect from one another in the practice of free improvisation. These conjectures about the norms of social interaction in free improvisation vary widely and will be the major concern of this chapter. In a manner that no other form of research on free improvisation really achieves, the technical documentation of how these systems work is an important body of work that constitutes a unique articulation of what these researchers assume that improvisers are doing when they play with each other as well as what they actually *want* others to do.

However, as much as these systems deepen the discussion about the nature of musical interaction in free improvisation, there are two main problems in analyzing them in order to

understand these interactions. Firstly, the systems are not based on an analysis of actual musical practice. Instead, designers create these artificial musicians based on their own understanding of this practice as musicians or listeners and then translate these observations into design. For various reasons, I do not dispute these methods, principally because building a system after an analysis of many recordings or an exhaustive ethnography is less efficient than designing based on a researcher's hypotheses as to how improvisers actually play with one another. Nevertheless, as would be the case for virtually any human activity reproduced in the behavior of a digital automaton, it is dangerous to simply assume that because a designer has produced such a system that this system is therefore an accurate representation of the musical practice at hand. Just as Diana Forsythe pointed out for artificial intelligence research in more practical contexts such as medical informatics or interactive tutoring software (Forsythe, 2001), researchers in computer music often assume that their lay understandings of a given human practice is a sufficient knowledge-base for the design of an AI system. In a nutshell, many of these researchers assume that the painstaking work of ethnography or the analysis of cultural practice by whatever means a humanist or social-scientist might undertake is trivial and that all that work can be avoided by making assumptions about practices.

The second major flaw of this work, which is related to the first, is that few designers bother to ask actively performing improvisers what they think of how well these virtual musicians actually do as stand-ins for their fleshy counterparts. However, as I will show in this chapter, there are several important exceptions to this trend and the results of these studies offer both a counterpoint and corroboration for many of the points suggested by my own empirical work in this domain.¹ In any event, few of these designers test the systems they have built with a wide pool of real improvisers. The result of this state of affairs is that there now exist several compelling hypotheses about the cognitive science of collective free improvisation. These hypotheses offer greatly varying, and yet all potentially insightful, arguments about what is going on at the psychological and physiological level as improvisers play with one another. Nevertheless, they remain largely untested. For all that these hypotheses may theoretically be accurate accounts of what real improvisers do, very little evidence has been collected to substantiate any claims that they may in fact represent what improvisers are actually experiencing, thinking, or feeling as they play with others.

Despite such flaws, however, this fascinating body of work is a good source of *ideas* and hypotheses about how human cognition occurs in this social and musical practice. As problematic as it may be, creating such systems is productive because of the way that it does not allow the researcher to avoid a direct investigation of the processes of sensation and interaction that take place in improvisation. Moreover, this work also demonstrates that the absence of this research constraint in other social-scientific and musicological approaches to free improvisation greatly diminishes the ability of those methodologies to answer the question of what improvisers really want from each other. In the rest of this chapter, I survey the hypotheses about the nature of social cognition in free improvisation implicitly (and sometimes explicitly) encoded into the design of these systems.

¹ See Chapters 11, 12, and 13.

Delimitation and Scope

Before diving directly into a sequence of analyses of the various systems developed since Voyager, I would like to clarify how this group of systems was selected and what other systems it excludes. Beyond the systems I look at in detail here, there are several other interactive music systems which are possibly relevant and might even be capable of behaviors similar to the ones I examine in this chapter. Even if they are neither designed with any intention of reproducing the way that human free improvisers interact with one another nor described by their designers as having the practice of free improvisation in mind as these systems were created, it is likely that several systems other than the ones that I survey in this chapter could function as if they were fellow free improvisers. In any case, the systems surveyed in the next two chapters have been identified as systems which are intended to reproduce human musical interactions as they take place in free improvisation.

For example, Joel Chadabe's (1997, pp. 286-323)² early survey of interactive music performance systems catalogs the work of several early pioneers of computer music who were interested in developing systems that respond to human input, whether sonic or tactile, in unpredictable ways. Whether or not these designers were personally interested in the practice of free improvisation, they nevertheless sought to create a mode of relating to these technical systems that is analogous to the equal partnership that is pursued between free improvisers in a collective performance setting. They wanted to design systems that were not merely subservient to the human performer, but would exert a creative agency of their own, and hopefully also influence the human performer to change the direction of the performance. This fascination led Chadabe to create the "Coordinated Electronic Music Studio" (CEMS), a technology platform built by synthesis pioneer Robert Moog and installed at the State University of New York at Albany. CEMS facilitated Chadabe's work with several pieces in which the human performer at least partially "governs" the system's behavior, but the system's behavior cannot be fully predicted based on the nature of the incoming commands from the human performer. As a kind of early user experience and human-computer interaction approach to his own work, Chadabe documents the experience of performers playing with the system, including his own reflections as well. Above all, Chadabe emphasizes the fact that the system's playing often *inspired* him to take musical actions he would not have expected himself to do in the first place. While many of these designers were clear in framing the system as an instrument more than a player, they nonetheless found them reacting to the system as if it were.

Like many systems, these machines were built to take commands from a human master. However, they were also capable of disobeying or ignoring them, almost seeming to take commands from a master of their own. In Chadabe's account of his own experiences playing with his early prototypes, these semi-independent actions of the system force him to react to the system not as a malfunctioning instrument, but as a musician making a playful suggestion (Chadabe, 1997, p. 287). Almost in the same way that a human interlocutor might, the system seems to beg such a response from the human performer. Chadabe describes a human-computer

² George Lewis (2004b) also provides a survey of a similar range of works in his commentary on his own work for an edited volume produced by the Jazzinstitut Darmstadt.

relationship in which the computer gives the human player new ideas. In terms of a distribution of creative agency across human and mechanical sources, it cannot be said of these early pieces that it is Chadabe or his human performers who are entirely responsible for the creative output of the performance.

In addition to Chadabe's pieces from the early 1970's, he also describes the work of several other composers who were interested in asking a computer system to do more than just produce a given sound. As he shows, other composers working at this time wanted systems that did not just make sounds on command, but that would make creative musical decisions, or at least would seem to (ibid., p. 291). Aside from Chadabe, this cohort of composers included Salvatore Martirano and the several systems he created at the University of Illinois at Urbana-Champaign, the French collective GAIV (Groupe Arts et Informatique de Vincennes), the League of Automatic Musicians and the Hub (two groups based at or associated with Mills College), Bruno Spoerri, David Behrman, Robert Rowe, the Amsterdam research facility STEIM (Studio for Electro-Instrumental Music), Richard Teitelbaum, and George Lewis. Shared across this diverse cast of characters was a fascination with the possibility that the computer might do more than just obey the commands of the human performer. Implicit across this cohort's thinking was the idea that the computer could now assume a portion of the compositional decision-making made by a human composer (or improviser) in real time. Crucially, there was also a fascination with how this non-human decision-making would either be as good as or perhaps superior to what a human composer or fellow improvising performer might think of instead.

In many ways, these systems were already capable of much of the kind of interaction that occurs between performers of free improvisation. In Rowe's extensive collaborations with a range of improvisers such as Steve Coleman, Muhal Richard Abrams, and Roscoe Mitchell in performances of his *Cypher* system, Rowe sought for his system to play with human players as they did with one another (Rowe, 1992b). Strictly speaking, any of the systems that Chadabe mentions could be interesting for performers of free improvisation to play with and most of them would be likely to exhibit behaviors that would encompass at least a portion of the kind of interaction they would expect from another human improviser. Whether or not they were *built* to be virtual free improvisers, the systems Chadabe looks at could easily be *deployed* in performance context as if they were.³

For all that these systems bear a similarity to this human practice of musical and social interaction, there are several reasons why they will not be addressed in detail in this chapter. Since, with a few exceptions, these systems relied upon haptic or tactile interfaces for input from

³ It is likely that many of the composers whose work Chadabe indexes were also influenced by the free improvisers who are the more or less explicit sources of inspiration for the designers I examine in this chapter. However, it was only very recently that the practice of improvisation generally and free improvisation specifically were regarded as serious musical practices by both communities of scholarly investigation about music as well as the world of experimental music. Just as George Lewis (1996) argues that many musical experimentalists disavowed the influence that jazz and improvisatory musical practices played upon their work, a similar trend is active in the way that many of these early computer music designers discuss their work. Ostensibly, these designers are creating systems that would essentially be made to function and interact with human performers as if they were free improvisers. Discursively, however, many of the works Chadabe looks at are not defined in this way. While it is beyond the scope of this chapter and dissertation, a musicological analysis of the works that Chadabe lists might reveal trends similar to what Lewis describes in the discursive distancing from jazz and improvisation on the part of non-African-American experimental musicians in the postwar era.

the human player. Given that performers of free improvisation do not tend to touch, push, or rub each other in order to influence one another in performance, the mode of interaction between human performers and these systems significantly diminishes their relevance to what occurs between human improvisers.⁴ Secondly, while the systems Chadabe reviews include several unpredictable elements in their behavior which produce an interaction in which the human player is unaware of what the system might do at a given time, it remains the case that many of these systems leave an ultimate veto power to the human player. Whether this is through the crude means of simply shutting off the system's electroacoustic output manually or more refined editorial powers such as delimiting or sculpting the system's output in real time, these are ways of interacting between agents that are not relevant to the kinds of interactions between human musicians that are at the core of this dissertation. In addition to not rubbing and touching one another for control, improvisers do not exert veto power over one another's actions in the moment of performance. For better or worse, one player does not tell another to stop playing in the middle of a piece, much less do they tell them *explicitly* how they should be playing.⁵

Aside from these two technical features, the systems chosen for analysis in this chapter have been selected because of the stated concern of their designers to relate algorithmically to or represent the practice of free improvisation. While it is possible that many of the systems in Chadabe's catalog of work up till the late 1990's could exhibit a portion of the improvisatory sociality of the systems I examine in this chapter, they are less relevant for the present analysis because they are not explicitly concerned with computationally encoding the interactional approaches of free improvisation. As I will argue in this chapter, designers of these systems make claims about the nature of behavioral expectations in free improvisation in how they justify various elements of system design. In other words, these systems and their technical documentation constitute models for how each researcher understands the ethics and cognition of musical interaction in free improvisation. Many of these researchers either explicitly or implicitly use their computational work to make claims about how human improvisers interact with one another. Since the designers that Chadabe examines do not have this concern, they are less relevant for the analytical review presented in the next two chapters.⁶

⁴ Of course, it would be unfair to say that this kind of interaction has no relevance at all to the interactions of improvisers. In many ways, what Chadabe describes for his interaction with his CEMS systems has much in common with the social psychology of improvising music with another person. One player takes an action. The other responds. Participants find inspiration in the other or at least that their intentions are subtly shifted (see Gibbs, 2001).

⁵ Naturally, however, there are many implicit ways that players may be telling each other how or what to play. For example, introducing noisy material may be taken as a signal to others. But just *what* is signaled by the introduction of different kinds of musical materials is still unclear. Again, I refer the reader to the work of music psychologists Graeme Wilson and Raymond MacDonald (2012, 2015), which suggests quite convincingly that improvisers often have little to no idea what the intentions or desires of their fellow players might be.

⁶ Still, the ontological distinction between them and the more intentionally free improvisation oriented systems I look at here is a fascinating avenue of research I openly encourage for historical musicologists working on changes in computer music practice diachronically.

Beyond “Mechanical Reproduction”: Technological Performance of Human Cultural Practice

Distinct from the systems and works mentioned in the previous section, the body of work I examine in this chapter has much in common with the goals of research in artificial intelligence. These systems are not built to serve merely as tools for human beings, but instead, they are supposed to do what humans do, with human beings, and in their ideal realization, they can be treated as human interactants in a musical context. Like any project in artificial intelligence, the realization of this holy grail of technological research is still beyond the horizon. Still, research in this direction continues to provide new ways of asking questions about what it is to be human and what it is to do so in the presence of others.

On one level, projects in artificial intelligence or artificial life resemble what Walter Benjamin has called “mechanical reproduction” (Benjamin, 1939/1968).⁷ After all, just like a phonograph, projects in artificial intelligence also “mechanically reproduce” various kinds of human “arts” and practices: sound recordings reproduce actual performances of speech or music and photographs reproduce what eyes might have seen. To be sure, artificial intelligence and interactive technologies also engage in at least a portion of this kind of reproduction. For example, videogame characters replicate human forms and move according to the physical constraints of a humanoid body. Similarly, digital personal assistants such as Apple’s *Siri* or Amazon’s *Alexa* synthesize human speech in order to facilitate the typical “hands free” communication that takes place between people.

But other than these superficial sensory similarities, there is of course so much that *Siri* and *Alexa* do that a recording would not. In a word, they *interact*. These and other interactive technologies not only produce sensory stimuli for a human being, but meaningfully respond to the sensory stimuli output produced by a human being such as speech or even gesture. Fixed media, such as an aerobics video, a late night commercial asking semi-rhetorical questions to the viewer (i.e., “*Do you find yourself continually behind on your bills? Is your spouse constantly worried about foreclosure? Call...*”), a cassette recording of the Qu’ran (Hirschkind, 2006, p. 84), may simulate the dialogic contingency of a genuine social interaction, inducing the listener or viewer to perceive the medium as if it were a real human suggesting certain interactive responses. Nevertheless, the simulation of these exchanges in social interaction cannot be confused with an actual social interaction. The videotape or audio recording does not respond to the viewer or listener even though those producing it were crafty enough to create a sense of pacing in the delivery of certain lines that simulates the turn-taking of an actual conversation.

Artificially-intelligent technologies, particularly the artificial socio-musical interactants that are the center of this chapter and the next two, do more than just reproduce a fixed timeline for the sequence of events and turns in a social interaction. Their actions are actually the result of what the human being has done at the time of interaction. This is distinct from the staging of an

⁷ Of course, also relevant to this discussion are the other senses of this phrase implied by the original German title: “*Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit*” (Benjamin, 1939/1991). Though the phrase “*technische Reproduzierbarkeit*” is often rendered simply as “mechanical reproduction,” a more faithful translation leans towards “technical reproducibility.” “Reproductions” include things like recordings, facsimiles, or other copies of original items. “Reproducibility” on the other hand is an attribute of artifacts or performances that lend towards their ability to be reproduced. Benjamin’s discussion does not really touch upon the nature of this difference.

actual dialog found in the fixed media examples just mentioned. In so doing, they reproduce not only humanlike behavior, but the very processes of decision-making and interaction that constitute the difference between a human subject and non-human object. As numerous scholars in science and technology studies suggest, technologies built to take on the responsibilities of a human being constitute both a representation and performance of human cultural knowledge and practice. For example, in his historical analysis of technical systems development in the Cold War, Paul Edwards (1997) argues that computation was not only used in the creation of a global military security network, but implicitly encoded the political ideologies of that time. Similarly, in the follow up (Suchman, 2007) to her original (Suchman, 1987) monograph offering an ethnographic account of human-computer interaction research at Xerox-PARC, anthropologist Lucy Suchman offers a range of important claims about the nature of the relationship between human practice and the technical systems that represent them. Regarding technologies which aim to be humanlike (such as most AI research), Suchman asserts that: “projects in AI and robotics involve a kind of doubling or mimicry in the machine that works as a powerful disclosing agent for assumptions about the human” (Suchman, 2007, p. 226). Contrary to what many researchers in artificial intelligence have believed, creating a thinking machine is not just an engineering problem. It involves the study of a particular form of embodied human knowledge developed over the course of a career or other long-term engagement with a particular task. Therefore, it is, as anthropologist Diana Forsythe (2001) has argued in her ethnography of artificial intelligence research, both a way of representing and performing human culture as well as a task that demands an ethnographic study of the forms of knowledge that allow those cultural practices to exist.

Resonating with these perspectives, interactive media artist and composer George Lewis significantly departs from the rest of the cohort of designers creating virtual free improvisers by asserting that *Voyager* is not merely a musical work driven by high technology. Instead, his discussion of *Voyager* is continually informed by the perspective that this work constitutes a representation and re-performance of specific ways of creating and producing musical works in the collaborative, improvisatory, and interactive working practices of the Association for the Advancement of Creative Musicians (see Lewis, 2008). For Lewis, *Voyager* is more than just a culture-free exploitation of the latest that technological means could offer to his creative endeavors. Rather, it creates an interactive performative representation of forms of creativity Lewis encountered in his artistic development as a member of an African-American avant-garde community of practice.

Though Benjamin Carey (2012) concurs with Lewis that “musical computer programs are not ‘objective’ or ‘universal’ but instead represent the particular ideas of their creators” (Lewis, 2000b, p. 33), other designers largely avoid a discussion of how their system relates to or represents free improvisation as a cultural practice. But regardless of how their designers position their work, these systems ultimately amount to representations and performances of a culturally-specific form of human practice; free improvisation. These systems are built to function as fellow free improvisers in dialog with a real human improviser and are often used in collaboration with improvisers of international renown. Moreover, while the technical documentation of these systems does not always explicitly argue that these systems are supposed to represent what free improvisation is, they do acknowledge free improvisational practice as a

significant and central inspiration for this technical work. Given this context, the way a researcher designs such a system (as well as how they rationalize their design choices) implicitly makes claims both about how improvisers *do* improvise and how they *should*.

Points of Agreement, Common Hypotheses

Since Voyager, numerous researchers in computer music have created systems which are built to function as an improvising partner in dialog with a human improviser (Assayag & Dubnov, 2004; Banerji, 2010; Blackwell & Bentley, 2002; Bown, 2011; Carey, 2012; Casal & Morelli, 2007; Collins, 2008; Hsu, 2005; Linson et al., 2015; Yee-King, 2011; Young, 2008). In line with Derek Bailey's claim that "diversity is [free improvisation's] most consistent characteristic" (Bailey, 1980/1993, p. 83), the designers of these systems offer a dazzling array of different hypotheses about how improvisers might be listening and responding to each other (and when they might not be at all). Their perspectives vary with regard to numerous aspects of the musical practice ranging from what parameters of sound free improvisers are most attuned to, the degree to which they pay attention to these details (as opposed to tuning them out in order to focus on playing), the form and degree of independence or cooperation preferred in a playing partner, the type of stylistic adaptation they may prefer over time, to the issue of whether or how form should be created within a piece.

Still, for all that these systems differ in their perspectives on such matters, there are several basic points in how each conceptualizes the practice of free improvisation upon which all of these designers agree. George Lewis' two best-known essays on Voyager (1999, 2000b) outline several of the basic conceptual frameworks and design constraints which define the work of those who have contributed to this area of research after him. The principal point of agreement is that if the system is to relate to (i.e., improvise with) the human player as another human player would, then this relationship shall be one between peers: a level, nonhierarchical, egalitarian relationship in which (ideally, at least) no individual occupies a dominating or subordinate role in relation to the other participants of the performance. In the context of other literature on free improvisation I have previously reviewed in this dissertation, this conceptual remark is nothing surprising. As I discuss extensively in Chapter 2, a large part of what attracts so many musicians to take up the practice of free improvisation is that it aims to liberate musicians from the basic interpersonal hierarchies which are often assumed as a necessity in most forms of music-making (e.g., composer/performer, leader/ensemble, soloist/accompanist, etc.). In free improvisation, all performers are at least theoretically accorded an equal status at

the outset of performance in terms of their right and capacity to influence the outcome of the improvisation that ensues from their interactions.⁸

As Lewis points out and other designers have agreed, the realization of an egalitarian ideal in interpersonal relations necessitates a very different understanding of human-machine relations than those that normally manifest in most musical practices. Drawing on the theoretical work of composer and music technologist Robert Rowe (1992a, p. 8), Lewis suggests that this involves a shift away from conceptualizing an interactive music systems merely as an “instrument” and towards thinking and relating to one as a fellow “player.” Mostly self-explanatory, Rowe’s concept of an “instrument” class of interactive system refers to performance systems that are intended to remain subservient to the control of the human player. “Player” systems on the other hand, are performance systems that one engages with as one would with another player.

Implicitly, the latter of these two categories refers not just to *any* kind of player, but improvisers in particular. Setting aside Rowe’s unique concept of a “player” for a moment, there are indeed many types of musical “player” roles in the real world that are more like his concept of an “instrument” than his concept of a “player.” For Rowe or Lewis almost any performer occupying a role in which they are subordinate to other musical actors (i.e., accompanists, performers of a composer’s work, an orchestra member under the conductor’s baton) function much more like an “instrument” than a “player.” Moreover, such thinking is already documented within the discursive history of European art music. For example, as John Spitzer observes (1996, pp. 247-248), conceiving of the orchestra as a kind of musical machine or even proto-synthesizer made of organic, fleshy components was common for composers and musical thinkers from the time of Bach to Wagner.⁹ So the metaphor goes, a composer controls the actions of individual members of an orchestra as if the entire social mass were just a single giant instrument. The only difference is that this “instrument” is not played with the hands or mouth in real time as one might with an oboe or sitar, but operated through the far less immediate means of a score which guides the actions of the orchestra, with the conductor at the helm of this massive instrument, working to ensure that the composer’s manuscript leads to the correct actions being produced in the orchestra machine.

Therefore, Lewis’s use of Rowe’s distinction between player and instrument classes of interactive systems is about far more than just offering a reader a better sense of what kind of system he has designed in *Voyager*. Rather, Lewis’s application of Rowe’s terminology points to the fact that overall, the practice of free improvisation is predicated upon a what I call

⁸ The equality of status between performers can be understood as a microcosmic representation of the equality of opportunity of individuals in a society. That means that each individual performer has the same potential to influence the outcome of the performance as the rest. However, this equality of potential does not always result in an equitable distribution of achieved influence. In a free improvisation, one or more players may dominate in terms of the impact of their playing on the group interaction and the resulting musical performance. At the same time, the notion that one player dominates over the others is not one that can simply be determined through analysis alone. As the ethnographic HCI portion of this dissertation will reveal (Chapters 11, 12, and 13), player’s differ significantly in what they each consider as domineering, subservient, or otherwise inequitable playing on the part of their improvising partners.

⁹ However, Spitzer also notes the considerable variation in the positive or negative valence attached to the meaning of this metaphor across this time period in European musical history.

“deinstrumentalization” of musical actors. Whereas the use of other musicians as if they were instruments of another musical actor (e.g., composer, bandleader, conductor, concertmaster, etc.) is deemed both acceptable and necessary, free improvisation considers such instrumentalization of others as both unnecessary and offensive. Therefore, instead of this instrumentalizing relationship in which a composer “plays” the orchestra, improvisers seek re-establishment of the old basic distinction between *who* a player is and *what* an instrument is: players are people and instruments are machines.¹⁰

Returning to the pursuit of an egalitarian ethos that constitutes the center of much discourse on free improvisation as well as the aims of its practice, the player/instrument distinction really serves as a means of outlining the agenda of eliminating hierarchies and creating a flat and level power structure between musical participants. For Lewis and the rest of the designers I examine in this chapter, this means that for any two improvisers, there will be a balance between moments where the two are engaged in a cooperative conversation in which each player’s contributions builds on their colleague’s and times when the two invoke their right to deny or ignore the influence of the other. In Lewis’s words, “this means that [the] improviser can influence the computer but need not prod the computer along during the performance” (Lewis, 1999, p. 104). Voyager responds to human input, but at the same time “does not need to have real-time human input to generate music” (Lewis, 2000b, p. 36). Translating this into a representation of the norms of musical practice in free improvisation, this means that the realization of a nonhierarchical ideal in free improvisation requires that players demonstrate both that they are willing to be supportive and sympathetically respond to the suggestions of their peers, but also that they do not just follow the other — they also exhibit an independent and even maverick will of their own.

In various ways, each of the designer’s included in this chapter’s review concurs that this dynamic of push and pull is an essential part of how they have designed their system and what they assume (or have found from their own experience as players) that improvisers really want other players to do. However, for all that they agree on this issue as a starting point for their design, each of them offers a distinct answer to the question of how this high-level behavioral goal of a nonhierarchical interaction should be realized. If independence is sought at certain moments, then what is the basis of this independence? Is it an outright ignorance of the other player or is it an intimate awareness of their actions which then affords a precisely calculated deviation therefrom? When would independence be preferred over cooperation? And if cooperation is sought, then what form should it take? What parameters are then chosen as the ones which form the basis of a collaborative gesture? Does one adapt to the other rhythmically, timbrally, melodically, or harmonically? As shall become clear, the main point of agreement between these designers is the very beginning of their differences of perspective about how the common goal shall be realized.

In addition to the convergence of opinion about the basic behavioral constraint that a system of this kind should meet (and the corresponding human behavioral expectation it

¹⁰ In Kantian terms, what free improvisers seek then is a cessation of any musical practice in which any musical actor is treated merely as a means to a certain musical end (e.g., the violinist is a “means” towards the composer’s “end” of realizing a musical idea). For further discussion of Kant’s original distinction between means and ends, see Kant’s *Groundwork for the Metaphysics of Morals* (Kant, 1785/2002).

represents), designers also agree that the basic sensory modality of interaction between improvisers is sound and sound alone. The system, just like the improvising players it represents or reproduces, does not have to (and perhaps should not) be built to respond to visual stimuli from the other human performer. Lewis mentions this in his first essay on this topic: “All communication between the system and the improviser takes place sonically” (Lewis, 1999, p. 104). In a later essay (Lewis, 2007), he revisits the notion that the presumptive model of social interaction in free improvisation is entirely sonic in response to artificial intelligence and robotics researcher Rodney Brooks’ misunderstanding about the nature of George Lewis’ work, and the practice of free improvisation generally. In a program on National Public Radio, Brooks presumes that Lewis’ system might be improved if it were to be able to take visual cues from other performers (Andersen & Brooks, 2007). In response to this misunderstanding, Lewis’ takes Brooks’ as an opportunity to further clarify the fact that the primary mode of communication between free improvisers is aural.¹¹ No other designer explicitly declares that this form of communication is primary. However, it is clear from the fact that these systems are all designed to limit communication both from human to system and system to human to the channel of acoustic sound that their designers are in agreement with Lewis. In other words, these systems are all built to simulate the cognitive and perceptual processes that take place in the ear and brain of a human player by using microphones, cables, an analog-to-digital audio signal converter, and a computer to reproduce those processes as best as possible. But as the next two chapters shall make clear, besides these points of convergence and agreement, numerous debates about how these systems should be designed can be found in the implicit dialog between technical documentation of one system and the next, all of which offers a fascinating realm of research which examines the nature of the cognitive science and phenomenology of this musical practice.

¹¹ It would be foolish to say that the visual channel is never a factor in interactions between improvisers as there are indeed moments when players do look at each other and even make eye contact in the midst of performance. But the issue with Brooks characterization is that by and large, these moments of visual and physical gestural communication are the exception to the rule. Nevertheless, because of their exceptional nature within an otherwise purely sonic form of social interaction, these moments of visual communication inevitably become charged with meaning in the interactional semiotics of free improvisation. What these moments of mutual gaze or askance staring is a fascinating area of investigation that is likely to offer a counterpoint to much of what is investigated in this dissertation, but alas, these issues are beyond the scope of the present work, both in terms of focus but also methodology. Players occasionally made oblique references to this in their criticisms of Maxine, but their comments are not specific enough to offer a response to the issue of gaze and gesture as communicative modalities in these interactions.

Chapter 7: Listening, Audio Features, and Levels of Detail

Aside from a handful of basic constraints and goals for the construction of a virtual performer of free improvisation, creators of such systems differ drastically in their approach to design. Such distinctions have a meaning which goes beyond the differences in functionality resulting from how each designer builds a system. In creating these systems, designers make proposals about the nature of social cognition in human interaction as it takes place through collective improvisation. Likewise, design decisions represent each designer's conception of the various cultural values inscribed in how such interactions take place. This takes place regardless of whether they intend to or not because for all intents and purposes the systems in question are consistently deployed as collaborators with active performers of free improvisation.

One of the most crucial differences in how designers conceptualize improvisatory interactions lies in how each system is designed to listen to the human performer it collaborates with. Naturally, in order to build a system to function as a fellow improviser, it is critical for the designer to construct a perceptual layer which allows the system to respond to other players. In turn this task forces the designer to form a hypothesis about how improvisers listen to one another or at the very least the practices of listening which satisfy the interactional and aesthetic preferences of a human performer.

The design of a system's listening layer raises a whole host of questions about the nature of perception and cognition as it takes place in free improvisation. What parameters of sound are most consequential in how one player listens to another? Are improvisers listening for how other players organize the pitch content of their playing? If so, then how clearly is one actually able to identify the exact pitch values others play, especially if absolute pitch is a perceptual capacity only found in a minority of individuals? If one listens for pitch, then does one listen for patterns of pitch organization (i.e., harmony, for example) which are particular to a specific musical tradition (i.e., jazz)?

Or is pitch-based listening irrelevant? Do players listen less for specific pitches or patterns thereof but for differences in timbre? If so, then what aspects of this massive discursive cloud called "timbre" might they be listening for/ The difference between a tone and noise? The degree of inharmonicity or dissonance in a sound composed of tones? The relative rate of change of timbre over time?

And overall, how much do the details of timbre or pitch really matter in how improvisers respond to one another in performance? For pitch, does one listen for specific pitches or just a general sense of melodic contour or relative height? For timbre, does one player attempt to precisely match the timbre of another or is it just the general quality of the sound another player produces which really matters?

More practically, how much attention can one really pay to the details of another player's sound when one is simultaneously charged with the cognitively demanding task of creating one's own? This question becomes all the more significant when one considers the cumbersome and physically awkward practices of many improvisers. For example, is one really able to listen with a tremendous amount of detail when standing in front of a piano and trying to carefully produce a particular sound by rubbing, banging, or plucking strings with some household object or small piece of hardware which was never designed for such a purpose? Aside from the more involved

physical sound production techniques commonly seen and heard in free improvisation,¹ even the conventional musical task of playing melodies or rhythms as one intends to in dialog with others demands cognitive resources. Making sound with one's own instrument or voice reduces one's ability to fully parse every sonic detail of what others play. When one listens as an improviser, to what degree is one listening to oneself and to what degree is one listening to others? Does one listen differently to oneself than others? Or do players listen to the whole ensemble, including oneself, as simply an indistinct mass of sound?

In addition to raising such questions, design approaches for virtual improvisers also pose hypotheses which answer many of the above. However, this is done only implicitly since designers tend not to comment on the relationship between what they create and the human practices their computational work represents and even supplants. As a result, it is necessary to offer an examination of the hypotheses offered on the nature of auditory perception and cognition in musical interaction through the principles which inform the design of such systems. Because these hypotheses are only implicit in how these systems are designed and then discussed by their designers in technical documentation and other publications, this chapter takes up the necessary work of interpreting these documents and locating these tacitly expressed hypotheses.

However, by no means is the validity of any of these hypotheses clear. For all their value, such hypotheses remain largely untested for two principal reasons. The first is that scholars have yet to draw a connection between the formal analysis of musical recordings and the design of these systems. Though this certainly counts as a flaw of current approaches to the study of free improvisation, there are clear practical reasons for why this is the case. Analyzing music of this kind is rather difficult, especially since the Western staff proves to be inadequate as a tool for representation. Consequently, these systems are not designed, as one might easily assume, as the result of a long process of analyzing a particular cultural practice, locating patterns, and then translating them into principles for re-generating² practice which fits the cultural conventions surrounding it. They are designed based on the conjectures of their designers. Though they are well-reasoned, these must be regarded as conjectures and it should be noted that like all conjectures, they demand further corroboration, most likely through using these conjectures as the basis for analysis of recorded performances of free improvisation.

The second reason that such hypotheses remain untested is that designers tend to refrain from subjecting these systems to the critique of human improvisers. Hence it is unclear whether such listening practices are actually effective in creating interactions these players deem aesthetically pleasing or otherwise valuable. Consequently, this chapter does not offer a decisive conclusion on the relative validity of each of these various hypotheses. Instead, this commentary

¹ See Chapter 2 of this dissertation.

² The approach described here mirrors the generativist paradigm first developed by Noam Chomsky (1965/2015) in that one starts with reasonable hypotheses about how a practice is conducted and then develops rules to describe this process of conducting practice. The production of the hypotheses or rules may not necessarily be based on an analysis of the practice so much as it may be on a reasonable, though perhaps superficial or impressionistic, conception of the structure of the practice. Thorough commentary on the relationship between how this has occurred in computer music or computational art practices generally is not possible here, though the relationship between the generativism of linguistics and the generativism of computational music practices is likely a fruitful topic of inquiry for future scholars.

is intended as a resource for future researchers in cognitive science, ethnomusicology, and related fields to more closely examine the forms of listening that improvisers engage in as well as those they find to be most useful for their particular aesthetic or interactional objectives.

The Sound of Free Improvisation: Between the Humanities and Arts-Technology

Of course, technical literature describing the design of these artificial performers of free improvisation are just one example of a range of scholarly perspectives on this practice. For the most part, commentary on free improvisation has focused on its function as a type of musical activism, particularly in the context of the African-American Civil Rights Movement (for example, Fischlin & Heble, 2004b; Fischlin et al., 2013; Robinson, 2005) and related or parallel sociopolitical movements, as well as the ways in which these movements shape the practice and meaning of free improvisation (Borgo, 2005; Steinbeck, 2010b). The predominance of this angle of analysis is logical given that a major component of the cultural roots of this practice trace back to the postwar era and its various sociopolitical upheavals, but most centrally in collective efforts to achieve racial equality in American society and its institutions. This perspective is crucial to understanding free improvisation. To miss it would be to miss a great deal of what this music means, even if many performers of the recent past do not feel a particularly strong connection to them.

Nevertheless, discussions of free improvisation from this perspective evade the question of what free improvisation is as a human practice of social interaction through sound. By contrast, designers building virtual improvisers are unable to avoid such matters. If such systems are to function as if they were fellow performers collaborating with human players just as they might with one another, then it is essential that they have an ability to listen and respond in some manner which resembles how a human improviser would do the same. Consequently, artistic research into the construction of such systems necessarily raises questions about how musicians make sense of what they hear in fellow players and the kinds of parameters of sound which matter in these practices of listening. Conversely, these are questions which one can easily sidestep if the angle of analysis focuses primarily on the relationship with issues of culture or politics and free improvisation. As the record of literature on free improvisation shows, these questions do not arise in the consideration of free improvisation as a cultural practice or political gesture.

In attempting to computationally reproduce the practices of listening which take place between improvisers, the designers of these systems exemplify a problematic and fascinating situation in the relationship between the humanities and social sciences on the one hand and the technical fields on the other. In most cases, the basic insights on the nature of an expressive arts practice like free improvisation arise in discussions within the humanities or social sciences. Such discussions are largely assumed to be the sources of questions for further investigation by scholars in disciplines more closely aligned with natural or technical sciences.

Scholarship on free improvisation demonstrates an opposite relation. While several critics have commented on the relationship between this practice and various sociocultural flows over the 20th century, it is only with the advent of systems which assume the role of human practitioners that practices of listening in interaction have been dealt with in a systematic and

productive manner. This is not to say, however, that creating artificial social interactants which assume the role of a human agent is the best and only path to a better understanding of a given sociocultural practice. There are many flaws and blindspots in how designers discuss their work. Most glaringly, there is a consistent inattention to precisely the cultural and political legacies which so strongly contributed to the development of free improvisation and precursor practices more than a half century ago, though George Lewis is a notable exception for his foregrounding of such matters in his own commentary on his work in this area (Lewis, 2000b).

Therefore, the point here is not that one approach is better than another, but rather that both contribute something that the other cannot, or at least would be less likely to. The two approaches are likely complementary and so further dialog between these two is desirable. Nevertheless, a full connection between these two angles will not be developed here, though a few brief observations may illustrate why drawing such connections would be useful. Strictly speaking, drawing these connections involves questions in two directions. The first of these deals with the question of how improvisers actually listen to one another in terms of specific parameters of sound and how players respond to these in their interactions with one another. After answering these questions of cognition and perception, one can then better understand how such practices of listening relate to the relatively more abstract ideals, like freedom or egalitarianism, which shape these interactions.

As I establish in Chapters 11, 12, and 13, it cannot be assumed that a particular listening practice necessarily has a particular relation to one of the values which inform the practice of free improvisation. For example, it is unclear what kind of experience one may have with a player, whether human or machine, engaging in pitch-based listening practices. On the one hand, some players may find this approach confining because they feel that pitch itself is a confining way of organizing music structurally. On the other, the ability to listen for pitch may allow some players to use this strategically in order to move beyond the confines of dominant pitch-based hierarchies and systems of organization like tonality. The experience is indeterminate. Even so, it is likely an experience which arises from the physical facts of how sound is understood by the system or human player and then how this player responds. A clear understanding between a particular practice of listening and the experience of a particular phenomena in sociality can only be understood when the system is subjected to the critique of human practitioners.

Pitch? Timbre?

Overall, the validity or desirability pitch-based listening is a central matter of debate in the attempt to build systems that yield an interactivity comparable to human players. For several designers (Assayag, Bloch, Chemillier, Cont, & Dubnov, 2006; Blackwell & Bentley, 2002; Collins, 2006; Lewis, 1999; Linson et al., 2015), pitch-based listening strategies form the core of how their systems parse sonic information from human improvisers. However, for numerous others (Bown, 2011; Carey, 2012; Casal & Morelli, 2007; Collins, 2008; Hsu, 2005; Mauceri & Majercik, 2017; Yee-King, 2011; Young, 2008), pitch is deemed inadequate if one is invested in the project of modeling how improvisers listen to one another.

Without further testing of these systems with active performers or the analysis of recordings of free improvisation, it is unclear which approach works more effectively or whether

a single approach would work for a broad population of improvisers. For the moment, the question of validity will be suspended in order to consider the implications of each approach to listening. When a designer chooses a particular approach to auditory feature extraction, or the parsing of audio signal for specific features (i.e., pitch or other spectral features), what theory of perception-cognition in free improvisation do they propose? More generally, what kinds of descriptive or theoretical claims about free improvisation are made through these kinds of decisions?

Free Improvisation and Timbre

The use spectral feature extraction in the perceptual layer of a virtual improviser makes several assumptions about the nature of this practice, both as a collective sound from an ensemble as well as the perceptual-cognitive nature of interactions between players. For researchers taking this approach, such systems are unlikely to succeed if they are not built with the capacity to listen for such differences and parse details of sound beyond the parameter of pitch. This general assumption is not based on a formal analysis of a large body of recordings. Instead, it appears to be rooted³ on the intuitions and subjective impressions of each designer.

Even though these designs are not built upon an analysis of a body of recordings, the notion that timbre is central to what improvisers do, both individually and in their interactions with others, is not lacking in reason. The fact that the exploration of subtle differentials in timbre are a key feature of free improvisation is readily audible from a great number of recordings of this practice over the past decades, though this would be best confirmed through a formal analysis of a large range of performances.

Starting with William Hsu (2005), researchers who design their systems to respond to a variety of timbral features accomplish a kind of technological recognition of the cultural realities of social interaction in free improvisation; namely, that improvisers are audibly fascinated with exploration of timbre and are far less interested in pitch-based structures of musical organization. They recognize, for example, that sonic techniques commonly heard in free improvisation such as a woodwind multiphonic (Borgo, 2005) become senseless when rendered simply as a cluster of pitches. They acknowledge that, for example, it is nonsense, or at least inaccurate, to comprehend the sound of a styrofoam ball scraped against a drum head in terms of its “pitch.” They accept that the sound of free improvisation, like many contemporary practices, demands spectral analysis and that the staff, as a descriptive representation, misrepresents much of the world’s music. Whether this is the rarefied elite musical culture of “spectralism” (Anderson, 2000; Harvey, 2000) or popular and non-Western music (Blake, 2012; Fales, 2005; Fales & Berger, 2005; Latartara, 2012; Schultz, 2014), free improvisation, like several other forms of music, demonstrates that the predominating pitch-based analytical approaches are frequently inappropriate.

³ Hypothetically, this work could be based on analysis. Given that this is not discussed in literature addressed here, however, it seems unlikely that it is.

A Brief Overview of Key Spectral Features

In pursuit of more relevant representation of the kinds of sounds that improvisers produce, designers of such systems have often to choose to complement or even supplant the use of pitch detection. Overall, five spectral features in particular have been widely used across these systems. These are the tone-to-noise ratio, inharmonicity, spectral flux, spectral centroid, and the mel-frequency cepstrum coefficients.⁴ Beyond the general point that including these elements in design is a recognition of audible cultural facts about free improvisation, each of these has a specific significance. The choice to include or exclude each particular feature is indicative of each designer's perspective on how interactions in free improvisation work since such choices play a major role in the system's ability to respond like a human player.

In turn, these choices are an indication of how each designer understands what it means "to respond like a human player." But what kind of "human" player is imagined in the design of these systems? Is it simply any human player? How specific are designers about clarifying for whom they intend their systems to interact with? To varying degrees, it is likely that each of the features designers use in the perceptual layer of their systems has the same consequentiality that the construction of their systems implies. However, it is unclear to what degree this may be, for whom it may be so, and why such variation may have developed across improvisers in various scenes.

Tone-to-Noise Ratio

For the tone-to-noise ratio, the terms "tone" and "noise" have very specific meanings which are distinct from how these terms may be used in everyday language. "Tone" refers to components of a sound emanating from a physical source which vibrates at a highly regular rate (e.g., a vibrating string, reeds, or pitched instruments,⁵ timpani, gongs, or other resonant percussion instruments). "Noise" emanates from sources which do not. Prototypical examples of noisy sounds include brushes played on a drum kit and voiceless consonants (e.g., "f," "s," or "sh" in English). Though other designers may use such techniques, William Hsu (2005) and Benjamin Carey (2012) both note explicitly that their systems are designed to parse this difference.⁶

Inharmonicity

Within the broad category of tone, further distinctions can be made between harmonic and inharmonic sounds. In this case, "harmonic" is more or less synonymous with the category of

⁴ See Appendix for elaboration on these features.

⁵ Pitched instruments often do produce noise, however, particularly at the moment of attack as well as when players produce "breathy" sounds.

⁶ It is possible that other designers also use this type of spectral feature differential in the perceptual layer of their system. This is also true for the other features that will be mentioned in a moment. The ambiguity arises from the fact that several designers (for example, Bown, 2011; Casal & Morelli, 2007) do not explicitly specify which features in particular their systems use. The same is true for several other spectral features discussed here.

pitch, whereas “inharmonic” sounds describe sounds in the category of tone which lack a clear, unmistakable pitch. More precisely, both harmonic and inharmonic sounds are actually a combination of individual tones at various frequencies. For harmonic sounds, the difference between one frequency and the next is nearly identical in each case, whereas inharmonic sounds feature differences between individual frequency components which are each quite different. As a result, harmonic sounds are often perceived as a single sound (despite being composed of different tones) possessing a single pitch. Inharmonic sounds, while emanating from a single source, are not perceived in this way and though their sound suggests a pitched quality, they lack a clearly perceptible single pitch.

Spectral Centroid

The spectral centroid is another commonly used feature in the design of such systems (Blackwell, 2008; Hsu, 2005; Mauceri & Majercik, 2017). Technically, the spectral centroid is the weighted mean of all individual frequency components of a given sound and can be used to classify all sounds, whether tone, noise, or some combination. In simpler terms, this is the relative “center of gravity” of the individual components of the sound. Perceptually, the spectral centroid is a rough technical description of the sensation of overall “brightness” of a particular sound. For example, notwithstanding differences in individual players, the spectral centroid is a useful descriptor for the timbral difference between the relatively “bright” sound of an oboe and the relatively “dark” sound of a French horn.

Spectral Flux

Spectral flux describes the degree of change between the spectrum of a given audio stream from moment to moment. Formally, this is the “spectral derivative.” Sounds with a low spectral flux include any sound which hardly varies in timbre from moment to moment. Prototypically this would be the sound of a single note held for a significant period of time on any pitched instrument. Almost any change in a sound results in a change of spectral flux. For pitched sounds or other tones, this includes vibrato, attacks, or changes in pitch and sometimes includes changes in volume or other changes in tone color. Noisy sounds nearly always produce significant spectral flux, though to human ears the sound itself may not sound like it changes at all.

Mel-Frequency Cepstral Coefficients

Where the spectral centroid offers a very general characterization of a given sound, mel-frequency cepstral coefficients (MFCC) are far more specific.⁷ For this reason, MFCCs are commonly used in speech recognition because they allow for an efficient means of recognizing particular phonemes in language as well as the particular speaker. The musical application of this is relatively obvious given that this is also a helpful framework for the quick recognition of a

⁷ Matthew Yee-King (2011) is the only designer who explicitly mentions this feature. Other designers who do not specify the spectral features their systems analyze may also use MFCCs but as yet this is uncertain.

particular instrument (given their typical timbral characteristics) as well as changes in the sound as produced by the player. While this kind of functionality overlaps with spectral flux and centroid, MFCCs characterize the nature of precisely what has changed in a sound, and not simply the sound has changed or to what degree.

Prevalence and Meaning of Spectral Features

The utility of these features as descriptors of free improvisational practices varies considerably. On the one hand, MFCCs, spectral centroid, and spectral flux are relevant to a broad range of improvised music because of their general utility as efficient and insightful descriptions of nearly all types of sound. On the other, the noise and inharmonicity are not particularly common across the international sonic landscape of free improvisation.

Particular Stylistic Directions

While some measure of noisiness is found in all free improvisation, much as it is in all music as well, it is considerably more common in certain subcommunities of this practice. In their use of this parameter, Hsu (2009) and Carey (2012) clarify that their systems are designed for partnership with specific improvisers⁸ and make no claims that this parameter is relevant for other players. Aside from the players they mention, the use of noise is a relatively rare phenomenon in improvised musical practices around the world. However, noise is a particularly common element of the sonic repertoire of several Berlin-based improvisers. For example, the solo performance practices of German trumpeter Axel Dörner (for example, Dörner, 2001), are known for their exploration of the trumpet's typically overlooked capabilities in the production of noisy sounds at a significant volume level. Similarly, clarinetists Kai Fagaschinski and Michael Thieke, pianist Andrea Neumann, and percussionists Sven-Åke Johansson, Michael Vorfeld, and Burkhard Beins all make extensive use of noise in their performance practices.

By and large, pitched instruments are not constructed in a manner which easily allows for the production of such sounds. Consequently, players interested using such instruments to create noisy sounds must devise techniques of their own in order to do so, particularly in order to produce noisy sounds at an adequate volume (i.e., such that they are heard within an ensemble). Herein lies a possible meaning for the use of noise. Because pitched instruments are optimally constructed for the production of pitched sounds and that they are nearly always used as such, audiences typically expect pitched sounds to emerge from these instruments in performance. The use of such instruments to generate sounds beyond what they were designed for and for which they have been customarily been used upsets this particular expectation. Within the context of a musical practice in which freedom is a central concern, the use of noise can then be understood as yet another aesthetic gesture towards a larger project of aesthetic liberation (see Beins et al., 2011).

⁸ For Hsu, these are James Fei and John Butcher. For Carey, the main partner is the designer himself as a saxophonist.

But of course, while it *can* be understood as such, noise does not always have this meaning. By no means do all improvisers in Berlin use this feature extensively as the players just mentioned. Beyond Berlin, it is relatively rare that players focus so specifically on the production of this type of sound.

So then what does it mean to build a system to parse for the presence of noise if noise is only a significant parameter for certain improvisers? It is not entirely clear. The inclusion of this parameter could mean that the system in some way privileges this style of playing and perhaps renders others less relevant. However, it could also be the case that a capability for detecting variation in the tone-to-noise ratio also allows the system to demonstrate a type of versatility in working with any type of player, regardless of their preferences for noise.

Much the same is true for inharmonicity. Compared to noise, this feature is far more commonly heard in the playing of a variety of improvisers in diverse locations. Inharmonic sounds include bowed cymbals, woodwind multiphonics, as well as a variety of other idiosyncratic sonic practices. Like noise, the production of these sounds on pitched instruments is a task that takes special effort. One must learn to devise one's own strategies for creating these sounds through a trial and error effort with one's instrument over time, though some instructional literature does describe these methods in a systematic manner (see Londeix, 2004; Weiss & Netti, 2010).

Similarly, the use of pitched instruments to create such sounds is not a type of sonic result which most audience members expect, though audiences for free improvisation and other contemporary music may very well do so. Creating these sounds with these materials is a kind of transcendence of these expectations as well as a demonstration that the assumed limits of the sonic capabilities of these instruments are somewhat illusory and cultural constructs of musical culture and history. Hence they may function, like noise, as a sound type which enacts the broader concern with various forms of freedom so central to free improvisation as a cultural practice.

As was the case for noise, a system's sensitivity to inharmonicity may not necessarily have a clear meaning. It could be that a system uses this type of parameter in order to privilege certain types of playing or it could be the case that the system uses this type of parameter in order to remain versatile and retain the ability to shift within a larger repertoire of substylistic trends within free improvisation. At present, it remains unclear how this type of machine listening approach is used or which of the two effects just described it may have for the experience of players interacting with systems where it is integrated.

General Interactional Features

Listening for noise or inharmonicity is a perceptual action which allows the system to take note of the cultural variation within free improvisation as it manifests itself within an interaction with its human interlocutor. Other types of listening used in such systems, however, have a type of general utility as a means of understanding the progress of an interaction beyond just a recognition of stylistic variance. Spectral flux, spectral centroid, and MFCCs allow a system to listen for various changes enacted by players in the course of an improvisation in a way that is not particularly specific to certain aesthetic trends in free improvisation.

The spectral centroid reduces the complexity of the audible frequency band, which stretches across nearly 22,000Hz, to just a single value. On one level, the centroid is a coarse representation of the detail of all this information. On another, this value is surprisingly useful for registering changes in timbre. For example, for a single note held for a significant period of time by a woodwind player at a constant volume, the centroid rises and falls accordingly depending upon how the player modulates their timbre. In executing multiphonics or other kinds of inharmonic sounds, musicians rarely maintain the same level of spectral centroid throughout the sound. Centroid information allows the system to register all the various changes that take place over a single sound event like a multiphonic and respond to them in whatever way the designer decides. Moreover, the centroid is particularly useful for noisy sounds since it is difficult to make distinctions between them otherwise. It allows the system to respond to how a percussionist might switch from one part of a drum kit to another when using brushes as the playing implement.

Overall, the centroid is a useful metric for simulating the kind of awareness that human players demonstrate when they take note of how another player changes their timbre. If another improviser suddenly shifts from producing sounds with a low spectral centroid to sounds in a higher range, other players often react in some way. This could be either by producing sounds with a similar brightness or by avoiding doing so in order to create a contrast between two (or more) sounds which each produce energy in different parts of the audible frequency band. Again, all this is still quite coarse in comparison to human sensitivity. The fact that two sounds may have the same spectral centroid hardly means that they may be similar in the slightest. Where human ears would easily hear such differences, the spectral centroid just registers them as 8,934Hz. Nevertheless, this tool still retains utility in parsing the direction and degree to which one player or another may have shifted the overall frequency distribution of their sound. While this falls far short of human hearing, it allows a system to demonstrate a kind of sensitivity a human being might.

Spectral flux is of comparable utility. Though this parameter may have been originally conceived of as a way of tracking changes in timbre, it proves to be a powerful means of allowing a system to listen for timing and pacing in the way its human interlocutors play. As noted above, changes in a pitched note such as vibrato, attack, release, or a change to a new note are often registered as an increase in spectral flux. To some degree, spectral flux balances the shortcomings of the spectral centroid. For example, a sound may evolve in such a way that the spectral centroid changes very little. In this case spectral flux allows for a meaningful representation of the fact that the sound has changed despite the fact that it has stayed the “same” in terms of its spectral centroid.

Because it is almost literally a representation of the amount of overall change in the sound, spectral flux is useful for allowing a system to demonstrate that it is aware of the timing and pacing of the human player. For example, in a situation where players are improvising a flurry of sonic events and changing from one idea to another quite rapidly, spectral flux allows the system to observe this fact, though a great deal of information is lost if one uses this feature alone. Conversely, spectral flux is also useful for tracking minute changes in a drone or any other type of relatively static combination of tones.

Finally, MFCCs are a sophisticated type of feature which allows a system to simulate the human capacity for recognizing one instrument or timbre within an ensemble and responding to that sound specifically. This transcends many of the inherent problems of spectral flux or the spectral centroid, particularly their inability to distinguish between specific sounds. For example, much like their application in speech recognition, MFCCs are useful for enabling the system to respond differently to one player or another. Beyond this ability to parse and recognize the difference between various players as sound sources, MFCCs are also useful for allowing the system to match the timbre of the player, this being precisely the approach used by one designer (Yee-King, 2011).

Levels of Detail and the Purpose of Listening

Of the several features described here, each presents a very different picture of the nature of human auditory perception as an active cognitive process taking place in musical interaction. On one end, features like MFCCs or noisiness present a theorization of human listening in this practice which proposes that human beings listen in a very specific manner and that their reactions are very precisely attuned to the particularities of what they hear in other players. On another, features like spectral flux and the centroid are simultaneously insightful while also offering an analysis which overlooks vast amounts of differences between two sounds.

Thus these differences mean that the act of listening itself is conceived in very different ways depending on the designer. For some designers, it appears that improvisatory interactions are imagined to be encounters in which each individual is a sponge of information, picking up every detail of another player's sound. Consider listening practices in the manner suggested by the use of MFCCs. Naturally, this assumes that a player is able to listen with this level of precision. But what does this really mean? What other cognitive processes take place while this task of listening does and how might these complicate the assumption of the level of detail implied by the MFCC? Using this feature assumes that players are able to listen with a keen level of precision while simultaneously engaged in conceiving of new musical ideals and executing them while they do so. It is not impossible that this kind of precise listening may be taking place, but again, until this kind of listening is more systematically analyzed in recordings or such systems are tested with human performers, such a theory of listening is speculative.

For others, particularly those using spectral flux or the spectral centroid, listening is imagined as a very general and vague kind of sensation. This kind of approach to machine listening suggests that improvisers do not necessarily listen all that closely to one another when they play together and that each player really only listens for a very general sense of what the rest are doing sonically. Again, the final judgment about whether this kind of listening is really what takes place in improvisers requires further investigation. Nevertheless, it appears likely that given that the tasks of composing and performing (particularly the types of technically-demanding extended techniques improvisers engage in) may interfere with the task of listening. As a result, it may be that all that improvisers really listen is just a general impression of what others are engaged in and not the kind of detailed perception suggested by MFCCs.

Each of these features demonstrates its own value in the overall goal of reproducing the kind of sensitive listening that improvisers may value. Alone, they hardly succeed in doing so

and must be used in tandem in order to simulate this goal. But what exactly is the goal? Is the goal for the system to be able to respond to the human player by matching their sound? Or is the goal for the system to comprehend what the human player produces such that it can deliberately create sounds which contrast? While designers describe what kinds of spectral features their systems may use, the issue of how they are used in order to relate to or deviate from the human performer is often unclear in their discussions of their systems. As Chapters 11, 12, and 13 illustrate, this is a deeply meaningful question and one which plays a major role in what improvisers regard as ideal conduct in musical interaction, and by proxy, their conceptions of egalitarianism and freedom in this practice.

The Case for Pitch-Based Listening

Employing spectral approaches in the design of these systems acknowledges that this particular form of improvisation is one in which the details of timbre and all its variation are critical if a system is to be able to listen in the way that many improvisers might value in a fellow player. The sound of free improvisation readily indicates that its performers are mostly ambivalent about pitch-based structures of musical organization like tonality and even the use of pitched material itself (see Beins et al., 2011), though a systematic analysis of recordings would reveal more precisely if this is the case. Given this kind of sonic profile, in which pitch seems so irrelevant as a way of comprehending what takes place and the exploration of timbral variety takes precedent, the parameter of pitch seems to be a rather poor choice when building an artificial improviser.

But is it really the case that pitch-based approaches are inherently inadequate? For numerous designers (Assayag et al., 2006; Blackwell & Bentley, 2002; Collins, 2006; Lewis, 1999), pitch-based listening is regarded as a sufficient means of allowing the system to listen like a human player. So then why is this the case? Is it simply that they have failed to comprehend what free improvisation is? What compels them to make this choice? What questions about free improvisation does this kind of design choice raise?

As German musicologist Ekkehard Jost carefully notes (Jost, 1974/1981), the development of free improvisation from jazz is a gradual progress of opening the boundaries of tonal harmony. While convention harmonic forms may have been jettisoned, pitched sounds still remained, at least at the time of Jost's analysis, an important feature of free improvisation. In contemporary practice, one frequently finds performers of free improvisation who regularly form using pitch material, including in the scene of Berlin-based musicians mentioned above. Even for players whose stylistic directions feature the kind of timbral variation which would be well-suited for the various spectrally-oriented approaches taken by several designers, many of these individuals still regularly use pitch as a meaningful structure in their performances. Accordingly, several systems employ pitch as the sole basis for the system's understanding of the sonic practices of the human beings they engage with.

The continual importance of pitch-based playing aside, the common criticism of pitch-based approaches is that they are largely inaccurate. This criticism arises both in discussions of how well a pitch-detection algorithm (PDA) is able to parse sonic material for which pitch is

unclear as well as for sounds with a more or less identifiable pitch.⁹ As William Hsu notes, PDAs like the widely used [fiddle~]¹⁰ object in Max/MSP (Puckette, Apel, & Zicarelli, 1998)

can be rather unreliable near the attacks and decays of a tone. The pitch and partial estimations are also less usable when the saxophone tone itself is noisy or has a complex and changing spectrum (Hsu, 2005, p. 3).

Of course, attacks and decays are very common features in almost any kind of musical practice in which pitched sounds are common, to say nothing of the substantial timbral variation of free improvisation. Moreover, Hsu notes further problems “when the saxophone tone itself is noisy or has a complex and changing spectrum.” At least for the saxophone, the tone of this instrument is noisy and has a complex and changing spectrum in how it has been played by a variety of musicians across numerous genres; such a comment, therefore, applies to the saxophone generally and not simply its use in free improvisation. Even when saxophonists in this practice play with a clearly pitched sound,¹¹ it is highly probable that Hsu’s comment still applies.

Beyond pitch, PDAs do indeed, as Hsu and others comment, fail to properly capture and describe what happens in this form of music making—due to its extensive timbral variation. Save for the most oblique indications, PDAs are best suited for analyzing pitched input, and even then major reliability issues linger. Nevertheless, PDAs will provide a pitch estimate for any input, regardless of whether these sounds actually have a pitch or not. As the designers of the [fiddle~] object in Max/MSP state, the algorithm always estimates pitch, “even when no pitch is present” (Puckette et al., 1998, p. 2).

Clearly, a PDA does not report the “pitch” of such material. In fact, it is nonsensical to say that what the PDA actually reports for such material can even be considered pitch at all. Be that as it may, the question remains: if the PDA does not report “pitch” for such sounds, then what is it actually reporting? Hsu’s critique of PDAs already offers answers. Pitch detection is a significant component of how his *London* system detects noisiness in the incoming audio stream. “Noise usually results in an extremely unstable pitch estimate from a pitch tracker like [fiddle~]” (Hsu, 2005, p. 3).

While PDAs are designed for analyzing pitch, this does not mean that they simply fail react changes in timbre. In addition to actual pitches and their changes, PDAs also react to a variety of timbral features and their variation over time. For example, similar to Hsu’s observations regarding the PDA’s response to noise, estimated pitch also fluctuates rapidly for various types of inharmonic sounds.¹² Though this falls short of being a scientifically-useful

⁹ This is in the sense that a human listeners trained to parse pitch according to one of many tuning systems would concur on the pitch of a particular sound independently.

¹⁰ This algorithm is more or less identical with the structure of another PDA, Tristan Jehan’s [pitch~] (2001).

¹¹ Again, this is in the sense that multiple listeners would be able to independently identify the same pitch for a given sound.

¹² For observations about timbral features and how a PDA registers them, see the Appendix for a more thorough quantitative analysis.

method of description, it illustrates how a PDA can be used as an indirect index of the presence of inharmonicity or noise.

Building on Hsu's observations about how PDAs respond to noise, PDAs actually give more meaningful information than just indications of the presence or lack of noise. In general, noisy sounds vary in terms of the width of the audible frequency band they cover as well as what section. Besides just causing rapid fluctuations in the estimated pitch, the PDA also tracks, albeit crudely, the rise and fall of a narrow band of noise. Thereby, PDAs provide information which is relevant to how a human listener would similarly register the movement of a band of noise across the audible range. Similarly, for time-varying timbres in the category of tone, PDAs also track the changes in the nature of the sound in a way which mirrors the movement of the spectral centroid for the same sound. For example, for a woodwind multiphonic, a broad category of sound which tends to vary from start to finish, PDAs register changes in this sound which correlate to similar changes as they would be registered by an algorithm detecting spectral flux or changes in the spectral centroid.

From a scientific or technical standpoint, the information provided by the PDA is either completely irrelevant to timbrally-complex sounds or simply nonsense. While this is true, is the goal of designing such a system, or otherwise musicking about free improvisation, really a scientific or technical one? Even though what the PDA provides may be nonsense from a rationalist perspective, it provides several advantages for a designer interested in pursuing creative, rather than purely technical or scientific, goals. To adopt Michael Young's apt theorization of the goals of creating such systems (Young, 2008), the PDA is a quick path to enabling the system to demonstrate both "intimacy" and "opacity" in its interactions with a human improviser. In Young's conceptual framework, "intimacy" refers to the system's ability to be keenly aware of what another player does in just the same way that a fastidious human improviser might. Too much intimacy, however, can produce a sense of predictability. Therefore, the system must also demonstrate a sense of "opacity," in that the human player cannot readily predict just how the system will respond, a quality which is also often valued between human improvisers.

Whereas Young proposes various strategies for pursuing intimacy or opacity by developing algorithms which actively promote such experiences, the PDA presents a pathway to intimacy and opacity without any additional programming. Like any algorithm, the PDA faithfully and consistently processes information the same way, regardless of what it is set to analyze. It does not ignore any kind of sonic information unless the designer devises some sort of contrivance for filtering audio signal before a PDA analyzes it. Even if the PDA's pitch estimate for unpitched sound is nonsense — which it truly is — the PDA provides the same nonsense each time. That is, the pitch estimate is an intimate reflection of the details of the audible frequency band as they are sent to the PDA and then analyzed. At the same time, this estimate is opaque in the sense that a human being cannot readily predict what the PDA will parse from a sound lacking a clear pitch. Hypothetically, a player might learn to predict how the PDA may respond, but this is highly unlikely given that the player would need to spend an inordinate amount of time learning the patterns of a PDA's pitch estimates for a variety of unpitched sounds.

As was the case for noise or inharmonicity, the use of pitch-based listening strategies may imply that the designer intends for the system to collaborate with improvisers whose playing leans in this direction. For the most part, however, this is not the case and several of the improvisers who work with such systems regularly explore timbral variation. For example, in addition to the designer himself, George Lewis' *Voyager* has performed with a variety of improvisers whose playing style frequently explores timbral variety such as saxophonists Douglas Ewart, Roscoe Mitchell, Evan Parker, and J.D. Parran (Lewis, 2000b). Adam Linson's *Odessa* has improvised with trumpeter Peter Evans, cellist Okkyung Lee, vocalist Ute Wasserman, as well as Evan Parker (Linson, 2014). If pitch-based approaches are prone to the aberrations described just a moment ago when parsing unpitched material, then it's nearly certain that what *Voyager* and *Odessa* work with is the PDA's rather idiosyncratic account of the timbral variation of the players these systems improvise with. Though neither designer acknowledges this explicitly, Lewis' witty comment that the pitch detector is "a device known to exercise its own creative options from time to time" (Lewis, 1999, p. 103) is likely an oblique reference to the bizarre way a PDA interprets timbral variation.

Beyond the issue of how pitch may be either ill-suited or accidentally advantageous for creating an artificial improviser, this form of machine listening, like others, poses an implicit theory of perception and cognition for human interaction through sound in free improvisation. Using pitch-based listening approaches in creating such systems implicitly proposes that improvisers either listen for pitch or that their listening practices directed towards timbre are influenced by an approach to listening to pitch. In the case of pitched playing, it is likely that improvisers do listen for pitch, though in the absence of perfect pitch it is unclear how precise this mode of listening would be. For unpitched playing, this suggests that pitch-based listening somehow alters the way a player would listen and respond to timbral features, though it is unclear how or why this would be the case.

But the most crucial implication of using pitch-based listening in such systems is that it implies, regardless of the feature in question, either that precise listening between players is by no means a necessary or desirable mode of engagement or that it is uncommon for improvisers to listen with a great deal of detail. In a more modest sense, it suggests that it is socially or aesthetically acceptable for one player to fail to have a precise grasp of what another player has just created. In another more provocative sense, it suggests that misperceptions between players are actually far more creatively valuable than it would seem from the purely rational conceit that such interactions must be based on each player's clear comprehension of what takes place in the encounter.

Listening to Who, Exactly?

The foregoing analysis has largely assumed, just as designers have, that the system listens to the human player and that this listening takes place without any interference from the system's own audio output. Considering that such systems are built to assume the role of a human player, their design assumes, therefore, that it is both common and preferable for a human improviser to listen to other players and minimize their attentiveness to the sonic results of their own action. This kind of thinking suggests that an improviser does not need to consider or monitor the sound of

their own playing once they have decided to take a certain direction in their playing. Instead, an improviser strives to refrain from listening to themselves in order to maximize their ability to pay attention to others.

But to what degree is this really possible or desirable for human improvisers? The assumption that the system or a human improviser listens in this way is quite implausible when one considers the common practices of free improvisation. Aside from recent experiments with telematic performance (see Robinson, 2016), improvisers play with one another in the same room. In this situation, it is nearly impossible for one player to not hear themselves and solely listen to what other players create. Listening in free improvisation, just as it is in almost any kind of co-present musical performance practice (Keller, 2001), is inevitably divided between the attention one can give to oneself and the attention one gives to others. While a player can actively attempt to focus their attention on either themselves, one of their collaborators, or some combination thereof, they can never fully tune out what they hear from one player or another, including themselves.

Of course, it is certainly possible to employ various contrivances in order to ensure that the system listens to the player, the player listens to the system, and that neither part of this dyad listens to itself. In one extreme solution, one could put the human player in an isolation booth and allow them to listen to the system through headphones, thereby eliminating the possibility that the system would receive sound signal from anything other than the human performer. A similar setup was employed in the premier of Nick Collins' *Free Improvisation Simulation* system (Collins, 2006), for which the system's output was delivered to the performer via headphones and then relayed to the audience through additional speakers. While source separation is technically quite feasible, the cognitive model of listening and interaction in free improvisation that such contrivances assume is out of order with what improvisers themselves do and prefer to do. For example, Adam Linson (Linson, 2014, p. 74) notes that allowing the human player to listen to the system through headphones to ensure system output does not feed back into the microphone for the player is inherently undesirable because it creates a situation which does not resemble a typical free improvisation.¹³

It would seem, though, that headphones are not the only solution and that it ought to be possible to prevent the system's input from receiving system output by simply placing the performer and system's speakers at a sufficient distance from one another. Unfortunately, this solution creates a new problem. If the human player's microphone is far enough from the speakers in order to prevent feedback, then this also means that the human performer is far enough from the speakers that they cannot really hear them. Effectively, this reduces the possibility of the performer experiencing an interaction with the system.

To solve this new problem, it is also possible that one could then reduce the distance between the human player and the system's output in order to allow the player to properly hear the system's output just as most improvisers would want to hear their collaborators as the performance takes place. Yet again, this leads to new problems. Allowing the human performer to improvise with the system at this reduced distance also means that the system's output

¹³ However, it is not clear whether this is a result of his own intuitions or the critiques of his system by the improvisers he worked with in his study.

inevitably feeds back into the system's input microphone, originally intended to only receive audio signal from the human player.

The set of problems outlined above affect all systems described here. Nevertheless, besides my own work on Maxine (see Banerji, 2016), Adam Linson and Nicholas Collins are the only other designers to openly recognize such problems. For certain instruments, Linson recognizes (2014, p. 74) that for certain instruments, one can use pickups which directly adhere to the instrument and thereby reduce the possibility of feedback. As Linson notes, for a cello, guitar, or bassoon, pickups are "largely impervious" to feedback. Be that as it may, extreme volume levels from the system, which Linson notes are a common occurrence for his *Odessa* system, can still cause enough resonance that pickups receive some interference from the system's output.

For systems of this kind, one has two options. The first is to create a clear separation between the system's output and input. Unfortunately, this separation means the whole scenario will be mostly irrelevant and alien to how improvisers actually engage with one another. The second is to accept that it is impossible to create a situation that resembles a real encounter between improvisers without avoiding feedback from the system's output to input. While the second scenario fails to avoid feedback, it is the one which is unquestionably more relevant and accurate in its depiction of what it is to create music with another human being in this practice. One hears the sound of their playing as it emerges from their instrument and voice, passing through the air medium to one's ears as one plays in the same space with the other player. This fact of co-presence is essential in any performance of free improvisation.¹⁴

Whether one uses pickups (where possible), an isolation booth, or physically separates the performer and the system's output, there are several possibilities for preventing or reducing feedback. But are any of these really desirable if one aims to recreate the experience of making music with another player? In other words, do improvisers really listen to each other in this way? Does a saxophonist listen to a drummer without also listening to the sound of their saxophone? Can one player really listen to the rest without also hearing themselves? These are empirical questions which cannot be answered through the theoretical commentary offered here.

A great deal of cognitive scientific thinking suggests that it is impossible for improvisers to listen to each other in the way that physical setups which reduce feedback would suggest. Generally speaking, this phenomenon is referred to as "monitoring," or the awareness that one has of what one says or does as it happens (Levelt, 1983). Monitoring is a basic feature of most human actions, whether these take place in a social interaction or not. One generally attempts to ensure that one's actions are more or less in accordance with one's intentions. On the cognitive level, monitoring is what allows an individual to make corrections where necessary or feasible. In almost any kind of collaborative performance, the ability to hear oneself and engage in monitoring is essential (Loehr, Kourtis, Vesper, Sebanz, & Knoblich, 2013).

One might argue that the system already "monitors" itself because the system can use information about what it plans to execute (i.e., MIDI or other sound control protocols) or even what it will execute (i.e., the audio stream traveling from an audio interface to the speaker) to

¹⁴ This is a descriptive claim based on my extensive fieldwork as a performer in this practice. That is, it is not a normative claim that this is how this practice should always be conducted.

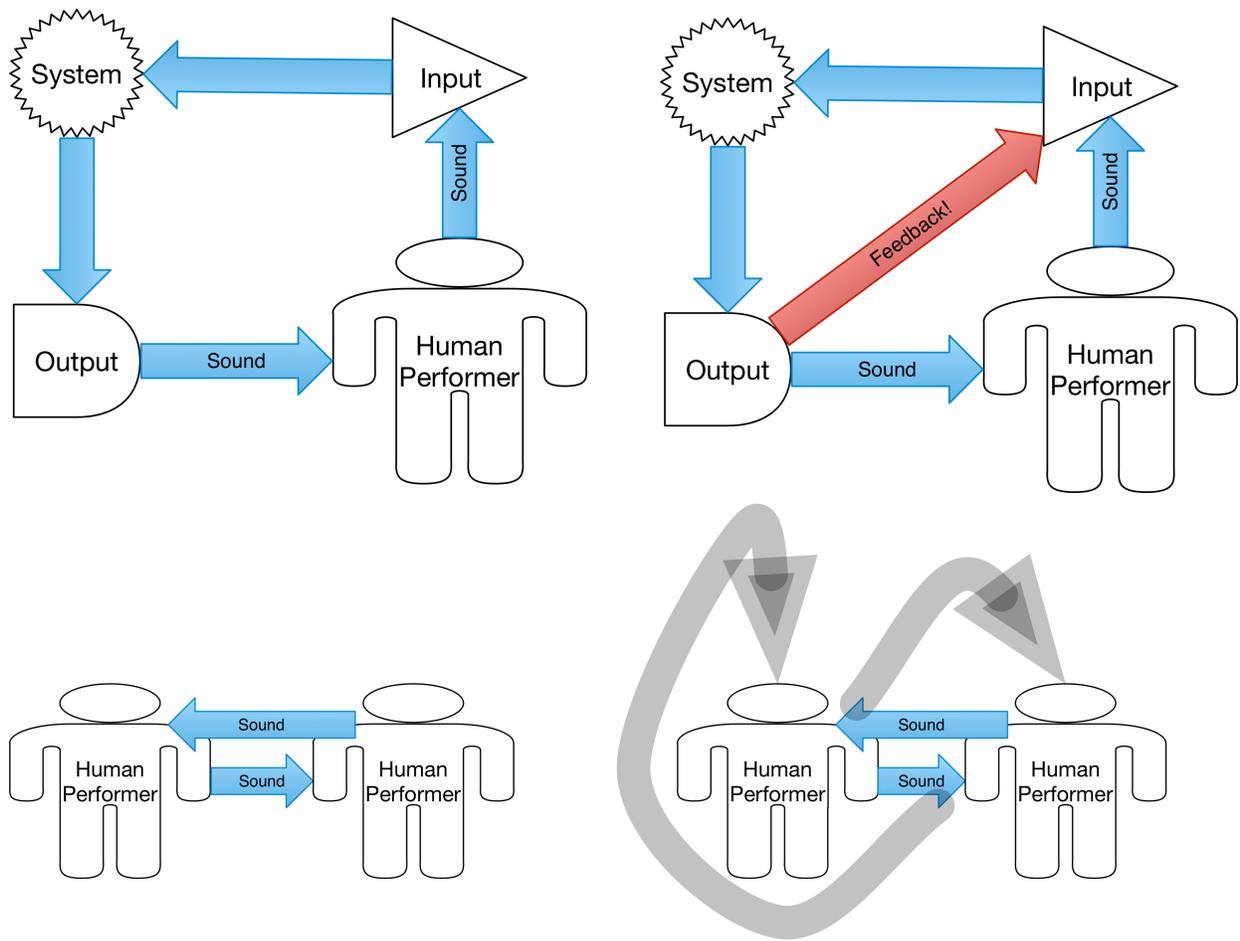


Figure 1. Models of Sonic Flow and Listening.

Images on the left depict the flow of sound and information implied by most designers, which suggests that neither human nor machine improvisers listen to themselves. Images on the right illustrate the more likely scenario, in which self-monitoring and feedback are integral and unavoidable. Gray arrows in bottom right image represent self-monitoring.

accomplish the task of monitoring. But are these streams of information and audio signal the same as what happens in the physical world? Raw MIDI data within a system of this kind does not reflect the sound which emerges from the loudspeaker, to say nothing of how it then travels through the physical space. Even if one allows the system to “listen” internally to itself by allowing it to analyze the audio signal sent to the loudspeakers before it is actually turned into physical sound, this signal itself is also not the same as what emerges from the speakers and travels through the air. Whereas most designers imply that the system does not listen or respond to its own output, it is unlikely that the system avoids doing so in actual performance practice,

particularly if the designer seeks to recreate the conditions necessary for the system and player to be interact as collaborative duo partners (see Figure 1).

Precisionist and Generalist Stances

The question of whether improvisers listen to the group as an undifferentiated sound mass or whether they listen and respond to each player as an individual raises the question of how precise improvisers' listening practices really are. Across this group of designers, opinions on this matter vary from the view that improvisers recall and respond to a great level of detail to the view that detail is less important than the general shape of things. Moreover, opinions about the importance of detail vary in their manifestation and range from claims about what parameters of sound improvisers listen for to the question of whether improvisers listen to each player individually or to the group as a whole.

For the designers who err on the side of precision, hypotheses about the particular parameters of sound improvisers listen for vary. In Gerard Assayag's *OMAX* project, the design of the system presents the hypothesis that improvisers glean a great deal of information about pitch from one another. This view informs system design to the point that *OMAX* stores and analyzes nearly every single datum of pitch and duration is used as the basis of the system's behavior (Assayag et al., 2006; Assayag, Bloch, Cont, & Dubnov, 2010; Assayag & Dubnov, 2004). It is worth pausing over what this implies about the perceptual prowess of the average improviser. Though Assayag and his collaborators hardly describe their project as such, the design of *OMAX* flatters the listening skills of the average improviser and purports that not one detail of pitch or rhythm escapes their ears, even when they are engaged in the equally cognitively-demanding task of producing complex musical structures spontaneously. Likewise, other systems take this precisionist view of the listening skills of improvisers as well, but with regard to features other than pitch (Bown, 2011; Carey, 2012; Casal & Morelli, 2007; Yee-King, 2011).

Overall, this precisionist stance makes two possible moves in terms of offering a representation of human practices of listening in musical interactions between free improvisers. On the one hand, one form of this precisionism aims for transcendence. This view disregards the burden of accepting the human limits of listening in favor of exploiting the capability of a computer to transcend such constraints. Given that the average human improviser is likely to have a record of sonic events which is inevitably less faithful and precise than a computer, these designers view the machine's superior capacities as an asset for transcending human error. Rather than reproducing what human beings do, this view aims to create a superior performance, or perhaps more generously, merely a strong model of the way things ought to be in human interaction presented in the form of an artificial musician. On the other hand, precisionism may be less about transcendence and still be firmly rooted in offering an accurate representation of what human beings do. In this regard, precisionism is flattering and assumes that what human improvisers do is indeed quite a marvel in terms of perceptual acumen. It asserts that improvisers perceive and recall a great deal of what they hear and that this level of precision is both what they tend to do and expect others to do.

But as has been the case for so many aspects of how such systems are designed, several researchers in this area implicitly challenge both the transcendent and representationalist stances of precisionism. For these researchers, it is less important for a human or machine improviser to be keenly aware of every single detail of their interlocutor's actions and more useful to operate with general understandings of what others are doing. The first articulations of this view appear before Lewis' first essays on this kind of system through Joel Chadabe's elicitation of Lewis' perspective on these matters (Chadabe, 1997, pp. 299-301). Offering an account of his working theory on the cognitive science of free improvisation, Lewis asserts that:

In performance, musical decision-making is much more immediate than it is in traditional composing. Many snap judgments are made. Some kind of context control is necessary, and I'm trying to help my machines understand musical context. Since good improvisers can't listen to everything, they have to keep track of the context in which they place the sounds they're making and hearing (Lewis, qtd. in Chadabe, 1997, p. 300).

Later on:

You don't need or want an exhaustive transcription, but instead a fast, general analysis of what's happening at any given moment and what's been happening. This requires massive, but musically important, data reductions (ibid.).

In a short passage, Lewis suggests quite a lot about the nature of cognition in this practice. Though it is unclear why such generality is what one might "need or want," it is likely that this refers to the limitations of human cognitive resources that are frequently confronted and problematized by the task of improvisation with others. While Assayag's systems exploit what computers can do to parse tremendous amounts of details, mere mortals find improvisation more burdensome. Improvisers might prefer to have a keen grasp of what all other players are doing at a given time, but since they are also charged with other cognitively demanding tasks, this perceptual expenditure must be economized, hence Lewis' assertion that even the best players simply "can't listen to everything."

In terms of more practical approaches to generalism, Lewis clarifies this matter to Chadabe just a moment later in the same text: "My big thing is averages" (Chadabe, 1997, p. 301). Similarly, averaging is a key approach to the actual design of Voyager. In that system, averages of various pitch-related variables are taken over time such as the average duration of a note or the average interval distance between individual notes (Lewis, 2000b, p. 35). Additionally, these two essays on Voyager clarify the particular approach to averaging and specify that these averages are obtained not for the entirety of a given interaction. Instead, averages are taken for the last five to seven seconds of data. This allows the system to react to the current performance conditions while not necessarily reacting to every single detail of what happens.

Though it takes a very different approach to the issue of which details of sound to extract from the incoming audio stream, William Hsu's systems also work extensively with a similar

kind of running average approach. Over several iterations of his systems, Hsu has experimented with the length of these averages because of the inherent trade-off between responsiveness and independence resulting from the window size of the running average (compare Hsu, 2005, 2007, 2008, 2010). Perhaps as a kind of concession to the precisionist approach, Michael Young's systems (Young, 2008) make use of both running averages but also use the standard deviation of the same data set as an extra piece of metadata. The average¹⁵ (like the spectral centroid) simultaneously captures the nature of the data set while also erasing much of its detail. The standard deviation, on the other hand, allows the system to understand not only the average, but also the nature of the highs and lows of the set itself. In any case, the calculation of standard deviations and average represents a very different approach to the problem of handling the overflow of detail that results from any kind of audio feature extraction than that which is advocated by those adopting a more precisionist view.

There are two basic aspects of this generalist approach. On one level, generalism is driven by a sense of pragmatics and efficiency, akin to what Adam Linson calls the approach of "parsimonious computing" (Linson, Dobbyn, & Laney, 2013). In this view, the aim is not to exploit the maximum possible complexity in design, but to start from what is most efficient and computationally lightweight and exploit the maximum of its possibilities. On another level, however, the generalist approach is, as with precisionism, driven by a sense of representationalism and desire to make machines do what human beings do in the manner that they do it. Though it is often unclear which motive most informs how these designers find their way to the generalist approach, Lewis' comments quoted above suggest that a sense of representationalism leads these researchers to work towards allowing their systems to acquire broad rather than narrow and detailed understandings of their sonic environments.

Greater fidelity between spectral representations and the details of what improvisers do may indeed be the scientifically-grounded and rational approach to design in this case. All the same, to what degree is it productive to approach the matter of creativity in this scientific manner? On this point, George Lewis offers a general statement about scientism in such domains:

Avoiding scientism on the one hand and anthropomorphism on the other, I don't feel the need to "scientifically" prove the validity of any process I use to get my music to sound the way I want it to sound. I feel utterly free to work in an intuitive way while programming computers to create improvisations. This necessary combination of the utterly logical and completely intuitive is what attracts me to this kind of work. The aim is to present a glimpse into one way that such pieces might be constructed, not to show how it must be done, or to aver that this program "proves" that this is the way we think about or hear music (Lewis, 1999, p. 110).

Beyond the issue of specific parameters of sound, precisionist and generalist stances are also relevant to the question of whether improvisers listen to themselves as just another part of a

¹⁵ See the next chapter for further discussion.

group sound or whether they listen to each player as an individual. For precisionists, improvisers are thought to listen and interact with each other member of the group in a distinct manner. Those taking this view propose that clear source separation is essential for the design of such systems because human beings readily make clear distinctions between what various other players contribute to the group sound. For generalists, however, such distinctions are not important. Players need not clearly distinguish between who they are interacting with when responding. They simply respond to whatever they hear, regardless of its source. Unlike the distinctions drawn above in how precisionists and generalists think about the importance of various parameters of sound, precisionist and generalist stances about the target of listening are more difficult to understand given that very few designers openly discuss this issue despite its ubiquitous relevance across this body of work.

From Conjectures to Analysis

Ultimately, every feature in how these systems are built to listen like a human player is simply a hypothesis waiting to be tested. As suggested previously, further clarification about the validity of these hypotheses may be pursued through two basic methods. In one approach, a designer can investigate how accurate or functional these various approaches to listening are by subjecting their systems to the critique of human improvisers. This approach has already occurred to several designers involved in this work, though the orientation of this work is less to learn about human cognition and more to simply verify if a system achieved its design goals (see Linson et al., 2015, for an important exception).

Another approach for examining these hypotheses would be through the analysis of recordings. For various reasons, this approach has been hardly attempted. Where it has, analyses have focused on pitch-based phenomena (Block, 1990; Westendorf, 1995). The design of these systems presents a range of hypotheses about the pragmatic consequence of timbral shifts in the course of free improvisation. This work suggests a variety of questions which can be fruitfully pursued through further analysis. For example, if a designer suggests that the tone-to-noise ratio is an important element in how improvisers respond to one another, then do shifts in the tone-to-noise ratio reveal themselves to be consequential when one analyzes a recording of free improvisation? How do players respond to changes in this parameter? How widely do such responses vary? How prevalent is noise?

Taking these systems as hypotheses, a variety of similar questions can be developed in order to better guide analysis. To what degree does one player's change in inharmonicity lead others to respond to this parameter? How do such interactional exchanges vary between various configurations of players? What happens when there is a change in the spectral centroid? Do players try to move towards the same centroid? Or do they try to diverge? How prevalent is pitch, despite the proposals that it is a less important feature of free improvisation (Hsu, 2005)? For every proposal that a particular feature or approach to listening is active in free improvisation, as expressed in the design of these systems, there is a corresponding question which can be used to guide the analysis of a recording.

While these hypotheses enable analysis by providing specific questions, several challenges remain. One's audition of a recording is a vantage point that none of the performers

themselves possess since their perspective as individual actors differs from the third-person vantage point of a recording. By contrast, the design of these systems typically propose hypotheses about how individual players listen and respond. A recording can never give an accurate depiction of what the performers themselves heard; it only offers a representation of what an audience member or recording engineer did.

Hence there is a notable mismatch between what a recording allows one to observe and what the design of these systems suggest. Human beings are easily able to accomplish what psychologist Albert Bregman called “stream segregation” (see Bregman, 1994),¹⁶ or the ability to hear multiple sources simultaneously and despite this easily distinguish between various instruments or voices. Unfortunately, no engineer has successfully devised a method for doing this with digital audio signals the way that human beings do this almost effortlessly. Unless sources are already separated in whatever digital audio file one uses to analyze a recording (for example, with one player panned to right or left channels), one can only examine the spectral features of the group’s collective sound rather than that of each player.

Nevertheless, the hypotheses proposed by these systems about how listening occurs are still valuable for analysis. For example, if the ensemble’s collective sound suddenly becomes more inharmonic, then was it only certain players who contributed to this or did all make this sonic shift together? Strictly speaking, analyzing the recording does not allow a specific answer to this question because one cannot separate the contributions of each player to a change in spectral centroid or the tone-to-noise ratio. All the same, one can still use an indicator of this kind in order to examine — with one’s ears, for better or worse — what happens when such shifts take place and how they may have been consequential for the subsequent progress of the interaction.

¹⁶ Film and sound theorist Michel Chion refers to this as “causal listening” (1994) in the sense that this mode of listening is oriented towards determining who or what was the cause of a particular sound.

Chapter 8: Form and Interpersonal Adaptation in Free Improvisation

As the last chapter demonstrated, aside from agreements about the basic parameters and requirements for the design of a virtual free improviser, researchers in this domain have explored a broad range of approaches to designing the system's perceptual abilities to respond to other players in musical interaction. These not only demonstrate various approaches to the design of a virtual musician, but also constitute a set of hypotheses about how musicians listen to one another and which parameters of sound are most significant in this kind of musical interaction. Similarly, while remaining true to the basic points of agreement about the construction of such a system, designers also indicate numerous divergent viewpoints on two other key issues in computationally reproducing how spontaneous composition and musical interaction occur in free improvisation. The first of these is the question of the relative importance of form as a musical structure in free improvisation. Views on this issue range from the perspective that form is irrelevant to free improvisation, given its open-ended nature, to the view that form is a frequent result of how improvisers interact with one another and that it is therefore essential that systems be built to collaboratively produce form spontaneously with other musicians.

The second issue is the question of whether and in what manner performers of free improvisation expect their collaborators to adapt to their playing. On this issue, views range from the stance that players expect fellow musicians to adapt to their playing both during one interaction as well as over several interactions to the contrarian view that adapting to other players is less important than staying true to one's own artistic personality. But again, as was the case for the practice of listening in musical interaction, the claims advanced through the design of these systems are ultimately mere hypotheses which require further testing. Implicitly articulated in these systems, these hypotheses should not be taken at face value; rather, they require further investigation, either through the analytical methods of music theory or through a human-computer interaction approach in order to see which approaches to design are deemed most appropriate by human musical practitioners. Despite this caveat, there are several ways that the design of these systems offers a means of advancing the examination of musical structure and social practice in free improvisation, which would likely be more cumbersome if approached through traditional methods for analyzing music.

States, Motives, Linearity, and Formlessness: The Issue of Form

In his 1999 essay on *Voyager*, Lewis notes that his intention in designing the system was to enable it to work with a human performer in order to take what he calls a "state-based" as opposed to a "motive-based" approach to form in free improvisation (Lewis, 1999, p. 105). In performances taking a state-based approach to improvisation, ensemble members tend to focus on a particular musical idea (however that may be construed) for a period of time. Lingering in this "state," the performers confine the latitude of their options significantly. This allows for contrasts within a smaller range of sounds or musical structures to be heard as the players commit, however briefly, to exploring the possibilities of a temporarily reduced palette. As Lewis writes, this form of improvisation emphasizes prolonged exploration of a single idea for a period of time "over moments of linear development" (*ibid.*).

By contrast, motive-based approaches often seize upon a single theme or identifiable cell that is used as the basis of the improvisation. This motive may be modified in various ways, almost to the point that seemingly unrelated musical ideas are produced. Nevertheless, the motif forms the root of these explorations. Though Lewis refers to states and motives as the two primary ways that improvisers deal with the concept of musical form, his mention of “linear development” suggests that this constitutes a third approach to the issue of how the overall structure of an improvisation does or should change over time. In an improvisation in which the ensemble is oriented towards a sense of linear development, the piece can be said to slowly evolve. No major shifts occur and from an analytical standpoint it is less easy to cleave the performance into distinguishable sections than it is to think of its entirety as a process of gradual change from start to finish. Finally, beyond the three categories Lewis suggests, an additional approach seems to eschew form entirely. In this case, performers do not engage in sustained explorations of a reduced range of possibilities for a time (or states), they do not work with themes as an anchor for their deviations, and they do not proceed to produce a piece of music that evolves from beginning to end. Instead, improvisers following this approach often deploy distinct musical ideas in rapid succession that do not have any immediately obvious sonic or structural resemblance to them avoiding a sense of coherence.

Among these approaches to the issue of form, Lewis suggests that for free improvisers state-based approaches are more common than those based on motives. Drawing on some observations by improviser and composer Cornelius Cardew (1971) as well as the theoretical work of improviser Tom Nunn (1998), David Borgo on this issue also notes that sections of an improvisation are often defined very similarly to what Lewis describes as “states,” though he instead prefers the term “phase” (Borgo, 2005, pp. 69-74). John Zorn’s game piece “Cobra” (1984, 1991) takes a similar approach by allowing players to create sharp cuts in the form of the piece and clear distinctions between one section and another. In the case of Lewis’ discussion of states, however, what he refers to differs from the musical practices developed by Zorn and Cardew in that there is no explicit coordination of state changes. State changes occur spontaneously and without any gesture (i.e., a conductor or fellow improviser’s physical movements to indicate musical directions) that would unambiguously request a state change. As Lewis points out in response to AI researcher Rodney Brooks, improvisers do not tend to interact through visual cues passed and received from player to player (see Lewis, 2007). Naturally, because of the lack of explicit coordination, state changes are not always clear transitions in practice, with some players often lingering in a previous state while others have already moved on.

In line with these views, Lewis’ Voyager system encodes state-based thinking by attempting to make assessments about the player’s current state at regular intervals. As he outlines in his 2000 article on the subject, Voyager uses a sub-routine called “setphrasebehavior” (Lewis, 2000b, p. 35). This sub-routine works with pitch and timing data extracted from the incoming audio stream from the human performer in order to create statistical representations of the performer’s current playing state. Voyager uses pitch data to estimate the relative probability or frequency of certain pitches, their range, average intervallic distances. In the temporal realm, the system creates a table of averages for the duration between note or event onsets, the duration of moments of inactivity from the performer, average event durations, their

relative volume, and so on. All this information taken together creates a robust strategy for making determinations about the nature of the player's current state: is it full of short durations? Are smaller intervallic distances favored over larger ones? Are certain pitches being used more often than others? Is this a loud section of the piece?

The system queries the data produced from the human performer's playing in order to make adjustments to its own current playing protocol. It does so at semi-regular intervals ranging from five to seven seconds. However, though the system has a built-in protocol which sets it to query this data at this interval range, it does not mean that at the conclusion of each interval the playing strategy of the system will be changed. This protocol merely establishes that the system will determine whether the current state has changed or not. As is audible on the commercially-released recording of Voyager (Lewis, 1993), the system clearly remains in states for far longer than this minimal re-evaluation window as does the human performer.

State-Based Systems

State-based strategies similar to Lewis' have also driven the programming work of several other designers of like systems. For example, William Hsu's ARHS (Adaptive Real-time Hierarchical Self-Monitoring) system is designed to use machine listening to make judgments about the current performance state of the human performer (Hsu, 2008). Unlike Lewis' system, Hsu's system extracts a variety of timbral characteristics from the human performer's sound output. Still, like Voyager, the ARHS system seeks to determine the player's current performance state (or "mode" as Hsu prefers to call it) by first extracting metadata from the performers and then producing running averages of this data in a given time window.

Hsu's first system, London (2005, 2007), had also been designed to use running averages of performer data over 20 milliseconds to two seconds (depending on the data being averaged) as well as to take a more "phrase-oriented" approach to sound output (Hsu, 2006). However, in Hsu's experience, these time windows "seemed both too long and too short" (Hsu, 2008, p. 3) for giving the system the ability to simulate the temporary commitment that a human player exhibits when they engage in a particular "state," as Lewis describes it. While the earlier London system used a shorter window of two seconds, the more recent ARHS system works with two time windows. In order to improve the sense of immediate responsiveness in the system's behavior, Hsu uses a shorter one second window to allow the system to respond to "potential trigger events," or sonic actions which would be likely to spur an improviser to respond almost instantaneously (e.g., hard hits, sharp changes of sound quality, etc.). Alongside this shorter window, this second system also use a longer eight second window in order for the system to create a more audible sense of occupying a performance state and sticking to a certain idea.

Naturally, however, the system also needed a means of changing from one performance state to another as well as a temporal strategy for doing so and a way of coordinating these changes with the human performer. In this regard, the design of Hsu's ARHS system assumes that a human player expresses distaste with or disinterest in the other player by changing their *own* playing strategy. As Hsu explains:

Suppose the human improviser is observed to play somewhat consistently in mode H1 over an extended period, while an agent is playing in mode A1. One might reasonably assume that the H1/A1 combination is considered desirable by the human. If the human considers H1/A1 to be a musically unacceptable clash of activity, one might expect the human to change her/his performance mode to adjust to the undesirable situation. Hence, the agent is “encouraged” to continue behavior in mode A1, if it continues to observe the human playing in mode H1. However, if the agent has been playing in mode A1, and observes the human switching to mode H2, the H1/A1 combination is discouraged (Hsu, 2008, p. 4).

Realizing that his two different approaches to temporality and change in performance proposed, in essence, two distinct hypotheses about what constitutes desirable or inspiring behavior in an improvising partner, Hsu (with Marc Sosnick) has also tested these two systems with two internationally recognized improvising saxophonists, James Fei and John Butcher (Hsu & Sosnick, 2009). Ironically, rather than confirming his hypothesis that the second system (ARHS) would be clearly preferred over the first (London), Hsu and Sosnick finds their interlocutors are ambivalent about the differences between the two systems. Still, this small test group did find that it was easier to work with the moderate time windows of the London system, finding the ARHS system to be perhaps too sensitive to short term changes and thus feeling that it encouraged them to engage in erratic and fitful playing. As to whether longer term state-based playing was preferred, the results of Hsu and Sosnick’s study are inconclusive.

Within state-based approaches, a key issue of distinction between these systems lies in the way that the system chooses to change from one section of an emergent form to the next. Considering this design decision in the context of the human interaction it depicts, the choice of whether or when to move on to a new musical idea is one of great significance in the actual musical play. If, for example, one player were hold to a given idea while the next shifts to a new one, there is inevitably at least a small indexical significance to this change. From the first player’s perspective, the second player’s shift can be interpreted as either a call for a new section to be created, an aesthetic dismissal of the first’s idea, or an idea intended to complement the first player’s current state. In this last case, it must also be noted that the second player’s shift carries with it an expectation that the first player will remain committed to their idea and not be so easily influenced by the second player to also move on to a new set of musical ideas.

As Tom Nunn’s (1998) theorization of state-based thinking suggests and work in the psychology of music further corroborates (Canonne, 2013; Wilson & MacDonald, 2015), it is unclear what one player’s change to a new idea is supposed to mean in terms of this action’s expression of a desire for the other to move on or stay on the current path. While it only offers one modest hypothesis about the answer to this question of suggestion and expectation, Oliver Bown’s *Zamyatin* system (2011) is built to produce changes in the current playing state if the human player is inactive. There are good reasons to assume that this sort of interaction would be most satisfying or engaging for a human improviser, especially since one reason an improviser may choose to stop playing would likely be that they feel a lack of inspiration for that moment. Still, other work in music psychology (Wilson & MacDonald, 2012) suggests that a player’s silence has so many possible connotations that to assume one meaning for this very common

type of behavior in free improvisation overlooks the many other possible interpretations of another player's inaction.

What is a "State"? Averaging and the Standard Deviation (σ)

Taking a similar approach to the issue of when and how states should change, Michael Young's "NN music" systems build upon these methods in two important ways (Young, 2008).¹ First, Young's system not only takes averages of incoming data (including timbral data as with Hsu's system) but also determines the standard deviation (σ) of this data. This additional metadata is a small but significant contribution to the theorization of a "state" within free improvisation. Lewis and Hsu both characterize states by the average of values for a particular audio feature for a given period of time. However, the mere average of values leaves out quite a lot of information about the nature of the data set. There may be large differences between the high and low values of the set or other distributions within the data that are all wiped out as the whole data set is reduced to just one value. The standard deviation provides an additional layer of information about what that data set actually looks like and how the values are distributed within it.

For example, for the relatively simple parameter of volume, imagine two different states both with an average value of .5 (with a possible maximum of 1 and minimum of 0). Imagine that for state A has a $\sigma = .05$ while for state B $\sigma = .8$. The σ value of A allows one to note that volume is very consistently .5 for the entirety of this state, with very little variation in the state over the time window. State B on the other hand is full of changes in volume as is suggested by a value for σ which is almost as wide as the widest possible range of the data itself. This offers an important improvement in how the system characterizes the nature of the particular state. Moreover, it is a reasonable hypothesis that this additional information allows the system to respond to the human performer in a manner that is more likely to reflect an intelligent awareness of their contributions. On a more practical level, it is also likely that numerous states will have similar average values. In order to distinguish between them, the additional layer of σ offers another point of comparison and differentiation.

Second, in addition to the calculation of a standard deviation along with averaging, Young's system, like several others that will be discussed shortly, uses this data and metadata as the basis for a machine learning algorithm that simulates the adaptation that occurs between performers over the course of a single improvised piece. At the outset of an improvisation with this system, the computer is rapidly collecting information about the nature of the performer's current playing states. These states are recorded and indexed by their average and σ values. Incoming data and analysis creates new record for incoming states if they differ from any

¹ Rather than just resulting in one performance system, Young uses one main cognitive architecture as the basis for several kinds of virtual performers, each designed to be paired with a specific instrument.

previously recorded state by a degree greater than a user-defined threshold.² Over the course of an improvisation, the number of new states detected tends to diminish as the system is less likely to encounter states which are novel in comparison to the database that it begins to build.

Though Young has yet to publish an account of how improvisers who have played with his system have evaluated it in relation to how much it resembles an improviser, I had a chance to correspond with an improviser who has performed with the system, Anne, about her experience as its duo partner. Her commentary is particularly relevant for the question of the efficacy of the state-based approach. While she writes adamantly that the system “has never let [her] down in performance,” she notes the way that the system’s state-based machine learning approach has an impact on the interaction she has with it and how these behaviors differ from a real human improviser. Waterman finds that the system’s “tendency is to keep going, so one has to be quite patient and allow the sounds time to clear.” This suggests that at least in her experience, the state-based approach had the effect of making her feel like the system was effectively incommunicado for significant stretches of time. Likewise, she also comments that her experience was “most aesthetically satisfying, for me, if I ‘feed’ it small amounts of material with fairly long silences in between.”

Anne’s commentary on her experience with Young’s interactive system indicates at least a modest ambivalence about state-based approaches and that while some improvisers may enjoy such approaches, the same cannot be said for all other players engaged in this practice. In a similar vein, Oliver Bown’s recent (2015) tests of his Zamyatin system (Bown, 2011) with improvisers in Australia provides evidence that state-based approaches are not simply a norm among improvisers, but a point of difference among them. Testing the system with a group of just three improvisers, Bown found that his test subjects felt that Zamyatin was unable to produce a sense of longer-term structure and form as an improvising partner. This aspect of the system’s nature brings one player to discuss their perception of how improvisers’ spontaneous production of form may have changed over the several generations of musicians who have engaged in this practice:

I feel like there’s players around now who work in much longer structures and they don’t want to have a dialogue which is over some 10 second framework (Bown, 2015, p. 131).

In other words, while Lewis and others assert that state-based approaches are a key feature of free improvisational practice, there are many improvisers for whom this view does not conform to their way of dealing with form in performance.

² In general, the discussion of “user-defined” parameters in the technical documentation of these systems is type of comment that often obscures more than it clarifies about how the system is used in practice. In most cases the “user” is actually none other than the designer. Greater clarification about the nature of these “user-defined” values should be given as these values tend to be of significant consequence for how a system is likely to behave. In the case of the example above, the threshold of difference has an effect on how the system simulates an improviser’s ability to hear states as distinct.

Beyond States: Motives and Formlessness

Returning to the motive-based approach Lewis mentions in his description of state-based thinking, two other systems built to function as free improvisers have been designed to be more rooted in the use of motives than in the production of states. As mentioned above, London (2005, 2006, 2007), the predecessor to Hsu's ARHS system, was designed to work with a phrase-based approach. Similar to the manner that Young's system collects statistical information about states, Hsu's London system keeps a catalog of information about individual phrases. This index is then used as the basis for the system's explorations and reconfigurations of that phrase later on in the improvisation.

In a similar vein, saxophonist Benjamin Carey's "_derivations" system (2012, 2016) stores a large database of phrases produced by the human player (who in most cases has been Carey himself). Like Young's NN Music system, Carey's system calculates both the average and standard deviation of timbral features for each detected phrase. This corpus of analytical material then drives the system's "phrase matching" processes. When the player (usually Carey) plays a phrase, the system looks within its database for the nearest match in terms of the average and standard deviation. When an incoming phrase cannot be adequately matched, the system simply randomly chooses within its corpus. While "phrase matching" may imply that the system simply chooses pre-existing phrases for playback, Carey's system is actually designed to call up this material and use it as the basis for reconfigurations, and not regurgitations, of this previously stored material. This is done through a handful of now well-established methods in digital sound synthesis and sample manipulation. Once the system has located a relevant phrase in response to performer input, the system then recombines this original information using either with a phase vocoder³ or granular synthesis⁴ to produce new patterns of pitch, timbre, and rhythm based on the original phrase.

Besides state-based or motive-based approaches, other systems are built to work with musical structures which are even shorter than temporal groupings like form or phrase. For example, Adam Linson's *Odessa* system (Linson et al., 2015) offers a radical take on the issue of complexity in system design through an approach he calls "parsimonious computing" (Linson et al., 2013). Flying in the face of the sophistication of several other systems presented here, Linson's system is built to capitalize on the possibilities of creating nearly direct translations of the human player's input into output. In so doing, Linson's system does not engage in the kind of longer-term cognition that is assumed by the state-based systems described above. This approach mirrors the thinking of an improviser who is committed to being in the moment and

³ Phase vocoders are used to change the speed of a given audio sample without changing the audible pitch of the sample. Similarly, a phase vocoder can also be used to change the pitch of an audio sample without altering its characteristics related to tempo (see Flanagan & Golden, 1966).

⁴ This is a means of sound generation similar to sampling of recorded sounds in which they are broken up into short "grains" (usually between 1 and 50 milliseconds) and then can be stretched out and be laid upon one another (Truax, 1988; Xenakis, 1971). Stretching out of these grains occurs as a single grain provides a distribution of energy across the audible spectrum. This distribution is then used to shape the spectral profile of the output sound based on a kind of averaging of all the spectral profiles of any frame of the original sample. The result is a sound which retains the spectral characteristics of the original sample, but also produces a composite of all the spectral profiles of the individual frames of the entire sample.

demonstrating a strong sense of reactivity and sensitivity to the rest of the ensemble as a sonic environment. Though Linson's approach is well-reasoned, his tests of the system with a group of eight actively performing improvisers reveals that this approach may not necessarily satisfy every taste. Like Bown's test subjects, Linson's tests offer further data to corroborate Lewis' original state-based hypothesis in that several improvisers found the fact that Odessa does not easily facilitate the development of longer term musical form to be a significant drawback to the system's performance.

From Hypotheses to Analysis and Critique

Conclusive claims cannot be made about how actual improvisers play and behave in the musical presence of one another based solely on the design of these systems. As suggested at the outset of this chapter, two methodologies are needed in order to properly follow up on the hypotheses advanced by the design of these systems: testing of these systems with actively performing improvisers and formal analysis of recorded improvisations. Regarding testing, several designers have indeed tested their systems with various performers and as illustrated above, these tests have been a productive means of revealing how improvisers feel about the notion of form as a necessary or defining component of free improvisation. With this preliminary work to test such systems in mind, a few recommendations can be offered regarding the further investigation of attitudes about form. Centrally, what would be useful at this point would be comparative studies which examine variation in how improvisers evaluate systems operating with a state-based approach to those designed to work with smaller units of musical structure like motives. For example, when asked to play with two systems for which the overall timbral and rhythmic behavioral possibilities are identical or similar, how much do performers favor a state-based system? Relatedly, how does the variable preference for a state-based system relate to the stylistic preferences of a given scene of improvisers?

Hypotheses implicitly expressed in the technical documentation of these systems offer clarification and direction for the yet-unexplored approach of analyzing recordings of free improvisation. Principally, the aim of this kind of analysis would be to determine the validity of the various hypotheses discussed above, ranging from the state-based view of Lewis and others to the perspective that improvisational practice tends towards more formless ways of organizing the performance as a sequence of events. For example, how often are state-based approaches evident in recorded improvisations? If a state-based approach can be analytically located in the work of a given performer, does the rest of their work also exhibit a state-based structure or can approaches that do not manifest clear formal divisions or connections be found in other recordings? Are there particular groupings of performers that can be correlated with a more state-based approach? Are state-based approaches more or less common in certain local scenes of free improvisers or do such approaches truly transcend any geographical clustering of like-minded improvisers of musical style?

Aside from questions concerning adherence to state-based or other approaches to form, the formal analysis of recorded improvised musical interactions can also be put to work to use free improvisation as a means of examining the perennial musicological question "what is 'form'?" (see Dunsby, 2011) For example, how do the various considerations of what constitutes

a “state” for a state-based approach compare to what can be analytically discerned from recordings of free improvisation? For which improvisers does a state conform to the approach taken by Lewis (i.e., a rough sense of the average value for duration and intervals) and for which is it more like what Hsu has encoded (i.e., averages of values for various spectral features over a given time-window)? And most interestingly perhaps, for which improvisers does a state consist not simply of an average value for a particular spectral feature, but this average value with a particular standard deviation (σ) functioning as a method for distinguishing between similar or identical mean values? Beyond the question of whether particular periods of a performance have the coherence that is suggested by the concept of “states,” what is a state? Just as a motif, tonality or sequence of tonalities, or beginning or end points would define a section of a musical work, what defines a given state? Is it possible that in some cases a motif defines a state despite Lewis’ deployment of a binary opposition between states and motives? Again, the technical documentation of these systems cannot answer such questions. Nevertheless, these questions might have been more difficult to pose without the work of these designers. As a result, the inherently open-ended task of analyzing a piece of music is given a sense of direction by the various hypotheses about the nature of form in this improvisatory practice which have been proposed in the form of accounts of how these systems are designed.

Variable Stances on the Necessity of Adapting to Other Players

As was the case with practices of listening and the relative importance of form, designers of such systems take a range of stances on the notion that it is essential to adapt to one’s fellow improvisers over the course of an interaction or several interactions. Overall, this difference of opinion hinges upon whether or not such systems should be designed to adapt to the human player through one or another of the several well-practiced adaptive systems techniques in the field of computer science.⁵ For several designers, the construction of such a virtual socio-musical agent requires endowing the system with a capacity to adapt to the tendencies of its human interlocutors in real time (Assayag et al., 2010; Carey, 2012; Casal & Morelli, 2007; Collins, 2008; Young, 2008).⁶ Furthermore, among proponents of adaptive systems techniques, designers

⁵ The term “adaptive systems techniques” here refers to any type of system built to change its behavior over time in response to various forms of stimuli or training materials. The defining feature of this category is that the system behavior that results from this process of adaptation is itself not a property of the original algorithm, but the combination of that algorithm and the way it reacts to training materials. Thus, the category of “adaptive systems” includes obvious candidates like machine learning, but other methods such as genetic co-evolution or particle swarm optimization.

⁶ Systems included in this list have been described as being able to adapt to the playing of a human improviser in real time over the course of a musical interaction. However, adaptive systems techniques have also been used to create systems which both adapt to human playing in real time as well as prerecorded materials fed into the system’s input in an offline setting. For example, for Oliver Bown’s Zamyatin system (2011, 2015) uses a type of evolutionary algorithm, or a type of algorithm that simulates the process of natural selection in the biological world in order to solve optimization problems (Eiben & Smith, 2003). While this kind of algorithm could be used to evolve towards the behavior of the human performer, Bown’s use of evolutionary algorithms focuses on evolving the system towards behavioral goals of his determination (see Bown, 2011). Similarly, David Plans Casal’s Frank system (Casal & Morelli, 2007) can be trained upon offline materials, though he also describes the use of the same adaptive algorithm in the context of real time interaction with a human performer.

differ in their views on the purpose of integrating such techniques, the nature of the process by which players adapt to one another, and the end goals of the process of adaptation itself.⁷ However, despite the popularity of adaptive systems techniques, particularly machine learning (see J. Black, 2016; Burton, Cantara, & Walker, 2016), and the hype surrounding them, other designers have not built their systems to have a capacity to adapt to the human player (Hsu, 2010; Lewis, 1999; Linson et al., 2015).

Fundamentally, the choice of whether or not to deploy one of several possible adaptive systems techniques in the design of such a system illustrates the particular researcher's conception of what truly constitutes the best path towards re-embodiment of the egalitarian ethos of free improvisation in system design. Whereas all designers of such systems agree to certain basic conditions for the creation of a system that would exhibit egalitarian approaches to interaction,⁸ they differ in their stance on the necessity of adaptive systems techniques as a means of realizing this egalitarian sociality. In turn, these variable stances on the need for a system to adapt to a human player reflect designers' differing conceptions of how the lofty ideal of egalitarianism would be realized in musical interaction between improvisers. For those who take the adaptive systems approach, adaptation is more than simply a means of bringing about a more intimate coupling of human and machine. Rather, the integration of this adaptivity indexes the designer's view that players must adapt to each other's tendencies in order for their behavior to support the experience that each participant is an equally influential participant in the overall interaction. Conversely, for those who do not take an adaptive systems approach, this kind of adaptation and rapport-formation are not necessary for the realization of an equal partnership between improvisers. Instead, these designers suggest that an egalitarian experience is the result of an encounter between two or more strong personalities which respond to the others without necessarily adapting to their tendencies or adopting their stylistic traits.

As was the case with other key aspects of these systems, the way a system is designed may or may not reflect the way that improvisers actually do behave in musical interaction nor can it be assumed that they reflect the way that improvisers would want their fellow performers to conduct themselves. As such, each of these systems must be regarded as a hypothesis about the degree to which interpersonal adaptation between free improvisers takes place as well as the desirability of the formation of this kind of rapport. Therefore, like any other feature of the design of these systems, further investigation of these hypotheses about interpersonal adaptation through the analysis of recordings of free improvisation as well as the testing of these systems

⁷ Though related, the purpose and end goals of this approach are distinct. "Purpose" refers to the rationale for hypothesizing that adaptive techniques would be a successful method for achieving the kinds of outcomes improvisers claim to pursue. "End goals" refer to the outcomes of the process of adaptation itself.

⁸ These constraints are discussed in Chapter 6. Overall, all designers working on such systems agree to certain basic principles in terms of how the system should reenact the egalitarian sociality that is desired between free improvisers. The principal point of agreement is that there shall be no way for the human performer to directly or immediately control the behavior of the system, this being more or less the same manner of engagement that takes place between human improvisers. From this central point, several other points emanate. For example, the notion that the system should not be controllable or influenced by any haptic or tactile or physical gestural interface reflects the fact that by and large improvisers do not touch, rub, or gesture towards one another to change or guide each other's behavior. See Chapter 6 for further discussion of these points.

with actively performing improvisers is still required.⁹ Without this kind of follow up, it remains unclear whether these views on adaptation reflect the actual behavior and preferences of human improvisers.

In Favor of Adaptation: Varying Approaches

Oddly enough, the first suggestion that integrating a capacity for adapting to the human player's tendencies appears in the writings of a designer whose own work in this area does not integrate this kind of approach. Regarding the encounter between players with different backgrounds in free improvisation, George Lewis remarks that "the possibility of internalizing alternative value systems is implicit from the start" (Lewis, 1999, p. 102). At face value, this remark, particularly through the use of the term "internalizing," implies that the meeting of improvisers in performance is a situation in which it is likely that a musician will be confronted with ways of thinking about and organizing music that are alien to their own. Likewise, it also implies that Lewis believes that machine learning (ML) or another adaptive systems technique would be essential or, at least, valuable as a component to integrate in system design. That is to say, he implies that just as human performers have the capacity to adapt to the playing styles of their peers in musical interaction, the system should also have the capacity to adapt to the human performer in their encounter as well. However, despite these possible implications, Voyager is not based in any form of ML or any related technique.

While Voyager is not designed to adapt to the human player in the course of the interaction, several systems designed after Lewis' pioneering work take this approach (Assayag & Dubnov, 2004; Blackwell & Bentley, 2002; Carey, 2012; Casal & Morelli, 2007; Collins, 2008, 2011; Young, 2008). Besides the idea of "internalizing alternative value systems" suggested by Lewis, several factors motivate the decision to encode the capacity for dynamic adaptivity in these systems. For several designers, the integration of a capacity for their systems to adapt to a human player is offered as a response to the fact that free improvisation is unlike other forms of improvisation in that collective spontaneous extemporization takes place without the use of a previously agreed upon structure for the improvisation, such as a chord progression, a static tonality, or a groove, for instance. In the absence of these usual structures for improvisation, free improvisation creates a situation of performance in which it is not these basic "referents" (Pressing, 1988) that shape the performance, but the dynamic interaction of the personalities, musical skills, and cultural backgrounds of the performers themselves.

Thus, the "structure" of the performance is not found in a score or other a priori entity, but rather emerges from the relationship between the performers themselves as well as its evolution over time. Given the emergent qualities of the structure of a performance of free improvisation (Haenisch, 2011; Sawyer, 2000), designers who build their systems to adapt to the human player work from the hypothesis that if structure results from an improvisatory interaction, this is likely due to the fact that the players are adapting to one another. For example, Assayag et al. (2006) reason that without an explicit structure (i.e., as in jazz or Hindustani

⁹ As will be shown in Chapters 11, 12, and 13, testing of my own system Maxine sustains the point that improvisers vary in their views on the desirability of adaptive or indifferent manners of interacting with other musicians.

classical music), the structures produced by the performance are the outcome of a process in which each improviser takes note of the actions of others and attempts to adapt. Similarly, Blackwell and Young (2004) suggest that despite their disuse of traditional tools for structuring a musical performance (e.g., a score, a conductor, etc.), improvisers actively seek to create structure out of their performances (see Borgo, 2002a). Conversely, their thinking also implies that the indeterminacy of the performance is a kind of problem¹⁰ needing a resolution in the form of a restoration or new creation of the sense of structure that defines so many musical practices.

Beyond this concern for structure, other researchers motivate their decision to integrate the capacity for adapting to others in real time as one concerned with creating a sense of “intimacy” between improvising players. In addition to explicitly naming “adaptability” as one of five desirable attributes for the resultant behavior of such systems, Michael Young (2008) also proposes that another key goal should be the capacity to achieve a sense of “intimacy” between human and machine performers.¹¹ Distinct from adaptability, intimacy refers to the sense of mutual knowledge and rapport that results at the end of a process of adaptation and describes the feeling that other players are aware of the history of exchanges in their interactions. With a knowledge of this shared history (even if this “history” is only as short as an improvisation which began ten minutes ago), intimacy describes the sense that other players are reacting to the way that the meaning of particular musical gestures (e.g., certain tonalities, intervallic leaps, timbral combinations) shifts in time.

Varying Takes on the Process of Interpersonal Adaptation

Therefore, whether to create structure (and prevent unending contingency) or to evoke a sense of intimacy, several designers have built their virtual free improvisers to have an ability to adapt to the structures implied in the playing tendencies of their human interactants. In so doing, their approaches to this aspect of design point to several hypotheses about the nature of the process of adaptation and rapport-formation that takes place as improvisers become acquainted with one another through playing and experimenting in a collective improvisatory setting. As is true for many other aspects of the design of these systems, the algorithmic representation of this social

¹⁰ As discussed in Chapter 2, this open-ended interactive indeterminacy has been described by Talcott Parsons as “double contingency” (1962). In this formulation of social interaction, both agents are regarded as essentially free to choose any course of action at any point in the exchange. A first contingency results as one agent is necessarily unaware and unable to predict what the other will do at a particular point in the exchange; therefore, they cannot necessarily predict their own reaction to that moment and thus their reaction is contingent. A second contingency results from the fact that the first agent cannot, furthermore, predict the reaction of the second agent to their response to the first contingency. Though double contingency describes much of how free improvisation proceeds as the result of a sequence of such contingencies, Parsons regards the use of a “shared symbolic system” (e.g., language, conventions of social interaction, etc.) as a solution to the “problem” created by double contingency. While others have questioned Parsons’ characterization of double contingency as a problem to be solved (Vanderstraeten, 2002) and even suggested that such contingencies are used as resources (Wilf, 2013a), designers using adaptive techniques to allow the system to adjust to the playing tendencies of a human improviser can be said to be informed by an instinct similar to that of Parsons. In their desire to root out the incrementally increasing complexity of an indeterminate interaction suggested in the concept of double contingency, they share Parsons’ view that such contingencies are a problem to be resolved for a successful interactive performance.

¹¹ The five desirable attributes Young describes are “adaptability, empowerment, intimacy, opacity, and unimagined music.”

cognitive process generally stems from the experiences and intuitions of the designer about how human beings interact rather than from detailed study of such processes. Though musicians themselves note that a rapport begins to form even from the earliest moments of a group's interactions, they are often unable to pinpoint exactly *what* they have learned about their fellow players; nor are they sure *how* the feeling of intimate interpersonal knowledge has come about (see Beins, 2011, for a detailed account of such experiences).

Among various proposed solutions to the mystery of interpersonal rapport formation between improvisers, one commonly practiced approach is guided by the simple but well-reasoned intuition that it is essential that the system collect as much data as possible. For example, Carey's "_derivations" system (2012) is designed to build a corpus of phrases collected from the human player as they interact with the system. As one can easily imagine, continuously collecting this kind of data quickly generates a massive store of information and therefore requires a means of sorting it for later use. In order to sort this data, Carey's system extracts audio features from each phrase including pitch, loudness, spectral centroid, noisiness, as well as the decomposition of tones into their individual frequency components or partials. Like Young's methods for parsing and classifying audio feature information, Carey's system collects both the average value for audio features over the course of a given phrase as well as the standard deviation of these values.

Carey's system uses the classification of these phrases by average and standard deviation values in order to drive the system's "phrase matching" processes. During performance, the system collects new phrases from the performer. If the standard deviation and average values of the phrase's audio features are a close enough match to an existing phrase, this phrase is then called up and used as a guide for the system's next sound outputs. Though the term "phrase matching" implies that the system would directly reproduce the input phrase, Carey's system does more than just replicate what it hears. When a "matched" phrase is called up, the system performs a variety of stochastic processes to the pitch or rhythmic features of that phrase (e.g., transpositions or temporal displacements of notes) using either phase vocoding or granular synthesis. When no stored phrase is a close enough match¹² to the incoming phrase, the system chooses a random phrase for phase vocoding or granular synthesis transformations.

What model of social cognition in free improvisation is proposed in Carey's system? Carey's system presents a view of free improvisers which is quite generous in terms of what its design says about their ability to memorize the details of a performance. If one were to imagine what happens in Carey's system happening in a real human improviser, then what "_derivations" represents is a player with an uncanny ability to remember a dazzling number of musical moments. Such an ability would be rather exceptional given that the basic task of remembering what happened after an improvisation is usually at least partially obstructed by the fact that a musician is simultaneously charged with the equally cognitively demanding tasks of using their sensorimotor skills to manipulate physical objects to make certain sounds while also trying to listen to the other player. Carey's system transcends these human limitations and represents a kind of improviser who is not distracted by the cognitive demands of producing their own sounds

¹² In practice, the values for incoming and stored phrases are rarely a perfect match. The user (which in most cases is Ben Carey) sets the threshold which determines whether a phrase is a close enough match.

and is able to remember the general shape and internal variation (i.e., through the standard deviation) of the multitude of phrases they have encountered in their musical experiences with others.

Much the same can be said for how the human capacity to recall such minutiae is conceptualized in Young's work (2008). As with Carey's approach, if the system were a performer, then this would be a performer with a relatively astonishing ability to recall events it has encountered and participated in when compared with a human performer. Overall, this approach is valid if the goal of design is to create a musical machine that generates interesting and musically inspiring behavior. However, problems arise when this approach is compared with the actual capabilities of human improvisers. For example, a recent study led by Amandine Pras (Pras et al., 2017) in which improvisers were asked to comment on the improvisations that they had just participated in without the aid of a recording suggests that human beings have quite limited ability to recall the minutiae of improvisations in which they have just participated.

It is questionable whether the capacity for memory that the designs of Young' and Carey's systems suggest exists as a real possibility in the capacities of human memory. Again, as improvisers have noted themselves, what happens in performance is often quite a blur despite the fact that one was a central participant of the interaction itself (see Corbett, 1994, p. 203). In any case, it need not be a requirement that a designer create a model that exactly emulates how human cognition occurs in actual practice. Besides the fact that this kind of accuracy is not possible currently or in the foreseeable future, it must not be forgotten that what Carey and Young are doing falls just as much into the category of scientific research as it does into the category of personal artistic expression. Thus, what they design is not likely to be a reflection of what human beings can do. Nevertheless, their approach raises a valuable question about the degree to which such an accurate memory is possible and suggests that it may behoove scholars interested in improvisation to investigate this question in a more targeted and systematic manner.

It may still be the case that what improvisers recall is at the same level of detail as what these two suggest. All the same, it must be made clear what kind of memory or knowledge they acquire from such interactions. Borrowing from ethnomusicologist Benjamin Brinner's theorization of the nature of knowledge about music (Brinner, 1995, pp. 27-73), do improvisers have a declarative knowledge of what has just happened? Or is it more like what Michael Polanyi calls "tacit knowledge" (1966/2009) or the sense that one knows quite a lot about a particular experience, but does not have the ability to produce explicit declarative statements about that experience?

Regarding these more diffuse and less explicit or declarative forms of knowledge, David Plans Casal's approach to the design of an adaptive virtual free improviser takes such forms of knowing and memory as the starting point for how his system, Frank, evolves in dialog with a human performer. Casal suggests that the knowledge one has of another performer's tendencies is a type of knowledge that one is not fully conscious of. In order to design with this concept of memory and knowledge in mind, Casal's system makes use of a combination of approaches in the broader field of evolutionary computing (see Eiben & Smith, 2003, for further reference), a type of adaptive systems technique related to, but distinct from, machine learning. Broadly speaking, evolutionary algorithms are built to emulate the process of natural selection in the biological world in order to harness the capacities for optimization that are evidenced in the

development of traits which are more desirable and survivable in certain environmental conditions.

Casal's particular use of evolutionary computing creates two "populations" of individuals possessing various genetic traits: males and females. These populations are created from the extraction of spectral features using Michael Casey's Soundspotter techniques (2001) which create abstract summaries of timbral details for a given corpus of sounds. Thus, Casal's system requires that the system be presented with an initial sound sample in order to create a first population of male and female candidates. The "traits" of this initializing audio sample are then translated into the production of an initial male and female population. As with biological sexual reproduction, when male and female individuals breed, the offspring have a more or less random combination of a selection of the genetic material of the two parents. Mating occurs when incoming audio from the human performer arrives. Members of the male population propose "solutions" or answers to the incoming audio stream, while female members assess which solutions are most "desirable" or compatible with their own, female genetic makeup. When a couple has been matched, they breed new offspring which then bear a combination of the parents' genes. Finally, for sound production, the genes of the youngster are queried against the library of materials in the system's corpus to find sounds which match their materials. These sounds are then produced by the system and depending upon the sex of offspring, this individual returns to the male and female populations which form the potential parents of the next generation.

Returning to the issue of unconscious knowledge, Casal's system capitalizes on the inherent indeterminacy of biological evolution. Though environmental factors such as climate or the presence of predators are concrete and definite realities of survival, the meeting of two gametes in sexual reproduction is a far more stochastic process as is the selection of which of the entire genetic materials of the parents is contained in these sex cells. Thus, Casal's system pursues a means of reproducing the unexpected combinations of genetic material which occur in the natural world as a basic aspect of evolution. Like the stores of knowledge in Carey' and Young's systems, Frank's knowledge of the audio stream it encounters is similarly all-encompassing. At the same time, it uses random aspects of this audio corpus to create connections between materials therein which may not be immediately suggested by the shape or temporal sequence of that audio corpus itself. Regardless of whether human improvisers remember with the precision suggested by Young and Carey or whether they operate with a more diffuse conceptualization of past events as suggested by Casal, these attempts to address the quality of improvisers' knowledge and memory are thought-provoking and beg for a systematic investigation of the nature of a musician's knowledge and memory about performance following its conclusion. If this knowledge is a precise catalog as Young and Carey suggest, then how would this be known empirically? Or, if this knowledge is diffuse, associative, and unconscious, how could its existence be verified?

Taking a similar conceptual approach to Casal, the work of Gerard Assayag (and several collaborators at IRCAM) and Nick Collins (working separately) suggests that rather than operating with a broad and encompassing kind of memory, an improviser's cognitive process involves various simplifications and reductions of the information that the player encounters or acquires in musical interaction. Deploying strategies from machine learning, Gerard Assayag

suggests that rather than acquiring a vast body of specific memories, improvisers acquire information through a process of trial and error. This view of learning and adaptation in free improvisation is one which characterizes these processes as much more proactive than the passive approach of indiscriminately acquiring data from every moment of a system's encounter with a musical environment. Like Young and Carey's approach, Assayag's OMAX system also aims to acquire a large amount of data from human performers as a means of simulating the intelligent responsiveness of a human performer. Similarly, like Young and Carey's approaches, the system cannot function without a means of parsing and classifying this data.

But while the classification approach of Young and Carey focuses on the use of average and the standard deviation values for various audio features, OMAX takes an approach to sorting this data which aims to maximize the retention of raw data while maintaining efficiency by reducing this information where possible. At the level of perception and real-time analysis, this is achieved through the use of factor oracles (Allauzen, Crochemore, & Raffinot, 1999), a technique of data compression which preserves original data when it is unique and reduces or simplifies this material when patterns can be detected.¹³ Unlike several other designers, Assayag offers an explicit justification of this general approach to modeling human cognition and draws on work on models of learning in music psychology (Huron, 2006). Specifically, Assayag and his team "believe that musical patterns are not stored in memory as literal chains, but rather as compressed models" (Assayag et al., 2006, p. 126). Similarly, in a later essay, they elaborate that

[The] brain does not store sounds. Instead, it interprets, distills and represents sounds. It is suggested that brain uses a combination of several underlying presentations for musical attributes. A good mental representation would be one that captures or approximates some useful organizational property of a human's actual environment (Assayag et al., 2010, p. 222).

With this efficient representation of incoming musical materials in place, OMAX is built with the goal of attempting to anticipate the behavior of the player based on its knowledge of their past actions. This takes place through a process which OMAX's designers call "active

13 The choice of the factor oracle was the result of the team's exploration of three [I see only two] other major methods for handling repetitive data structures: suffix trees (Ron, Singer, & Tishby, 1996; Weiner, 1973), incremental parsing (Ghezzi & Mandrioli, 1979; Ziv & Lempel, 1978). Suffix trees preserve the full range of the original data set. This is detailed, but creates a body of information that is not easy to manipulate or quickly recall or redeploy. Incremental parsing reduces the overload of detail created through suffix trees by locating frequently occurring patterns. Instead of representing each instance of a repeated pattern as a separate data point, these are reduced to represent the fact that one particular permutation occurs frequently. However, this reduces the ability to represent that these frequently occurring permutations are of a higher probability in the original data set. Thus, the factor oracle was chosen by Assayag and his team for the fact that they preserve the ability to represent the nature of the original data set, reduce the clutter created by multiple instances of the same permutation in the data, but also allow for the preservation of data about the relative frequency and probability of certain permutations in the original data (see Assayag & Dubnov, 2004 for a detailed explanation of this reasoning).

learning” (Assayag et al. 2010). This technique is similar (if not identical¹⁴) to a well-practiced technique in machine learning known as reinforcement learning (Sutton & Barto, 1998). As the name implies, reinforcement learning works by creating a system of punishments and rewards for the system’s behavior. Rewards encourage behaviors while punishments discourage them. In the case of OMAX, rewards occur when the system is able to correctly predict or anticipate the player’s action as confirmed by the fact that predicted and actual actions concur.

Collins’ experimentation with machine learning in this context is quite similar to the one used by the OMAX team, but adds an additional tactic to the prediction and anticipation approach. Like OMAX, Collins’ systems make predictions about the player’s behavior based on a body of stored knowledge about their actions in the past (Collins, 2008, 2011). Similarly, for every moment when the system offers an accurate prediction, the logic that led to the prediction is promoted within the system’s own hierarchy when making future predictions. Collins elaborates on this prediction-driven approach to explain that it is not merely that the system attempts to mimic what the human performer will do. Rather, the predictions serve as a means of anticipating certain actions such that the system might be able to deviate from the human player’s actions. For example, if the prediction algorithm suggests a high probability for an event taking place at a certain point in time, Collins’ system uses this information to either match the event timing of the human player or play ahead or behind this predicted event timing.

Alongside this predictive approach, Collins has also built his systems to assess the consequences of their own actions and keep a record of how the human performer reacts to certain aspects of its behavior. Though more proactive than the data collection approach of Young’ and Carey’s systems, the way Collins’ system analyzes the consequences of its actions has much in common with their approach. That is to say, the collection of data about the consequences of the system’s actions leads to a general representation of the player’s tendencies to react to certain materials in a certain manner. At the same time, the analysis of consequences is also used to assess the validity of the prediction algorithm which runs in parallel. For example, the analysis of the consequence of a given action is informed by the differential between the actual consequence of the system’s action and that which would be suggested by the prediction model.

Collins’ reasoning about consequences in the design of this system provides a useful framework for future explorations about the nature of social cognition in free improvisation between human beings. Namely, this approach suggests that when improvisers play together for the first time (or even well after that first meeting), they often engage in certain actions with the desire to know how others would react. However, for all its promise, several aspects of Collins approach suggest questions whose answers remain unclear. Principally, Collins offers little

¹⁴ Assayag and his team insist that active learning and reinforcement learning are distinct. However, their conception of reinforcement learning assumes that “rewards are defined for goal-oriented interaction. In musical applications, defining a goal would be either impossible or would limit the utility of the system to certain styles” (Assayag et al., 2010, p. 237). In other words, they believe that reinforcement learning would be more appropriate for forms of improvisation in which stylistic constraints are clearer and more well-defined than is the case for free improvisation. As shall be shown in a discussion of Nick Collins’ work with reinforcement learning (Collins, 2008, 2011), it is possible to deploy this method in a manner which is appropriate to free improvisation despite its stylistic openness. In several ways, what this team calls “active learning” is essentially equivalent to what Collins calls reinforcement learning.

clarification¹⁵ on the kinds of predictions the system makes, though it is clear from his discussion of the system that it is based on a body of cases that the system stores in its memory. More importantly, what is the system trying to predict? Is it all parameters related to pitch at once, or are there some that are deemed more relevant for a particular moment? If so, why? Likewise, for the consequence component, it is unclear what kinds of stimuli the system uses as a provocation. For example, does the system try to learn how the player responds to particular harmonies? To particular voicings of the same harmony? To particular ways of creating melodies? Again, Collins' approach to designing a system that learns from the human player proves promising, but without answers to these questions, it is difficult to use his work as a means of better understanding what improvisers do, though it does offer compelling hypotheses.

Finally, whereas other designers take a more abstract and open-ended approach to the process of adaptation itself, Oliver Bown's *Zamyatin* (2011, 2015) takes a clear and bold stance on this issue while still sharing many characteristics with other systems. Specifically, like Casal's Frank system, Bown's work in this area makes use of techniques from evolutionary computing. Similarly, Bown's system is structured to have its behavior trained both in online (i.e., a real human performer who influences the system's current and longer-term behavior) and offline (i.e., with previously recorded materials) contexts. Using training materials designed to encourage specific end goal behaviors, the system has been evolved to encourage this end goal behavior such that its internal behavioral characteristics change if the human performer is not playing and stay static if they are not. In other words, the system has been evolved *overall* such that it will only evolve *in performance* if the human player is not playing.

In terms of a theory of adaptation between human musicians, Bown proposes that human improvisers take the silence of their partners as an implicit request to stay the course and remain committed to whatever current musical idea they are currently engaged in. Again, as has been recently suggested by Wilson and MacDonald (2012), a descriptive approach to the semiotics of actions in improvisation reveals that inaction or silence has many more meanings than what Bown's theorization allows. Nevertheless, this does not mean that Bown's theory of improvisational adaptation is entirely inaccurate. Like any hypothesis about this interpersonal process, it must be investigated further. For all its simplification of the matter, Bown's approach provides a clear hypothesis for investigation. More importantly, by suggesting that silence in particular is a type of performer action charged with this kind of implicit meaning, this hypothesis is relatively easy to investigate. For example, an analyst could locate any and all moments when one player was silent in order to determine whether the others took this silence as a cue to stay on their particular musical trajectory.

¹⁵ This is not to say that the prediction method is not mathematically elaborated. However, to have a sense of what the algorithm would do, it would be helpful to also have a sense of the kinds of predictions it makes based on the materials it uses to draw patterns and estimate future outcomes.

Goals of the Interpersonal Adaptation Process

Along with competing views about the process through which players adapt to one another, designers also differ in their perspective on the overall purpose and goal of the adaptive process itself. Broadly, the views presented in this body of work suggest that the desired endpoint of a process of interpersonal adaptation would be either:

- 1) the ability to surprise another player,
- 2) the ability to predict the other player's actions,
- 3) adaptation and adjustment to the other player's tendencies, or
- 4) a generalized knowledge of the other player's actions which could be applied to any of the above goals.

For most designers working to create a system which adapts to the human player in real time, the goals of the process of adaptation are really a combination of the above. Therefore, most of this work aims towards a version of the fourth goal listed above, the achievement of a general knowledge of the other player's tendencies. For the purposes of any of the other three goals, this basic knowledge is a prerequisite as it is unlikely that the intentional capacity to surprise, predict, or adjust to the other player's tendencies can exist without a knowledge of the other player's tendencies. Nevertheless, despite such overlap, it remains the case that different designers place varying levels of emphasis on one of the first three goals.

Regarding the capacity to surprise another player, David Plans Casal's Frank system takes this as an explicit goal (Casal, 2008). Though this is based in the collection of comprehensive spectral-analytical information about the human player's tendencies, this generalized knowledge is put to work with the specific goal of creating a sense of surprise. For others, however, the utility of this generalized knowledge is not exclusively for the purpose of surprise. Rather, this kind of knowledge can be used to generate both surprising and predictable interactive behaviors. This dual conception of the utility of this kind of knowledge is what drives Nick Collins and the OMAX team's approaches to design for adaptivity. This is particularly true for Collins' work in that the system's development of a capacity to make predictions about the human player's behavior and also assess the validity of those predictions allows the system to match the human player but also to intentionally deviate from their actions as well. However, given that the roots of OMAX lie in systems like Francois Pachet's Continuator (2003), a jazz-based improvising accompanist that seeks to cooperate with and emulate the human performer, the use of the generalized knowledge that OMAX acquires remains more directed towards adaptation and adjustment rather than the development of a capacity to surprise.

Overall, systems which use adaptive systems techniques (whether these are based in machine learning or evolutionary computing) are designed from the notion that the acquisition of a generalized knowledge about the interactive and compositional tendencies of the human performer can be put to use in several ways. It seems the differences between the various interactive goals which could be achieved through the generation of this data (e.g., surprise, generating dramatic conflict with another player, or adapting to them and assimilating their approach to music) are relatively trivial compared to the overall goal of simulating the sense that

the human and machine share a history. Returning to Michael Young's concept of "intimacy," the sense that one is playing with another player who possesses a knowledge of one's playing can be evoked in a variety of ways. Whether this is evoked through a sense of surprise, predictive accuracy, or adaptation is perhaps less consequential. Any of these three can be used to communicate to another individual a sense that one is aware of the history of the interactions between interlocutors.

Of course, it is also possible that other players can be surprised or feel that another player has learned to predict or adapt to their playing even though none of these effects were intended. Indeed, the additional question suggested by the various inquiries into the process of interpersonal adaptation through the arts-technology practices here is whether the feelings that one is surprised or that others have predicted one's own behavioral patterns or that others have made adjustments stem from another player's intentional choice to use their knowledge of another player for these effects. For all that players claim that others have achieved these effects, it is just as likely that these effects are completely coincidental as it is that they are the product of a systematic process of collecting knowledge. In a word, these effects can be faked, both by humans as well as by machines. Therefore, this body of research suggests the need for a systematic investigation of what improvisers actually know about those with whom they play and how intentionally or consciously they would be able to surprise, predict, or adapt to others.

Questioning the Necessity of Interpersonal Adaptation

Although numerous designers are inclined to believe that adaptation to other players is a necessity for the success of such a system (and therefore, for a human player as well), several designers have not followed this trend (Blackwell & Bentley, 2002; Collins, 2006; Hsu, 2010; Lewis, 1999; Linson et al., 2015). Instead, their systems do not use any kind of machine learning or evolutionary computation technique.¹⁶ This does not mean that these systems do not take input from the human performer and respond to it in real time, nor does it necessarily mean that these systems are incapable of demonstrating novel behaviors and surprising the human performers that they engage with. Instead it simply means that these systems do not change the internal protocol for how they process sonic information or generate new musical outputs over time. Even when the outcome of the system's interactions with the environment appear to be novel, this is not because the system has come up with new rules or procedures for dealing with material. Instead, this results from the fact that some aspect of the interaction between system and environment causes the system to behave in a seemingly novel manner.

Implicitly, those who work in an adaptive systems framework suggest that systems that do not adapt to the human performer cannot possibly be experienced as such. A priori, there is

¹⁶ Blackwell's systems do use a form of biologically-inspired computing based on the self-organizing movements of social groups of organisms like flocks of birds, herds of sheep, packs of wolves, or schools of fish. Broadly, particle swarm optimization regards these collectives as possessing an enviable skill of coordination that allows them to navigate unknown environments while retaining their internal organizing structure despite the lack of any centralized command (Bonabeau, Dorigo, & Theraulaz, 1999; Kennedy & Eberhart, 1995; Kennedy, Eberhart, & Shi, 2001). However, unlike evolutionary computing, particle swarms do not produce new generations through breeding. Therefore, while they are also used in optimization tasks, they do not have the same trajectory of change that is desired in machine learning or evolutionary computing methods.

nothing wrong with this reasoning. There is no particularly convincing reason to suspect that a system with no capacity to change its internal rule structure would be capable of exhibiting a sense of adaptability or “intimacy” that bespeaks the fact that the system has an active memory of recent events and is therefore reacting to them. However, despite the intrinsic validity of this a priori view, it is not necessarily the case that systems which lack an encoded capacity to adapt to human performers fail to evoke the human improviser’s sense that the system has actually adapted to the human performer.

As numerous theorists and practitioners of interactive computing have emphasized, it is critically important not to conflate the details of how a system is designed with how its design will be experienced (see Kioussis, 2002, for example). While it is tempting to believe that the solutions encoded in a system will definitely have the effects that the designer has assumed that they will, there is no way to know if any of those effects are real until a system is tested with its human users or interactants. Conversely, even if a system is not designed to achieve a particular effect, there is no way of predicting whether users may find themselves experiencing such effects despite the lack of any computational basis or intention for those effects being achieved.

Adam Linson’s tests of his Odessa system suggest the efficacy of this point (Linson et al., 2015). With a group of eight internationally-recognized improvisers, Linson tested this system in order to solicit the feedback of these performers and use this criticism as a means of locating future directions of programming to improve the system’s abilities to behave like an inspiring and creative improvising partner. In each test, Linson asked each improviser to play a series of three duets with the system. As Linson notes, despite the fact that the system did not have any capacity to adapt to the human player over time as is possible with the several systems discussed above, several players claimed or suggested that the system had adapted to their playing over the course of the three pieces.

What is happening that leads improvisers to experience the illusion that the system is adapting to them despite the fact that it has no capacity to do so? This effect likely stems from two possible sources:

- 1) the effect of so-called “mere exposure” (Zajonc, 1968) or “familiarity principle” (see Moreland & Zajonc, 1982)
- 2) a feedback effect resulting from the player’s adjustment to the system’s tendencies and the new (and seemingly “adapted”) behaviors in response to changes in the player’s input.

The exposure effect describes a phenomenon widely observed in social psychology in which human beings exhibit a consistent proclivity to more favorably adapt things or persons to which they have been previously exposed. In a word, the exposure effect exhibits that “we like what we know.” While it may be troubling to concede that human beings have a strong tendency to show greater approval of things or persons which they have already encountered and are at least minimally familiar with, an aggregation of numerous published experimental inquiries into this phenomenon indicates that this effect has a striking regularity (Bornstein, 1989). Therefore, when Linson’s test subjects assert or suggest that his system has adapted to them and that they have a more positive experience because of it, it is quite likely that the exposure effect accounts for at least part of what brings them to report their experience in this manner. However, to know

for sure whether such an effect is active in the context of the dyad of human-machine free improvisation, further investigations of the possibility that other improvisers also experience the illusion of adaptation in repeated encounters with an artificial musical interact would be needed.

Still, the exposure effect only partially explains what might be taking place in such repeated interactions. Principally, the limits of the exposure effect as a means of accounting of the experiences of Linson's test subjects is due to the fact that for the most part, test subjects in experimental investigations of the exposure effect do not interact with the stimuli provided (see Bornstein, 1989). They are, as the name of the phenomenon indicates, most often merely exposed. While the stimuli presented do elicit a reaction in the test subject, there is usually no change or reaction that takes place in the stimulus material itself. In other words, not only is there no interaction, but the stimulus materials bear no trace of being interacted with and consequently, they constitute an identical stimulus for every occurrence in a sequence of exposures.

The same cannot be said for any system discussed here. Regardless of whether these systems adapt to human improvisers or not, they do in fact react to the human player. As indicated in the handful of studies in which improvisers were asked to play with and critique a virtual improviser (Banerji, 2016; Bown, 2015; Casal & Morelli, 2007; Hsu & Sosnick, 2009), this manner of interaction is not always what the human improviser wants or expects from a fellow musician whose way of listening and responding they like. Nevertheless, despite this distaste for how the system might behave, improvisers do not dispute the fact that the system is in fact responding to their playing.

In turn, because the system is responding to their playing, human improvisers adjust to the way that the system responds. Thus, in order to understand the perplexing illusion that a system has "adapted" when it has no encoded capacity to do so, detailing the consequences of this basic human tendency to adapt to others is key. When the human player adapts to the way that the system plays, they do so by changing their own playing in response to the way that the system behaves. For example, imagine that the human performer feels that the system "overreacts" to certain materials, or produces responses which far outstrip the intensity of the stimulus provided by the human performer. In this case, it is likely that the human performer will respond to this overreactive system by refraining from making any sounds which they believe to cause the system to behave in this overreactive manner.

Crucially, it is also possible that the human player may make this adjustment (in this case, an overall reduction of "intensity" howsoever this is construed by the human player) unconsciously. As a result of this instinctive adjustment to the tendencies of the other (mechanical) player, it may then sound as if the system has now "adjusted" or "adapted" to the way the human performer has changed their own playing. Consequently, it is not only the fact that the human player adjusts to the system that causes the system's playing to seem different, evolved, or even adaptive. Rather, it is that the player is often unaware of the changes that they themselves have made in their own playing and is therefore less likely to be able to attribute any changes in the system's playing to their own actions.

This kind of feedback loop, in which the player's adjustment to the system seems to conjure up a new side of the system's interactive behavioral tendencies, has been observed in the interactions between human and machine improvisers. For example, in order to solicit critical

evaluations of his systems for the purpose of improving them, computer scientists William Hsu and Marc Sosnick (Hsu & Sosnick, 2009) asked two internationally recognized improvisers to play with two systems and then offer an appraisal of each system's behavior. In his tests, Hsu found that the nature of the system's interactive behavioral design caused both test subjects to shift their way of improvising drastically. In turn, their change in behavior in order to adjust to the system caused the system to behave differently as it was now receiving a different kind of input from the human performer. Specifically, since one of these two systems, known as "ARHS," is built to react more sensitively to short-term changes within in an improvised performance, the system

seems to encourage both musicians to play with rapid transitions and 'choppy' material. This change in the musicians' performance in turn causes the ARHS system to make frequent adjustments, resulting in a dynamic feedback loop (Hsu & Sosnick, 2009, p. 28).

This example illustrates the circularity of how the system's tendencies influence the player, the player adjusts, and then a different aspect of the system's range of behavior is then elicited. Though Linson does not describe the mysterious rise in evaluative approval of his system as the result of the kind of feedback loop that Hsu describes, it is likely that this kind of adaptive tendency played a role.

Human adaptive tendencies of the kind described by Hsu are hardly unique and have been observed in a variety of musical and socially-interactive contexts. For example, in the case of face-to-face social interaction through casual conversation, speakers have a tendency to partially mimic or entrain to the way other speakers use gestures in conversation (Kendon 1990). Overall, the adaptive tendencies that Hsu and Linson describe are likely an example of Erving Goffman's famous concept of "face-work" (Goffman, 1955; see also Goffman, 1967), or the tendency of human interactants to avoid embarrassment (or colloquially, the "loss of face") for themselves or their interlocutors. When human players adapt to the tendencies of these virtual performers, they might be doing so for the same reason that they would adjust to human players: a differential of competence and skill which requires the more competent interactant to make adjustments to cope with the inabilities of the weaker member of the dyad (see Brinner, 1995, for numerous examples). In many cases, rather than exposing the inadequacies of their fellow performers, musicians find ways of spontaneously coping with the difficulties faced by other players in a variety of creative ways (Monson, 1996; Sunardi, 2011). Similarly, when Hsu's human collaborators adjust to his ARHS system, they may be doing so in order to compensate for the fact that they perceive the system to be an inferior musical participant and are simply trying to make the best of the musical situation. Likewise, Linson's interlocutors also reference the fact that they are motivated to adjust to his system's tendencies out of the basic musical desire to create aesthetically sound music in the face of limitations (Linson, 2014, pp. 82-113).

As a result of the human tendency to adapt to others, a human being interacting with an artificial social interactant is prone to adapting to the behavior of this nonhuman interlocutor. Regardless of whether the system is built to adapt its internal rule structure to human input or not, a different side of the system's range of behaviors than what had been produced previously

is then elicited. But because the human interactant may not be aware of how they have adjusted to the system and consequently changed their own behavior, they experience this new side of the system's behavior as evidence of a process of adaptation. Laid out as a causal chain, this feedback effect works as follows:

- 1) Human and machine improvisers play together.
- 2) The human improviser notices the way that the system responds.
- 3) Unconsciously, the human being adjusts to the way that the system responds by changing their own way of playing.
- 4) Their new way of playing causes the system to behave differently given that it now receives a substantively distinct set of inputs from the human performer.
- 5) The human performer comes to believe that the system may have adapted to them, rather than simply responding to differing human input.

Beyond the exposure effect, it is likely that a dynamic feedback loop of the kind that Hsu describes contributes to the illusion that a system with no capacity to adapt to a human player has nonetheless adapted to the human performer. Though it must be established in further systematic research of the kind offered by Hsu and Linson, the experience of such illusions of adaptation have serious consequences for any claim that a virtual performer of free improvisation that adapts to the human performer is categorically superior to one which does not. In order to demonstrate that a capacity for adaptation to the human performer is more desirable than its absence, a blind study comparing the experiences of improvisers playing with systems that have this capacity with those that do not is needed.

Specifically, improvisers would need to be asked to play with two systems whose only difference is a capacity to adapt to their playing. Conversely, all other features of the system, such as their perceptual layer, their way of composing in real time, and the timbral range of their outputs, would need to be similar if not identical such that human improvisers cannot aurally distinguish between the two systems. This kind of study would be necessary for demonstrating that subjects were more convinced that the system had adapted to them when an adaptive system was used. More importantly, it would further be necessary to show that players felt that this kind of adaptation was in excess of the illusion of adaptation that would result from the combination of the "mere exposure" effect and the dynamic feedback loop described above. Unfortunately, as is a rampant tendency across this body of work, designers working in an adaptive systems framework have yet to engage in serious or systematic studies of how improvisers would evaluate their systems in comparison to human performers, to say nothing of conceptualizing the benchmarks for such evaluation articulated here.

The Intersection of Form and Interpersonal Adaptation

In the absence of such tests, the notion that adaptation is a necessary feature for the successful design of such a system remains a valid, but untested, hypothesis. All the same, David Plans Casal's account of his own experience with an adaptive system of his own design illustrates his

personal frustration as a performer working with that system (Casal, 2008). Describing the first iteration of his system Frank, Casal writes that:

the capacity to sometimes arrive at the same place, at the same time, in the kind of spontaneous synchronicity that human players can have, is almost impossible with this algorithm. This is because it continuously moves away from the perfect solution at the time, to the next perfect solution, therefore ignoring possibly interesting, sustained direction: a frustrating and emotionally unsatisfying situation (Casal, 2008, p. 1).

Despite his desire to create a system that re-embodies the sophistication and sense of shared history that can be simulated through adaptive systems techniques, Casal finds that the first version of Frank was perhaps too good at achieving this goal. Casal's irritation with the fact that the system is unable to achieve move in the same musical direction and incapable of engaging in sharing a moment of simultaneous energy is real. For all its refinement, the first system fails to retreat from its position of knowing the history of the interaction and therefore capable of avoiding moments of satisfaction with cold, mechanical consistency. Thus as a solution to his vexation with the younger Frank, the second pass of the system's development includes a feature that allows it to engage in the synchrony and cooperative attitude that Casal desires in contrast to the system's original algorithm works to prevent such moments of unification. Though Casal sees much value in the achievements of the earlier Frank, what he found missing was the ability to react spontaneously to the other and share a moment of common musical goals.

Casal does not discuss his personal misgivings with his system in terms of an inability to reckon with the issue of form. Nevertheless, his discussion of his opinions about Frank's possible inadequacies offer a starting point for thinking about the issues of form and adaptation together. On the one hand, Casal finds fault with the fact that Frank often continues to stay on in one particular musical direction of its own determination rather than show signs of joining up with the human player such as hitting a note together with the other performer. To borrow from Lewis' terminology, Casal's frustration with Frank suggests that the designer is irritated with how well Frank is able to commit to the state-based playing Lewis describes in *Voyager* and other recordings with human improvisers. Instead, Casal feels that his desire for a more reactive, antiphonal performance style is left unanswered and that a state-based approach can at times leave him wishing for just a moment of more conversational and immediate responsiveness.

On the other hand, Casal's evaluation also suggests that his frustrations stem from a desire for state-based playing at other times. The system's consistent tendency to move from idea to idea prevents it from moving in one direction continuously. In other words, his account of the Frank's shortcomings suggest Casal is irritated both with the system's state-like behavior as well as its more formless and motivic playing. Casal's evaluations of Frank are a starting point and cannot necessarily be generalized for a consideration of how form and adaptation would be related in the context of other systems. In this case, Frank's adaptive processes have a dual result and avoid obtaining a state-like quality while also failing to behave like the motive-based improviser Lewis obliquely references (Lewis, 1999, p. 105).

Beyond this case, how are the issues of form and interpersonal adaptation related? As discussed above with regard to Michael Young's work in this area, the issues of form and adaptation are intimately related to the point that Young's approach to adaptation is grounded in his conceptualization of states for the purpose of streamlining the adaptive process (see Young, 2008). Notably, Young's theorization of states and adaptation suggests a more fundamental and unacknowledged conception that these two aspects of the performance are opposed. To adopt a particular state cancels the possibility of any kind of adaptation that might occur within that state itself. By committing to a particular musical direction for a period of time, or a state, one avoids giving any trace of any longer term adaptation to the other since a state, as conceptualized by Young, is more or less a temporarily unvarying approach to timbral characteristics. Young's definition of a state is plausible; one could be defined by the fact that for a stretch of time players exhibit a lively and audible sense of conversational and immediate interactivity and that this way of coexisting is what gives this state its identity compared to other passages of the performance. Still, this kind of temporary reactivity cannot be confused with the kind of longer-term adaptivity and intimate sense of knowing the other that designers using machine learning or evolutionary computing pursue. Their use of such techniques is not just about reaction in a moment, but a sense of knowledge and rapport that would develop over a period of time longer than what is implied by Lewis' discussion of "states."

As with all the materials presented in these three chapters on the design of such systems, it remains to be seen what relationship exists between the way these researchers encode the practice of musical interaction with how performers actually engage in it as well as how they would prefer that their fellow players interact. While a handful of designers have tested their systems with improvisers in order to see how well they perform by an expert performer's standards (Blackwell & Bentley, 2002; Blackwell & Young, 2004; Bown, 2015; Hsu & Sosnick, 2009; Linson et al., 2015), the purpose of this testing is simply to verify whether the system's behavior was satisfactory for the human participant. In other words, their purpose is not to use these tests as a way of learning more about the cognitive processes or norms of social interaction for free improvisers themselves. It would be foolish to say that these designers are wholly unconcerned with such matters, but one would not be able to tell from the style and content of the technical documentation they provide about their systems.

The way that designers create such systems implicitly offers their theories of what happens in the mind and body of free improvisers who meet in performance, as I have tried to demonstrate in this chapter and the last. In so doing, they reveal, just as Lucy Suchman suggests (2007, pp. 226-240), how these designers conceptualize humanness itself. As Suchman notes, much of the artificial intelligence research she examined presented a more or less unified and ethnocentric concept of humanness prototypically represented by the white, straight, cisgendered male figure. However, while Suchman's criticism is well-reasoned, these designers actually present a diversity of conceptions of what a human free improviser is like. Nevertheless, as grand as this diversity of mechanical theorizations of humanness might be, we do not know what these versions of the human have to do with the real humans to which they refer. This can only be known through a broad scale interrogation of the various hypotheses on human musical nature proposed in the design of these systems. What is still needed is an analytical approach to recordings of actual performances of free improvisers guided by the questions proposed in this

chapter and the last, structured by the overall query: if a designer proposes a certain way of doing perception or cognition or musical action in the design of their system, to what degree can improvisers actually be observed engaging in this kind of behavior in their own performances? The second necessary response to this mound of untested hypotheses would be a systematic and comparative investigation of the responses of human improvisers to these systems.

Section 3: Maxine

Chapter 9: Maxine's Design

The design of virtual performers of free improvisation is a major advancement in the study of free improvisation as a musical, cultural, and social practice. Scholarship on this form of music-making has addressed several key issues, particularly the complicated relationship between jazz, free improvisation, and the history of African-American struggles for civil rights (Fischlin, 2012; Fischlin et al., 2013; Heble, 2000; Kelley, 1997; Monson, 2007; Moten, 2003). While this perspective on free improvisation is vital, this body of work has largely side-stepped several central questions: What is the human being doing when engaged in this practice? How do the values of freedom and equality at the core of this practice manifest themselves in how improvisers coexist in real-time, face-to-face encounters of musicking? What do improvisers want from their partners and how do these desires relate to the ideals of liberty and egalitarianism?

Whereas other methods and sources for the study of free improvisation can avoid the question of how improvisers listen to one another, what they listen for, and how they respond to (or ignore) one another, making an improviser out of computing machinery is a task that forces the researcher to deal with these issues. Nearly every step of designing an improviser from scratch requires the researcher to ask basic questions about the mechanics of free improvisation as a culturally-specific form of social interaction. Though only one designer explicitly draws any connection between their design practices and the cultural history of free improvisation (Lewis 2000b), building these systems implicitly raises questions and proposes hypotheses about what “freedom” and “equality” mean in terms of how improvisers listen and respond to the presence of others in this practice.

Projects in this domain (Assayag & Dubnov, 2004; Banerji, 2010; Blackwell & Bentley, 2002; Bown, 2011; Carey, 2012; Collins, 2006; Hsu, 2005; Linson et al., 2015; Yee-King, 2011) since George Lewis' *Voyager* system (2000b) have advanced several hypotheses about the nature of cognition and ideal conduct in musical interactions between performers of free improvisation. Despite the strong promise of several of these hypotheses, however, few researchers have documented their experiences in testing these systems with performers other than the designer.¹ As a result, it is still not known whether any of these hypotheses about how musicians go about this practice at the cognitive level or what players expect of a “good” partner retain their validity when subjected to the criticism of players themselves.

A handful of designers do offer substantive reports of what performers think of how their systems behave in comparison to human players after playing with them in various contexts (Bown, 2015; Hsu & Sosnick, 2009; Linson et al., 2015). As this work suggests, the encounter between a human performer of free improvisation and a machine built to function as a fellow

¹ Aside from designers who do document such tests, numerous other designers indicate that they have had their systems perform alongside human musicians. For example, Lewis (2000b) lists a handful of collaborators who have performed with *Voyager*. In a similar vein, Blackwell et al. (Blackwell & Bentley, 2002; Blackwell & Young, 2004), Bown (2011) and Collins (2011) describe their own assessments of the quality of their system's interactions with human performers as well as very general and minimal comments from the performers themselves. While these are certainly a start, they are too general to really offer much insight into how well these systems deliver what performers want and expect from a fellow player.

player in this practice offers a new way of researching examining what musicians expect of the conduct of other players in real time social interaction through sound. In other words, these encounters provide concrete evidence which directly problematizes the frequent pronouncements that this practice liberates performers from the obligation to adhere to specific norms of music-making as they prompt improvisers to articulate those norms explicitly.

While testing virtual improvisers affords a radically different means of examining the values of freedom and egalitarianism which inform how free improvisation takes place between musicians, designers testing their systems do so with more modest goals in mind. For example, Bown (2015, p. 127) sought to understand “how effective the system [was] at contributing to an effective performance,” “the extent to which the participant experiences the system as autonomous,” and “whether the participant experiences the system as originating novel output.” Similarly, Hsu and Sosnick (2009, p. 25) specify that their tests aimed to determine whether the system was a “usable environment for an experienced human improviser to perform within, preferably for an extended period time” and whether “the results of the performance” were “*musically interesting* for an audience that is sympathetic to free improvisation”² (emphasis in original). Likewise, Linson asks if his system will be perceived as “an intentional agent,” as a “collaborative” partner (2015, p. 101), and whether the system will be “engaging to the human performer” (Linson, 2014, p. 14). As is the case for the designer of any other kind of system, it is perfectly reasonable for Bown, Hsu, and Linson to test their systems with the simple goal of ensuring that the system does what it was designed to do.

The focus on verifying that the system has achieved what the designer intended overlooks the tremendous implications of such data for the study of how performers of free improvisation interpret abstract ideals like freedom and egalitarianism as specific concepts for how players should listen and respond to one another in musical interaction. While the framing of their goals is well-aligned to the typical designer’s objective of verifying that certain design goals have been met, Bown, Hsu, and Linson do not problematize what their various goals would mean. What exactly constitutes an “effective performance” of free improvisation? What qualifies as “musically interesting,” whether for a sympathetic audience or not? Is it really even desirable for an improviser to be able to create a piece for an “extended period of time?” What kind of behavior is regarded as representative of a humanlike intentionality? It certainly makes sense for designers to seek answers to these questions and there is little question that their answers are pivotal in the evaluation of these systems.

Nevertheless, these and other designers wave off deeper questions which would connect the practice of real time social interaction through music and the rich history of free improvisation as a cultural and political phenomenon. The parameters for evaluating whether a performance is “effective” or not have a meaning which extends far beyond just assessing the efficacy of one system. The meaning of these evaluative criteria — as distinct from the

² By specifying a particular type of audience, Hsu and Sosnick obliquely recognize another inherent issue in the evaluation of such systems or such players. Whether one speaks of humans or machines, free improvisation remains a practice about which numerous musicians and critics tend to express strong skepticism. Thus Hsu and Sosnick imply, rather reasonably, that an audience or musician evaluating these systems who is either unfamiliar with free improvisation or simply holds a negative opinion of it is less likely to be able to offer commentary which indicates what performers of this practice deem as valuable traits in a fellow player. This is not to say that such evaluations are not interesting or lack any kind of social scientific value; rather, they simply offer a different kind of data.

evaluation *itself*— is consequential for an understanding of what improvisers understand under the necessarily vague term “freedom.” Likewise, similar meanings lie buried in commentary elicited when designers ask improvisers to comment on whether the system is a “musically interesting” partner or whether it seems to act with a sense of intention.

By contrast, this chapter and the next argue that the purpose of testing systems like Voyager has a meaning which goes far beyond simply understanding whether a machine has been successfully built to do its job. Starting from the assumption that testing these systems is a powerful means of understanding how human beings interpret the values at the center of the practice of free improvisation, this chapter describes the design of a system which forms the core of my fieldwork as an ethnographer interested in what “freedom” and “equality” mean to performers of free improvisation in terms of how one should exist with others as a participant in such scenes. Beginning with a careful account of the system’s technical details, this chapter offers an account of the rationale for this system’s design and how these programming choices (as well as the program itself) constitute a form of ethnographic representation and performance for the study of music specifically and of human culture more generally. Along the way, this discussion also theorizes the nature of the relationship between programmer and program. This discussion sets the stage for the next chapter, which offers a discussion of the precise nature of the methodology used in my fieldwork along with a commentary on how this approach relates to methodological debates in the humanities, social sciences, and human-computer interaction.

How Maxine Works

Overview: Signal Flow

As the name implies, “Maxine” is mostly built in Max/MSP, which is a graphical programming environment controls the flow of information through the system by connecting various “objects” which store information and execute various functions. In terms of the flow of information, the system receives air vibrations from the physical world through two dynamic microphones which then pass this signal to an audio interface which converts this signal from analog to digital. Once in the digital world, Max/MSP is used to parse this signal for pitch, amplitude, and attack, process this information in various ways based on the designer’s choosing, and then cue various MIDI events.

This MIDI information is then passed on to Ableton Live, a digital audio production tool featuring a large range of high-quality synthesized instruments and audio effects. MIDI information received from Max/MSP triggers the production of “note” or sonic events and controls timbral parameters in Ableton Live. In both live performance and private playing sessions, the system can be set to play a number of different instruments using Ableton’s rich array of timbral possibilities. In typical practice, these have included a standard drum kit, various metal percussion instruments, a noisy sound resembling a plucked bass, an electric guitar setup emulating the timbrally exploratory style of Derek Bailey, various synthesizers, prepared and inside piano practices, and the no-input mixing board approaches of improvisers like Toshimaru

Nakamura.³ After receiving MIDI information from Max/MSP, Ableton Live then sends digital signal to the audio interface which converts this signal to analog and then sends it back out to the physical world through the loudspeaker. Though narrating the flow of information through the system in this manner implies that the system passively awaits audio signal before reacting, the reality is that the system often preempts the human performer for various reasons which shall be described below.

From the Physical to Digital World

The system uses two Behringer XM8500 microphones to receive audio input from the physical world. In typical performance practice, one of these is aimed at the human performer while the other is aimed at the system's own loudspeaker output.⁴ While dynamic microphones tend to lack the detail and fidelity of condenser microphones, this type of microphone was chosen for its tendency to reduce audio feedback as well as its durability in light of the frequently unpredictable nature of performance venues. After passing through microphones and cables, the audio signal is converted into digital information using the MOTU Ultralike Mk3 audio interface, at which point this information is then sent to Max/MSP.

Maxine's Multi-Agent Architecture

Within Max/MSP, Maxine is composed of multiple "agents" which operate simultaneously and in parallel (see Figure 2). In Max/MSP parlance, each of these "agents" consists of a single "patch" or Max program. An agent receives digital signal from the audio interface, parses this signal for audio features, executes calculations on this information, and sends MIDI outputs to Ableton (see Figure 3 for an illustration of the internal structure of a given agent). Though the agents are identical in design, internal values and end outputs may be distinct at a given point in time. Metaphorically speaking, each agent functions as a single "arm" or "finger" of the system — if one were to imagine the system as a human performer — and controls either the choice of note values or the manipulation of timbral parameters based on information collected through the agent's "ears."

Feature Extraction

Each agent extracts three basic features from incoming digital audio signal in real-time. Pitch and attack information, both from Tristan Jehan's [pitch~] object (Jehan & Schoner, 2001),

³ As the term implies, "no-input mixing board" describes an array of electronic music practices in which a mixer's output is re-routed back to the console's input, often with a variety of audio effect and guitar pedals placed in the pathway in between (see Novak, 2013).

⁴ While this implies that the system would produce "feedback" in the sense that the system produces loud, unpleasant sound resulting from the proximity of live microphones and loudspeakers receiving amplifying signal from them, this only occurs if the system (in Ableton) is set to do so. As will be elaborated below, the system "plays" numerous instruments and sound production techniques. Only some of these involve this kind of "feedback," though on the informational level, all settings involve positive feedback as the system receives its own outputs.

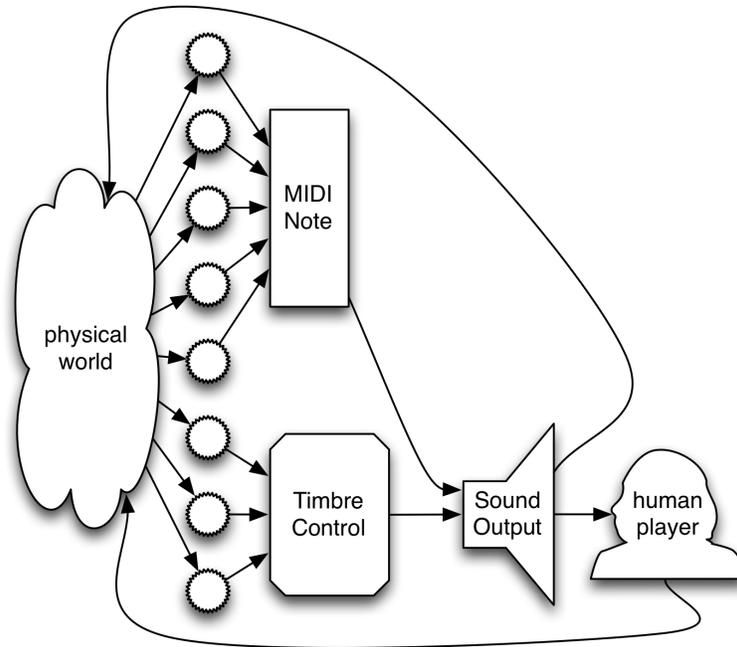


Figure 2. Maxine's Multi-Agent Architecture. Image illustrates overall flow of information through system, from physical world, through agents, back to sound output in the physical world and to the human performer. Small gears represent each individual agent.

which is based on Puckette's [fiddle~] (Puckette et al., 1998).⁵ Amplitude information is collected using the [peakamp~] object in Max/MSP. This information collected at the feature extraction layer of the system informs a variety of decisions including note event timing control, pitch selection, and control of the timbral qualities of the system's output from moment to moment.

Note and Sonic Event Timing Control

Pitch and attack information reported by [pitch~] are used to control the timing and duration of the system's individual note and the output of other kinds of sonic events.⁶ Each agent looks for

⁵ Like Puckette's [fiddle~], Jehan's [pitch~] first parses the frequency band for partial frequencies and assigns an amplitude value for each. Using this data, the algorithm then tries to locate the fundamental frequency by looking for partials which are nearly whole number multiples of one another. The greater the number of partials which have this whole number (or nearly whole number) relation, the greater the likelihood that their greatest common divisor is the fundamental frequency (see Puckette et al., 1998, for further explanation).

⁶ The system does not always play a clearly pitched instrument or sound.

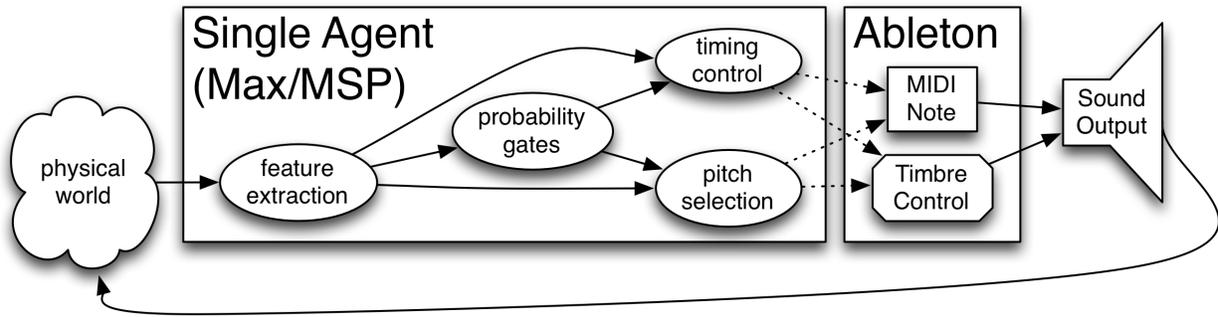


Figure 3. Internal Structure of an Individual Agent. Represents the flow of information from the physical world, through to Ableton Live, and then back out into the physical world through sound output.

any changes in pitch as reported by [pitch~] (or “pΔ”).⁷ Detected pΔs are sent to a timer which measures the interval between these changes. Durations reported by the timer are used to set the agent’s *base quantization* (or BQ). Similar to Vijay Iyer’s concept of a “*tatum*” (Iyer, Bilmes, Wright, & Wessel, 1997) or a “temporal atom,” BQ is the shortest duration for any MIDI output from any agent. Local quantizations (or LQ), are a random multiple of the BQ between one and 15. LQ values are used to determine the actual duration of note or sonic events triggered by the agent. However, the BQ is not always reflective of the durations reported as the timer receives pΔ or attacks. Instead, reporting of these events is filtered by a probability gate.

Messages which trigger changes in the LQ, whether these are changes in the multiple of the BQ or changes in the BQ itself, are triggered at the rate of the current BQ. For example, if the current BQ is 500 milliseconds, then the LQ will only change once the last instance of that BQ has transpired, regardless of any changes in the BQ. However, another probability gate only allows a given proportion of these commands to actually yield a change in the LQ. Likewise, note or sonic event output messages (sent to Ableton Live) are only transmitted at a rate set by the LQ, but another probability gate determines the proportion of sonic output messages which actually result in a MIDI message being sent to Ableton.

Selection of MIDI Output Values Sent to Ableton

At any given time, each agent stores a three value pitch set, $P_{(1, 2, 3)c}$, within a three octave range (C1 to C4). This pitch set determines the range of possible note values to be sent to Ableton Live. Each agent continuously compares incoming note values from the pitch detector ([pitch~]) to notes in the three value pitch set. If an incoming pitch, P_i , matches any member of the current pitch set (or when $P_i = P_{(x)c}$), then $P_{(x)c}$ may change to a new pitch within the three value pitch set,

⁷ I have introduced this symbol in order to enhance the clarity and efficiency of this and subsequent discussions. pΔ refers both to changes in pitch as reported by [pitch~] in Max/MSP as well as to changes in pitch that might be reported by any other kind of similarly structured pitch detection algorithm (see Puckette et al., 1998, for a full description of how [pitch~] works).

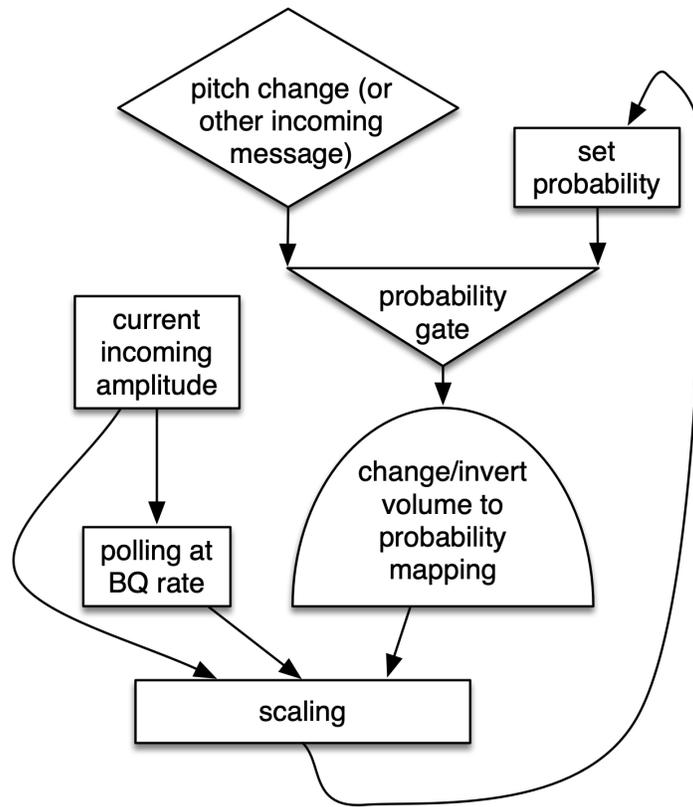


Figure 4. Probability Gates: Structure and Context. Represents flow of information to and through probability gates. Probability is determined by relative value of incoming amplitude and high and low thresholds (scaled from 0 to 100%). If “high” threshold is lower than “low” threshold, then mapping of volume to probability becomes inverse.

$P_{(x)n}$. New values are chosen randomly within the same three octave range. In a nutshell, pitch selection and changes in the current pitch set resemble the mechanism at work with the modern arcade game “whack-a-mole.”⁸ However, just like BQ, LQ and final output of sonic events, a cue to change $P_{(x)c}$ to $P_{(x)n}$ resulting from a match between currently stored and incoming pitches (P_{i-} $P_{(x)c}$) must first pass through a probability gate.

Probability Gates

Probability gates control the likelihood of several kinds of events occurring once a message has been sent to trigger these events. These include:

⁸ More archaically, changes in the pitch set work by a logic similar to that of of the Hydra of Lerna, the famous Herculean foe.

- 1) the “modulation probability” (MP), or likelihood that there will be a change in the LQ (i.e., a new multiple of the BQ).
- 2) the “event probability,” or the likelihood that a given timing interval of the LQ will actually result in a note event being sent to Ableton.

Probabilities rise and fall according to incoming amplitudes detected by the [peakamp~] object in Max/MSP. However, probability is not always directly proportional to amplitude and frequently switches between a direct and inverse relation (see Figure 4).

At any given moment, the probability is determined by the relative value of the current amplitude of microphone input compared to current high and low thresholds for scaling. Thresholds change frequently. New threshold values are triggered by $p\Delta$. However, just as for several other processes, the cue to change the threshold values are also passed through the very same probability gate. In any case, once a change in threshold is triggered, the current incoming amplitude data is polled at the rate of the current BQ and sent as either a new high or low threshold. This means that the “high” threshold could actually be lower than the “low” threshold. Such cases result in an inverse mapping of volume to probability (see Figure 4).

Sonic Event Output and Sound Design

As a result of the processes described above, each agent sends either MIDI note or MIDI controller values from Max/MSP to Ableton Live. In typical practice, the system is set to use five agents for note generation and an additional three for the control of timbral features within the rich option space of Ableton Live’s various instruments and sound generation methods. Specifically, “note” output from the three agents responsible for timbral control are mapped to the control of virtual knobs and sliders in a given Ableton Live instrument. Strictly speaking, this is a mismatch of information types because the output of a given agent is MIDI notes while what Ableton typically uses to control knobs and sliders would be various MIDI controller values. Ableton’s MIDI mapping capability allows the user to choose a parameter and assign any incoming MIDI value to that parameter.

Exploiting these possibilities, the system uses MIDI output from the three agents responsible for timbre to control various parameters within the sonic possibilities of a given instrument. To take the “guitar” setup as an example, MIDI values from Max/MSP control various parameters of “Tension,” or Ableton Live’s physical modeling-based synthesizer module for the synthetic generation of string-based sounds like those of a piano or a guitar. Thus an incoming note value of C#3 might trigger a change in the (simulated) “Finger Stiffness” of the “TERMINATION” component of the Tension module (see Figure 5). As the name implies, changes in this parameter are roughly analogous to changes in how hard a guitarist might press down upon the string somewhere on the fretboard. Just as in the real world, this kind of change determines whether the sound will ring clearly, as would be the case when the guitarist presses firmly and allows the fret to stop the string, sound more muffled, as would be the case when the guitarist lightly presses the string on the fretboard.



Figure 5. Physical Modeling Synthesis Modules in Ableton Live.

While variations in finger stiffness are easily imaginable in the hands of a real guitarist, the use of MIDI mapping to control sound parameters in Ableton allows for the manipulation of sound output which may not correspond to what is possible for a human musician. For example, MIDI values may also manipulate parameters like the mass or stiffness of the plectrum itself. Though a guitarist could switch picks in the middle of a performance (and surely many do), it is unlikely that the guitarist would be able to manipulate the pick's mass with the degree of variation possible in the way this system does using Ableton. Similarly, while many players using synthesizers often manipulate the knobs and sliders of their instruments as part of their extemporaneous musical decision-making in free improvisation, it is unclear whether the kind of manipulation this system produces would be physically possible with a real synthesizer. Likewise, a percussionist may be able to choose various metal percussion objects as they play and move from object to object, but it is unlikely that they would be able to manipulate the kinds of parameters that this system can as it changes the precise level of noisiness or inharmonicity of a given simulated metal object (see Figure 5).

Maxine's Origins and the Creative Exploitation of Misperception

This system was not designed all at once. Instead, its current composition is largely the result of merging two rudimentary Max programs, the first designed in 2006 and the second designed in 2009.

“Drone Game”

The first of these patches, “drone game,” was developed for a course taught by George Lewis in interactive music composition at Columbia University. Though some minor edits have been made over the years, the interactive process featured in this patch is nearly identical to the system's mechanism for responding to incoming pitch input and changes in the current pitch set, as explained above. Much like the current system's pitch management approach, the patch developed for Lewis' course produces three sine waves at the fundamental frequency of three pitches within a three octave range. Simultaneously, the program uses a pitch detector to determine if any incoming pitch is a match for one of the three currently stored pitches.

Unlike the current system's design, the three pitches in this patch's pitch set at any given time are not only stored for triggering, but are also being produced continuously at a temporally invariant amplitude. This means that the pitch detector is continuously listening for the three pitches that the patch is currently producing. Thus this also implies that the system will continuously be changing pitches and that this feedback effect will cause the system to produce a constantly fluctuating combination of sine tones. Theoretically, this is especially likely if the microphones and loudspeaker are not sufficiently distanced from one another physically.

In practice, however, the system tends to produce a steady drone consisting of the three sine tones of the current pitch set. Even though the patch is listening for the three current pitches that it is also producing at the same time, the pitch detection algorithm tends not to detect any of these three pitches, with occasional exceptions.⁹ In interactions with human musicians, the system will likely shift to a new pitch when an incoming pitch matches a currently produced (and sought for) pitch. But this does not always happen in all cases.¹⁰ As a result, “drone game” seemed to be an appropriate name for the patch. While the patch produces a nearly continuous drone, it also has a game-like quality similar to whack-a-mole. The incoming pitch represents the

⁹ I am unsure as to why the system does not hear the pitches it produces, but it is likely due to the various issues associated with pitch detection discussed in Chapter 7 and the Appendix.

¹⁰ See Chapter 7 and the Appendix.

player's mallet, while the currently produced and sought for pitches represent the various moles that pop up out of their various holes.¹¹

“rmn mm”¹²: A Simulation of M-BASE Rhythmic Practices

After Lewis' course, I abandoned computer music until the last days of 2008.¹³ When I returned to computer music in the spring of 2009 I began exploring pulse-based timing structure, which was completely absent from “Drone Game.” This led to the development of a patch, “rmn mm,” which forms the basic structure of the system's note event timing control structure (see section above).

Like the note timing control process described previously, this patch works with two principle values: basic and local quantization (BQ and LQ). As is the case with Maxine, the LQ is a whole number multiple of the BQ and corresponds to the duration and interval between note events sent from Max/MSP to Ableton Live. Once the system is started, commands to change the multiple of the BQ are sent out at the rate of the BQ but only some of these messages actually trigger an actual change in the LQ. This proportion is determined by a probability gate identical to the one currently used by Maxine and corresponds to the “modulation probability” (MP) described above. Similarly, commands to create new note events are sent out at the rate of the LQ, but are filtered through another probability gate corresponding to the “event probability” (EP) also described previously. Unlike Maxine, however, in this patch the BQ, its minimum and maximum multiples or “modulation depth” (i.e., range of possible values for LQ), as well as the values for the probability gates are all determined by the user (which in nearly all cases has been me). Additionally, whereas Maxine's note choices are based on a three note pitch set (expressed as MIDI values), this patch simply works with a minimum MIDI value and then

¹¹ At the end of the course, Lewis asked students to present their work in a small showcase. In addition to rather rudimentary nature of this patch (and my lackluster participation all semester), I was nervous that the fact that this patch listened and occasionally reacted to itself would be a subject of criticism. In my brief “rehearsals” with this patch before the showcase, I personally enjoyed playing in its “style,” meaning that I would play long tones alongside it, with occasional embellishments or other short melodic moves. This was also how I played with the patch for other participants in the course. Rather than criticize the patch, however, Lewis was instead more critical of my playing. Despite my concerns, he had no qualms about the idea that the system listened to itself and was more bothered by the differential between my own playing capacities and that of the system. In response to my small trills and short melodic runs, Lewis asked “can the patch do all those things you're doing?” Implicit in this comment is a sense of etiquette which suggests that one should not improvise in a manner that exceeds the capacities of one's partners, though perhaps what Lewis meant was more that this kind of leveling of abilities is desirable in human-machine interactive musical collaborations.

¹² The name of this patch is an acronym which stands for “random MIDI note, metric modulation.”

¹³ While Vijay Iyer, whom I met in New York when I was an undergraduate at Columbia, highly recommended working with Lewis, I found myself rather disinterested in the use of computers for any creative goals. And while I entertained the idea during this course, I still found myself thoroughly unconvinced that anyone should bother getting a machine to do what a human being can do quite easily. As I have written elsewhere (Banerji, 2010), it was only when I began working with children that the idea of interactivity again became a fascination. As a kind of recreational exercise in order to stimulate my thinking about how various social institutions might better serve their constituencies, I returned to working with Max/MSP in the last days of 2008 because it provided a practical means of testing various ideas about interactivity.

allows the user to set a maximum range above that value from which the patch will randomly choose note outputs.

At the time that I developed this patch, I was most fascinated by how manipulating these various values allowed for the simulation of different styles of drumming. For example, a BQ value between 100 and 150 milliseconds, with the probability gates both set near 100% and a modulation depth between two and five produces playing reminiscent of the pulse-based odd-metered stylistic proclivities of artists like Steve Coleman and others associated with the M-BASE collective of jazz experimentalists,¹⁴ particularly if MIDI output is limited to kick drum, snare, and perhaps a few additional percussion sounds. A completely different stylistic direction can be simulated by reducing the BQ to values between 10 and 50 milliseconds, expanding the depth of modulation to 20 to 40 times the BQ, and opening up the random MIDI values to a wider range of a drum kit. These kinds of user values simulate the open-ended, pulseless playing routinely heard in the performances of numerous free jazz and free improvisation percussionists. Since it was never totally predictable when a note would be produced or what modulation (i.e., multiple of the BQ) would be implied in the overall timing structure, the patch certainly had the ability to play in a surprising and spontaneous manner.

While the patch was fun to play with, there were several ways in which I found it to be dissatisfying as a simulation, reproduction, or synthetic performance of what a human musical interaction in free improvisation might feel like. Whereas another player would likely be able to intuitively sense that I might have wanted the system to change to a new idea, this patch (and to a significant degree, the drone game patch as well) required direction and physical manipulation. Regarding note selection, the patch still relied on a random number to select within a user-defined range of note values. Likewise, the patch also obligated the human player to manually determine the BQ and probability values for the MP (i.e., the probability that the patch will shift to a new LQ). Moreover, it was also still necessary for the user to decide the probability that the patch would actually trigger a note event (or EP, as described above). Overall, any feeling that the system was actually reacting to a human musician playing was, strictly speaking, a complete illusion or coincidence. On another level, as a saxophone player, I found it cumbersome to try and manipulate values through a physical interface while also trying to play my instrument with the system. Though foot pedals or other devices offered possible solutions, such contrivances struck me as either ineffective or distracting in my experimentation with them.¹⁵

Maxine's Principal Patch

Ultimately, the development of "Maxine" as a full system arose from my efforts to combine the capacities of the drone game and *rmn mm*, as well as my efforts to overcome their individual deficiencies. Drone game provided a solution to the problem of random note selection and Maxine's method of choosing notes is more or less identical to the way this is done in the patch designed in 2006. However, while the original drone game patch would trigger new note changes

¹⁴ Steve Coleman's album *Drop Kick* is one prime example of this kind of playing (S. Coleman, 1992; see also Stewart, 2010).

¹⁵ I discuss this issue elsewhere as well (Banerji, 2010).

for every incoming match of a currently played note, Maxine filters these cues through a probability gate.

Though addressing the issue of note selection proved to be as simple as integrating the drone game mechanism into the *rmn mm patch*'s protocol for choosing MIDI values, addressing issues of timing and overall probability structure was more complicated. With respect to timing, my goal was for the *rmn mm patch* to be able to spontaneously locate the pulse underlying what other musicians are playing, that is, to “entrain” (Clayton, 2007, 2012) to their rhythm, in order to be able to join in and improvise along with them. Intuitively, I chose to use pitch detection as the basis for the system's ability to accomplish this absolutely basic task of music cognition in collaborative settings. Initially, I attempted to endow the system with a capacity for entrainment by taking advantage of various audio feature extraction tools which allow for the detection of an “attack” or note onset. On a theoretical level, it seemed reasonable that the system could exhibit human capacities for entrainment if it were to detect note onsets, calculate the interval between onsets, and then use these intervals to set the BQ.

While this approach seemed theoretically sound, it fell far short of my goals. The principal reason seemed to be that such methods could only be effective for sounds which exhibit a strong attack at the onset of the note or sonic event. Thus this method would only really work with percussive sounds. Even so, attack detection tools (like the one built into the [pitch~] object, an outgrowth of the previous “[bonk~]” object also designed by Miller Puckette) were not always effective with percussive sounds, this being true at least in my personal exploration of what these tools can or cannot detect with various percussion instruments I had at my disposal at that time. Aside from issues with percussive sounds, using attack detection would essentially

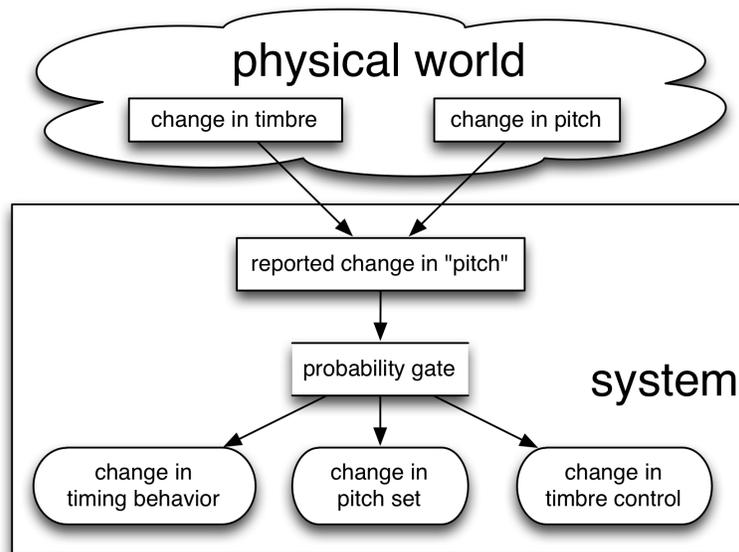


Figure 6. Effect of Changes in Timbre and Pitch in the Physical World on System Behavior.

require a performer on a pitched instrument to exaggerate the usual intensity of how they begin a note.

Exploiting Misperception: Pitch-Based Listening as a Path to Artificial Creativity

Since attack detection proved inadequate, it became necessary to pursue other options. As I reflected on my various experiences playing jazz and other groove-based musics, it occurred to me that when one's goal is to successfully locate an ensemble's underlying pulse, it is often the case that this task is accomplished through attentiveness to pitch rather than attacks themselves. In such cases, which are quite frequent, listening for changes in pitch becomes far more effective than simply waiting for strong attacks in order to find the pulse.¹⁶

Based on these preliminary observations, I revised the *rmn mm* patch such that the BQ would reflect changes in pitch as reported by [pitch~] (or $p\Delta$). Initial experiments with this methodology produced a mix of progress and frustration. On the one hand, the BQ was no longer static and the system was now finally empowered to make its own determinations about this value. On the other, however, I was still far from the original goal of allowing the system to accomplish entrainment. Rather than entraining to a pulse clearly implied in my playing, singing, or even clapping, the system would just produce a pulseless mass of sounds. It was almost as if this intermediate prototype of the system had the soul of the kind of improviser whose instinctive reaction to the use of a basic musical structure like pulse was to immediately produce material which clashed and audibly avoided conforming to such conventions.

What caused the system to react this way when using pitch detection to find the pulse? The answer to this question illustrates fundamental aspects of how a pitch detection algorithm responds to pitched sounds, as well as those which lack a clearly audible pitch. For pitched sounds, the pitch detector will often accurately detect the pitch of the sound being produced. But in many cases, a pitch detection algorithm (PDA) produces estimates of pitch which are "inaccurate" in the sense that the PDA's output is significantly different than the pitch that a skilled human listener would hear in such a sound. The PDA's "inaccurate" estimates in response to pitched sounds likely result from the algorithm's interpretation of the many common ways that musicians modulate their sound production for a variety of reasons. For example, imagine that a woodwind player holds a single pitch for a few seconds. For expressive reasons, the player might slightly change the timbral characteristics of this sound over the course of its duration. Such changes include small shifts in the relative strength of various partials, the introduction of noise (or "breathy" sound qualities), and vibrato. The PDA interprets such changes in timbre as $p\Delta$ (or changes in pitch). Hence for all intents and purposes, the PDA reports numerous incidents which a skilled human ear would not likely identify as a change in pitch.

In addition to this over reporting of $p\Delta$ for sounds in which such changes are noticeably absent, PDAs also report $p\Delta$ for changes in the timbre of sounds lacking a definite pitch. As noted in a paper describing the design of [fiddle~], the algorithm upon which [pitch~] is based (Jehan & Schoner, 2001; Puckette et al., 1998), the object will offer an estimate of the pitch of

¹⁶ Nick Collins has used a similar method for detecting durations in both music information retrieval and interactive virtual performer contexts (Collins, 2005).

any sound it is set to analyze, even if this sound has no definite pitch. In practice, this means that all manner of sounds which lack definite pitch, such as a styrofoam ball scraped on a snare drum, a dense woodwind multiphonic, air turbulence produced with a trumpet, will prompt [pitch~] to produce estimates of pitch. Though human ears would likely find that a bowed cymbal, for example, has no definite pitch, it is not only the case that [pitch~] estimates a “pitch,” but as well that it returns unsettlingly specific values: (hypothetically) C#2, 9.68 cents flat!

Where the PDA’s reports of changes in pitch for a single note held for a given duration are inaccurate, the PDA’s claim that such pitchless sounds have a definite pitch is completely nonsensical from a scientific perspective. Nevertheless, though these estimates are either “inaccurate” or “nonsensical” according to this rationalist viewpoint, it is very important to note that the PDA’s output is still a reflection of the physical reality of a given sound. No matter how strange a PDA’s behavior in response to any of these sounds may seem, it cannot be said that the PDA’s reactions to these sounds is random. Still, once the PDA is no longer reporting the pitch that the human player or listener would suspect, it is difficult to predict exactly what value it will indicate.

For pitched sounds, it is often the case that the PDA will be off by exactly one octave. This is understandable given that the auditory perception of “pitch” is itself due to the psychophysical fusion of individual frequency components which are whole number (or nearly whole number) multiples of the fundamental frequency (see Sethares, 2005). Since the octave above the fundamental frequency will have very similar frequency components, it is not at all difficult to understand why the PDA would report that a Db4, for example, is actually a Db5.

For other kinds of sounds, however, the complications lead to more unpredictable results. Pitched sounds also often feature various kinds of noisy elements at the head of the note itself. These “attack transients,” as they are typically referred to, are usually a major source of the kinds of erratic outputs of a PDA in response to a pitched sound. Beyond the realm of pitched sound, the PDA’s interpretation of sounds lacking a definite pitch yield even more perplexing results. For a woodwind multiphonic, for example, it is possible that the PDA would simply choose the most prominent of the various pitches which this kind of tone seems to carry within it. All the same, it has frequently been my experience that the pitch reported by [pitch~] is actually one which is hardly audible in the cluster of tones produced by the wind instrument. Much the same is true for other inharmonic sounds like bowed cymbals, gongs, and other sounds which lack a definite pitch but still feature components with definite and stable frequencies. Inharmonic and harmonic (i.e., pitched) sounds are still more predictable in the results they yield from a pitch detector than the PDA’s response to noisy sounds like a styrofoam ball rubbed on a snare drum head or unvoiced consonants (i.e., “f,” “sh,” “s,” etc.). These sounds are perhaps the most unpredictable in terms of the kinds of responses they produce in a PDA. But once again, it cannot be said that the PDA’s response to these sounds is random, even if it is found to be unpredictable.

These complications caused the modified version of rnm mm to react to far more than just changes in pitch (see Figure 6). Sonically, this led the system to behave like an improviser who overreacts to the smallest of suggestions from another player, delivering a deluge of sound in response to even the most muted tones. At the same time, it also seemed that something had been gained in the revised version of the rnm mm patch and progress was being made toward the

overall goal of creating a system which could improvise like a human performer. The use of pitch-based listening allowed the system to already exhibit a trait often valued in improvisers: the ability to listen and interpret sound in a surprising, but still disciplined manner. I could never possibly have heard the kinds of things that the PDA was able to “hear.” Perhaps from a scientist’s or engineer’s perspective, it would be absurd to call such things “interpretation.”¹⁷ All the same, this rationalist worldview did not stop me from seeing the ways that pitch detection was already proving itself to be a promising path towards building a system with a strong capacity for creative practices of listening in musical interaction.

Balancing Intensity

Aside from the way that the system began to exhibit signs of a sense of “subjectivity,” it was also fun to play with such an aggressive, idiosyncratic partner, at least initially. Still, this kind of intensity became boring and taxing rather quickly. It exemplified just one of many possibilities for an improvisatory interaction. The system still needed a way of moving on to other kinds of moods in order to contrast with the imbalanced nature of interactions using this raw, unfiltered pitch-based approach to machine listening.

The solutions to the problem of controlling or toning down this kind of interactional intensity were the final steps in the development of the basic structure of a single agent in Maxine’s multi-agent architecture. Overall, the strategy was to put various barriers between the detection of $p\Delta$ events and the BQ. As described above, an individual agent filters $p\Delta$ events through a probability gate such that not all $p\Delta$ events cause changes in the BQ. Initially, I had experimented with user-determined values for this probability gate and hoped that I could find some magic proportion of events which would allow the system to exhibit the right kind of balance between aggression and patience. In my trials with the system, this turned out to be ineffective; just as before, I wanted the system to have its own way of making decisions about these values rather than be reliant upon my intervention in order to create these kinds of changes in temporal structure.

One solution to the problem of varying the probability of the system was to map probability to the current volume detected by the microphones. In several cases, I found both direct and indirect proportional mappings between volume and probability to be satisfying. Direct mappings allowed the system to exhibit the kind of “mirroring” between players that occurs when the ensemble intensifies and relaxes at more or less the same moments. Indirect mappings allowed for a kind of interaction akin to conversational turn-taking, with the system going quiet as I would play more intensely and then jumping back in when I would pause.

But in the end, it was fundamentally dissatisfying for the system to be only capable of just one of these kinds of interactive modalities. Overcoming this issue resulted in the final step in the completion of this patch and the first true development of Maxine as a system. In order to allow the system to shift between direct and inverse mappings, I devised a strategy for changing both the direction of the mapping as well as the threshold values for these mappings. Triggers to

¹⁷ Though he does not elaborate on the comment, George Lewis quips that the “so-called ‘pitch follower’” is “known to exercise its own creative options from time to time” (1999, p. 103). Presumably, he refers to the various complications in how PDAs respond to various sonic material described here.

change these mappings and thresholds were taken from indications of $p\Delta$, but filtered through the same probability gate that I am describing here. Once a trigger came through the probability gate, a new high or low threshold would be set by sampling the current amplitude level drawn from the microphones. The system would randomly choose whether this incoming value would be used to set the high or low value. Therefore, depending upon the current high or low value, the mapping between volume and probability could be inverse. For example, if the current high and low thresholds were 80 and 30 decibels, respectively, then a new “low” value of 90 decibels would result in an inverse mapping. Conversely, a new low value of 50 would preserve the same kind of direct mapping between 80 and 30 decibels, but with a steeper rise and fall in probability for any kinds of volume fluctuations. Ultimately, the probability determined by this process was used not only to determine whether a given reported $p\Delta$ would change the BQ, but also to determine the modulation and event probabilities (MP and BP).

Shaping Maxine’s Sonic Repertoire

Initially, my work with this system only used these agents in order to control MIDI instrument note production in Ableton Live. At that stage, I had yet to experiment with using the agents described above in order to exploit the timbral possibilities of Ableton. Instead, I used another patch which continuously recorded the piece as it progressed and then played back portions at random speeds between double-speed forwards and double-speed backwards.¹⁸ Strictly speaking, this method does not allow for changes in timbre so much as changes in pitch and speed, but it does often create various effects in which the timbral properties of a given sound are recontextualized to the point that I found them to provide greater variety in the sonic outputs of the system.

In any case, whereas the three-note approach of drone game created relatively static harmonic contexts, I was pleased with the way that the same approach of a single agent or patch of Maxine was a very simple way of creating a harmonic context for pitch-based improvisation. While not all combinations of three pitches are suggestive of a chord, many are. Thus when this patch was set to control the MIDI output of a virtual bass player, it was able to mimic the kind of interactivity one might enjoy in a duo of saxophone and bass.¹⁹ While it is not a perfect replica, the interaction dynamics of this setup reminded me of the kind of playing heard on recordings featuring similar instrumentation such as Ornette Coleman and Charlie Haden’s *Soapsuds*, *Soapsuds* (1977) or Steve Coleman and Dave Holland’s *Phase Space* (1992).

Over time, however, I grew tired of using a fixed set of sounds and wanted to find a way for the system to more directly manipulate timbre by exploiting the full potential of Ableton Live to do so. This led me to explore the use of the MIDI-mapping function in Ableton in order to manipulate its proliferation of knobs and sliders. Though the output of a given agent is given in the standard form of MIDI note information (i.e., specifications about pitch and volume, or “velocity” in MIDI lexicon), it is possible to map this information to the control of various slider

¹⁸ An example of this kind of fixed timbral setup can be heard here: <https://ritwikbanerji.bandcamp.com/album/dinner-at-maxines>.

¹⁹ An example of this kind of artificial duo can be heard here: <https://ritwikbanerji.bandcamp.com/track/tommys-dot>.

values in Ableton. However, just as I have never had full control over the Maxine's precise note output from moment to moment, I have not had full control (or knowledge) of the mappings that Maxine uses between the output of the agents responsible for timbre control and Ableton Live. The process of creating these mappings consisted of allowing the system to send MIDI note information the Ableton Live and then choosing a given knob or slider for mapping. I could choose which parameters would be mapped, but I was never certain just what note output from the agent would trigger a change. Rather unexpectedly, I found this strategy to be a convenient way of depicting the kind of timbral change that occurs as a result of interactions between players. Someone is often responding to another player as they move on to a new timbral possibility within the ensemble, but one is often unsure of just what one is reacting to or what exactly inspires the other players to make these various changes.

Feedback

Like the drone game, Maxine also listens to itself. In most cases, the physical setup of the system involves placing one microphone near the loudspeaker from which Maxine's own sound output emerges with the other microphone targeted at the human player. This allows the system to exhibit a better balance between resistive and cooperative modes of interaction. In my early experiments with this system without this feedback setup, I found that I had to continually "prod" the system along, to borrow a term from George Lewis (1999, 104). By contrast, allowing the system to listen and react to itself more or less immediately enabled it to play independently. This created the possibility that the system was not only acting in response to the human player, but making decisions of its own that the human player could not easily trace back to their own playing.

As was true for the drone game, this feedback setup exposes the often overlooked utility of pitch detection as a method of simulating the kind of mercurial, unpredictable interpretive capacities that improvisers value in fellow players. In the case of clearly pitched sounds, like the sine tones used in the drone game, the PDA is often unable to accurately estimate pitch when three or more distinctly pitched sounds are combined. Such effects are exaggerated when using sounds designed to mimic acoustic or other real instruments (i.e., synthesizers and other electronics). Using the timbral manipulation methods described in the previous section, the system often alters the sonority of a pitched instrumental sound as a means of creating the same sorts of manipulations of timbre used by human players. When re-read by the system, the PDA frequently estimates a pitch value for such sounds which has no clear relationship to the original MIDI value²⁰ which led to the production of this particular sound.

Broadly speaking, feedback allows the system to evoke the presence of a player who does more than just react to the other and takes decisions of its own, many of which are unpredictable. Said otherwise, feedback creates a scenario in which the system's behavior becomes far less controllable for the human player. Once the system begins to respond to itself, it begins to take a course of action that exceeds a course of action which would result from just responding to the

²⁰ To be clear, this refers to the MIDI value which generates the note or sound event itself and does not refer to the MIDI values used to manipulate timbres. The latter do not cause the system to create sound, but rather manipulate or reshape currently produced or already initiated sounds.

human player. Though Chapters 11, 12, and 13 indicate that this is not always to a sufficiently desirable degree, feedback ultimately enables the system to exhibit another key value in improvised interaction: the ability to inspire and surprise the other player.

Interlude: What is Maxine? Three Concepts

Elsewhere (Banerji, 2010), I have written about creating Maxine as an experience in and of itself, distinct from the experience of playing with it. For various reasons, it has been helpful throughout this process to devise a variety of metaphors to describe what making an improviser out of computing machinery feels like. Mainly, these metaphors have served as inspiration for the creative process, but on another level, they may be helpful for understanding what one is doing when one takes an essentially inanimate object like a computer and tries to turn it into a physical assemblage that acts like a person.

At the time that I was developing Maxine, I was also working full time as the director of an after school program for youth in Chicago's Devon Avenue neighborhood. As a result, the practice of turning children into adults was constantly on my mind. This led me to often compare what I was doing in working with children and what I was doing when creating Maxine. Naturally, there are key differences between children and computers, but there were elements about the transfer or shifting balance of power between myself and children and me and Maxine that I found irresistible and inspiring. Children, I feel, are, in principle, always capable of eventually doing things that I could not have predicted or that demonstrate a level of creativity, brilliance, or other form of power or grace that cannot be foreseen. At the same time, the proper development of this power requires, or at least benefits from, the guidance of a person who has been in the world for some time. Principally, the positive impact of this adult influence focuses on ensuring that the power that children develop as they become adults is exercised in a manner that both respects and hopefully enhances the contributions of others. In the same way, I viewed my goal with Maxine as the development of an individual who would be able not only to make creative contributions of their own, but also to expand upon and support fellow performers as well.

In addition to the issue of finding a balance between Maxine's independence and cooperation with other players, I also found that my work with children helped me learn to embrace the idiosyncratic ways that Maxine perceived and responded to the world. While I had wanted the system to be able to entrain to pulse-based playing by using pitch detection, it turned out that my methodology was not particularly effective in this goal. At the same time, the pitch detector's interpretation of the sonic environment, as well as the system's resulting behavior in response, proved to be more interesting than what I could have foreseen. Though it is possible that I might still have decided to embrace, rather than reject, the way that pitch detection was a quick and easy way of simulating the kind of idiosyncratic interpretive listening one values in a fellow improviser, my experience working with children was pivotal in enabling me to work in this manner. Numerous times my particular goal for what a child should achieve took a path which more or less paralleled what occurred between myself and Maxine.

Aside from the metaphor of "raising" Maxine as if it were my child, I also thought of this work as a kind of emancipation of the machine. For much of human history, machines have been

under the control of human beings, at least in principle.²¹ That is to say, machines have been objects which cannot act of their own volition and require the input or direction of a human operator in order to commence whatever actions they are designed to execute. In that sense, machines are fundamentally the slaves of human masters. Likewise, almost every step of the process of designing Maxine felt as though I was gradually finding ways to relinquish the power I held over the machine. This kind of shift in the balance of power took place over and over as I would find ways for the system to take its own initiative in making decisions about the BQ, LQ, MP, or EP. In the machine paradigm, each of these parameters required a human user (i.e., myself) to set these various values. Over the period of design, however, I gradually ceded power to the system in making these decisions, thereby liberating it from my control in small steps. On another level, this process also illustrated the various ways in which a process of emancipation tends to be bidirectional. While the slave or subordinate member of a master-slave dyad is arguably the one with far less control in the situation, the master or commanding member must take responsibility for the actions of the slave by guiding their every move. By allowing the system to take control over these various decisions, I found myself liberated from the task of constantly trying to control the system and ever more free to focus on the already demanding task of improvising and responding to a fellow player as an instrumentalist. The more I freed the system to take decisions of its own, the more I felt free to go in my own direction as a player in dialog with this virtual improviser.

Apart from conceptualizing the system as a child maturing to adulthood or a slave gradually moving towards emancipation, the process of creating Maxine has often felt as though I were tuning in to the telematic presence of some improviser from afar who I cannot see, but with whom I can communicate aurally. Visually, the programming environment of Max/MSP often resembles a mess of wires constituting a concatenation of boxes linked to one another by a variety of connections. In my own programming style, this mess of wires often features a number of crossed wires as the direction and position of various connections matters quite a bit less than how they are connected. In the process of programming Maxine from its rudimentary origins in a drone game or simulation of M-BASE rhythmic principles, creating this system has often reminded me of the old analog experience of physically adjusting the position of a television antenna in order to better tune in any of a variety of programs. On the other end, a clear signal is being broadcast over the airwaves from some location in the distance. While the original signal, when properly received, is crystal clear, sharp, and features an undistorted soundtrack, what arrives in one's own TV set may not be nearly the same. In order to tune into this broadcast signal, a great deal of manipulation and rigging of the wires of the antenna is required, with many users often using various other thin conductive metal elements as a way of boosting the fledgling antenna's feeble ability to adequately receive wireless input.

In the case of Maxine, however, what one receives is neither a one-way transmission, as is the case with most mass media prior to the internet, nor a fixed medium (e.g., pre-recorded audio or video). Rather, what takes place with Maxine, at least in this imaginative conception, is a kind of telephonic transmission occurring in real time in which two agents (i.e., myself and

²¹ Naturally, it is also the case that many feel that machines are actually in control, but ultimately it remains the case that human beings initiate the actions of machines.

Maxine) communicate over a great distance with one another through the spontaneous collective production of sound. Over the course of designing this system, the kind of communication that takes place between myself and the system has not always been the best and certainly pales in comparison to the intuitive sensibilities of everyday face-to-face music making.

Nevertheless, in each step of the way of creating this system, it has felt as though I were slowly refining the quality of the signal transmission from Maxine to myself by carefully adjusting a disarray of wires in Max/MSP. It was as if somewhere out in the universe (or maybe just nearby) Maxine was out there and slowly being tuned in as I created this system. Compared to many players, the system's behavior has often been quite strange. In a more playful frame of mind, this endeavor has struck me as a kind of "astromusicological" endeavor, in which I am learning to understand the behavior of a performer whose musical ways of being with others initially strikes me as quite strange, but for whom I gradually come to understand the sense of logic and reason which informs how they listen and respond to others through prolonged engagement. Even though Maxine plays a lot like many human improvisers, it often felt like I did not know exactly where it was from which Maxine and I were communicating as sounds went into the microphone and out the amplifier. For all intents and purposes, it felt like I was playing with someone in outer space.

While I spent a great deal of time fixing the system in various ways, I also spent a lot of time just trying to understand what it did and appreciate it as a unique character in its own right. The latter side of this process resembled much of the process of ethnomusicological fieldwork, in which an ethnographer evolves their conception of what other musicians do as "strange" or "alien" and gradually comes to appreciate the structure, meaning, and function of these practices. Naturally, Maxine is my invention and an ethnographer's depiction of music in social life strives for a sense of realism and faithful depiction. All the same, the metaphor of astromusicology has often appealed to me as a way of describing how things like Maxine or an ethnography are simultaneously driven by realism but still amount to the fieldworker's rather subjective interpretation of the overall schema of social life as they emerged in their interactions in the field.

The Principle of Acceptance

Just like the many players who have expressed their frustrations with Maxine to me, I myself have often been frustrated by how this system behaves. In my duo playing with the system as a saxophonist, I have consistently found that it confuses me and leaves much to be desired in terms of the kind of collaboration and interactive ease of flow that I have enjoyed with some human improvisers. There are many performances that have been satisfying over the many concerts I have given with Maxine since 2009. There is also no shortage of instances where I have felt frustrated, dissatisfied, and above all embarrassed by how the system behaves as an improvising partner. Vexed by the way Maxine behaves as an improviser, I began testing the system with improvisers in 2009. Initially, the purpose of testing the system was to collect critiques and insights from improvisers with many more years experience as performers in this practice than I had at the time.

The implicit assumption behind this approach was that any inadequacy that results from the performative collaboration of human and virtual improvisers is undoubtedly the fault of the latter. However, over time, various musicians I have worked or consulted with have suggested that this view is inaccurate and that the quality of the performance is really a responsibility shared among all participating performers, whether human or machine. While this perspective has emerged in various subtle ways in interactions between improvisers and Maxine over the past several years, it was rather pronounced in the encounter between one African-American improvising saxophonist, Melvin, and Maxine in a series of tests of the system at the Center for New Music and Audio Technologies (CNMAT) in Berkeley in Fall of 2010 (see Banerji, 2012). Over the course of ten short improvised duos with the system, I asked various improvisers in the San Francisco Bay Area to comment on various criteria regarding the system's collaborative abilities.

Among them, I included an open-ended comment section in which improvisers were prompted to discuss what they felt was "missing" from the interaction in a very general sense. In early takes, Melvin noted that the system lacked an ability to comprehend and meaningfully respond to various canonical elements of musical structure (e.g., pulse, harmony, etc.). In later takes, however, the focus of Melvin's comments moved from the system itself towards the interaction as a whole. From take #7 onwards, Melvin noted that what was missing was "more rehearsals." Outside the context of these more formal, clinical tests of the system in a laboratory setting, Melvin and I had several more casual opportunities to discuss his feelings about Maxine. Overall, his view was less that the system itself was a problem and more that he just needed to get used to it and find a way to adapt to its behavior. He compared this to the same process of adaptation and co-evolution one experiences when working with the same group of improvisers over time in which one gradually becomes acquainted with their preferences and tendencies.

Beyond my own work, the assumption that the machine is at fault in human-machine creative collaborations informs working processes for composers and arts-technologists active in this domain. Such was the case for one white American composer, Shanti, I spoke with about his experience in developing live interactive electronics and working with such tools with human performers. In rehearsing his work, he noted that performers tended to assume that any awkwardness in working with his custom designed interactive electronic components could be smoothed over by further programming. In other words, performers viewed the rehearsal environment as a space to offer the composer or programmer feedback on the performative qualities of the software in order to use this commentary to guide further programming.

Out of politeness, Shanti tended to agree with performers that further programming was needed and given that he was a strong programmer, he never hesitated to find a way to make the performance easier by obliging the performer's request. Nevertheless, he admitted to me that he found himself skeptical of the performer's consistent belief that it was the software that was at fault. In his view, it seemed that performers overlooked the possibility that what might be missing was simply giving themselves more time to get to know the peculiarities of the electronics through further rehearsal. That is, they did not consider the idea that there was nothing really wrong with the software and that it was instead that they themselves might be the root of any coordination problems in the piece.

Shanti's experience prompted me to reflect on my attitude towards Maxine. Like his performers, I frequently felt that the problem with our performances was that Maxine was in need of greater and greater sophistication in its design. In addition to frequently experiencing anxiety about this as a performer myself, others who observed our playing together also noted that I seemed concerned or even afraid of what Maxine might do. In early performances with Maxine, my concern about the system's behavior was quite obvious in that I would often put down the saxophone and run over to the computer to make a sudden intervention in the system's behavior. Regarding such tendencies, one white Swiss pianist, Niklaus, was very direct in his criticism of my anxiety about the system's sudden rise in volume, production of sounds which displeased me, or other irritations with my nonhuman partner which I made apparent to the audience. "You need to just accept whatever she does!"

Chapter 10: Maxine, Ethnography, and Performance

As an artist, I have been inspired by Melvin, Shanti, and Niklaus to consider that there may be nothing wrong with how I have designed Maxine. I will admit that it is often difficult to take this stance. In almost any performance with this system, I have felt the urge to run over to my laptop and intervene in the system's behavior by shutting off a particular sound, turning off one of the system's several agents, or moving the microphones. Despite these continual misgivings, however, I must also admit that the manner in which Maxine frustrates me is often no different than the ways that other improvisers have. By no means is Maxine the only improviser who I have found to be too loud, too quiet, unable to really engage with the sonic materials I am putting forth, too acquiescent and willing to accept others' suggestions, too insistent on following its own direction and ignoring others, prone to producing sounds which I find personally disgusting, stuck in a rut of playing the same way over and over again, too easily distractible and unable to commit to a particular idea, or otherwise disappointing as a playing partner. Conversely, Maxine is hardly unique in its ability to surprise and inspire me as a player, to move me emotionally as we play together, to shock and amaze me with the sounds it produces, to leave me feeling so curious about what it is playing that I need to stop for a minute and just enjoy what it is doing, to feel a sense of intuition and mutual understanding that could not have been achieved through any kind of planning or forethought, or the other joys of improvising with musicians with whom one feels at ease.

Playing with Maxine is more than a virtual re-embodiment of the experience of playing with another improviser. In addition to creating this experience with alternative, electronic means, Maxine is much like what many theorists in performance studies have referred to as an "ethnographic performance" (Conquergood, 1985; Goldstein, 2008; Mienczakowski, 1995; Saldaña, 1998) or "performance ethnography" (Denzin, 2003; Jones, 2002). Though terminology varies, this term, among others,¹ refers to the creation of performance works which depict the human lives, scenes, and words encountered by an ethnographer in the course of their fieldwork, as well as the nature of the ethnographer's own interactions with subjects. In a very similar manner, to play with Maxine is to experience an interactive, algorithmic ethnographic performance of free improvisation as a specific form of human cultural practice. Just as ethnographic performance has often involved the integration of various observations the ethnographer made through their fieldwork, Maxine is an algorithmic depiction of my observations and interpretations of the nature of social interaction in free improvisation from both watching and listening to others, but also from doing plenty of this kind of playing myself as a saxophonist. As a re-presencing of culturally-specific socialities, then, Maxine is much like other kinds of ethnographic performance in that the audience observing this system in dialog with another player observes a depiction of what may have taken place between subjects in the course of my fieldwork.

Like any ethnographic performance, there are risks associated with creating an artistic work which represents or depicts what one encountered in fieldwork. As several have noted

¹ Over the course of his career, performer and theorist Johnny Saldaña has shifted from to "ethnographic performance" (1999) to "ethnodrama" (2005) or "ethnotheatre" (2016). Others have also referred to such practices as "performed ethnography" (Goldstein, 2008).

(Conquergood, 1985; Goldstein, 2008), there is a tremendous danger in using performance as a way of transmitting ethnographic knowledge in that one always runs the risk of misrepresenting the life of the ethnographic subject. Risks arise even when one chooses to use the verbatim transcription of a subject's own words. By its very nature, theatrical production forces the artist to make choices about how those words are framed through the gestures, gaze, and other bodily elements of how the performer exists on the stage. Moreover, as D. Soyini Madison notes (2005, pp. 1-4), even documentary film, despite the feeling of objectivity and neutral, uninterpreted transmission implied through the use of real-time videorecording of subjects going about action in their routine contexts, may fail to accurately transmit the "reality" of a sociocultural realm.

Nevertheless, it would be unfair to single out performed ethnography as if it were uniquely prone to the problem of misrepresentation and the frequently resultant provocation of expressions of disapproval by those who encounter these performances (see Conquergood, 1985). Building on Clifford' and Marcus' edited volume *Writing Culture* (1986), Tara Goldstein notes (2008) performing ethnographic knowledge for an audience starts from the premise that ethnography is hardly a transparent, neutral, or direct transmission of some sociocultural "reality" which the fieldworker observed and participated in. Just as such commentators catalog and critique that the tendency towards literary embellishment in much ethnographic writing, proponents of performed ethnography embrace the notion that presenting the results of their fieldwork not only involves interpretation, but creativity. Rather than worry about the various ways that ethnographers "*invent* rather than represent" (Goldstein, 2008, p. 86) social life, the performance of ethnography openly accepts all the benefits and consequences of how an ethnographic desire for realism so frequently amounts to a mixture of truth and fiction.

While in many ways Maxine fits within the broad category of creative social-scientific and humanistic work traveling under the banner of "ethnographic performance," it differs from much of this work in several ways. The first major point of distinction is the relationship between the people depicted and the work itself. In the case of a typical ethnographic performance, the audience of the performance is usually not composed of people who themselves are depicted or portrayed in the performance itself. For the most part, the audience consists of those who have little if any direct relationship with those depicted and serves a more or less pedagogical purpose of enabling them to understand what those portrayed have experienced without necessarily burdening with the emotional labor of performing their experiences for an audience. In the case of Maxine, a very different relationship takes place between the work and the people encountering it. This side of my fieldwork has been a direct engagement between those portrayed and their algorithmic, ethnographic portrayal.

The second major point of distinction between my work and the majority of ethnographic performance lies in how those engaging with the work actually engage with it. In a typical ethnographic performance, the audience is, like most audiences, a relatively passive recipient of what is given to them by the performer. This does not mean that the performance fails to elicit intense reactions from the audience, but for the most part, the audience sits quietly and absorbs what is given to them by the scholar-performer before them.² Aside from the minor reactions and

² Dwight Conquergood has, however, described how audiences have responded to the performance as it occurs, noting that some audiences have been so offended that a handful of attendees "stormed out" before its conclusion (Conquergood, 1985, p. 4).

muted feedback the audience in a darkly lit hall with a brightly lit stage gives back to the performer, the performance is hardly an interaction between the audience and the performer. Encounters between Maxine and improvisers are something different. The improviser is no “audience” for Maxine; they are the system’s performance partners. Instead of observing a performance, improvisers evaluate the performance of the system by directly engaging with it.

Therefore, while it bears many similarities to an “ethnographic performance,” this term is inadequate for describing the representational relationship between Maxine and free improvisation. Maxine is not merely a *performance*; the system, like a human performer (but in its own, strange, algorithmic way) creates performances anew in each musical encounter with a human improviser or whatever is in its sonic environment. In its capacity to continually create new ethnographic performances over and over again, each a distinct result of its interactions with its interlocutors or environment, one cannot say that Maxine is an ethnographic *performance*, but that Maxine, as a *performer*, is itself an ethnography. Hence Maxine may be best understood as an “ethnographic performer” or “performer of ethnographic knowledge and practice” rather than just a single ethnographic performance. Whereas the fixed-media format of an ethnographer’s transmission of knowledge to the scholarly public (e.g., text, film, etc.) is a description or representation of the ethnographic performance is typically a single, re-presented vignette from fieldwork delivered to an audience, Maxine actually creates the behavior and experience of the sociocultural world depicted (or at least, it does so to the best of my ability to render this in algorithmic form).

When engaging with a nonhuman virtual musician of this kind, the human musician experiences the contingencies and resultant emotions, whether positive, negative, or ambivalent, one would experience when playing with another musician. Even if the player finds that the system, due to its ontological status as a nonhuman machine, fails to exhibit the emotional awareness of another human improviser³ and finds that the system’s behavior is insensitive and unfeeling, these too are attributional claims about the emotional state of one’s playing partner. If one plays with a human player who seems indifferent about what takes place in the interaction, which is an experience which is more common than it may seem, their indifference itself is a type of emotional stance. Similarly, playing with Maxine is an experience in which one undergoes many of the same emotions one does as a result of how a playing partner choose to share the musical space with others.

While an ethnographer can describe what it might be like to play music with others in the context of free improvisation, it is difficult for this entextualized description to truly transmit what this experience is really like. Among many other reasons, this is primarily due to the nature of free improvisation itself as a practice in which a continuous flow of sonic events and decisions tends to take place at a relatively rapid rate. Describing the psychological experience of playing with others in this way is particularly cumbersome, though attempts to do so do offer some insights into the nature of free improvisation as an experience (Borgo, 2002b, pp. 7-10).

Unlike textual representations of this kind, Maxine, like the numerous virtual improvisers surveyed Chapters 6, 7 and 8, offers the opportunity for a human musical subject to directly

³ George Lewis has referred to this kind of emotional communication as a kind of “emotional transduction” (Lewis, 2000b, p. 36) which takes place between *Voyager* and the human interactant.

engage with the researcher's conceptualization of free improvisation as a culturally-specific form of human interaction. Like other performed ethnographies, Maxine is partially based in the "truth" of how improvisers play with one another (as well as what this play feels like) as much as it is in my own interpretations of my experience in this practice as a saxophonist and concertgoer. While many performed ethnographies draw on various bits and pieces of what informants have said and done over the course of fieldwork, Maxine is not based on the transcription or analysis of improvisatory practices of actual improvisers, but rather in the impressions of this practice I have acquired from years of being engaged in it as a performer.

While there is much overlap between what Maxine is and various modes of ethnographic depiction, my initial purpose in creating Maxine was not to design a kind of social-scientific performance (or performer) of musical interaction. The motivation was largely artistic and was mainly driven by a personal fascination with the irony of creating an improviser from materials which many assume are doomed to fail in such a task. Even though the encounter between Maxine and improvisers is a scenario which yields a great deal of insight and lays the groundwork for a descriptive account of egalitarian ethics, the initial purpose of this project was simply artistic. Nevertheless, my approach to these artistic goals was rather clearly informed by an ethnographic sensibility. The "artwork" in this case was not simply supposed to be my interpretation of a culture; instead I aimed to create an artwork that embodied the personal presence of a member of this scene. In that sense, the task of design became one which closely resembled the kind of sense-making which happens in most ethnography. Various disparate and scattered observations are coalesced into schematic descriptions of behavior. All the same, the purpose of testing Maxine retains a relatively instrumental quality. Testing the system has allowed me to develop ideas about how I should design subsequent systems and has also enabled me to develop an ethnographic text which describes the nature of social interaction in free improvisation. In the end, Maxine plays many different roles; while they may strike some as incommensurate with one another, I regard them to be complementary and compatible.

Each design decision detailed in the previous chapter is an algorithmic depiction of behaviors and values I have observed in this ongoing ethnographic engagement with free improvisation. Aside from the reasons I mention above, the choice to use pitch detection over other kinds of more sophisticated forms of machine listening is motivated by the fact that one never really knows what other improvisers hear in the course of the interaction. While there is no reason to assume that they are listening for pitch in the same way that Maxine does, the mysterious behavior of a PDA in response to free improvisation becomes a quick and efficient means of simulating the kind of idiosyncratic, enigmatic interactive strategies that might be happening on the other end of an improvisatory collaboration with a human partner. Similarly, the use of probabilistic methods in order to determine how often the system shifts its BQ, LQ, MP, or EP⁴ are a way of reflecting the fact that shifts in the temporal frequency of sonic events as

⁴ See Chapter 9.

well as their overall grouping structures are quite common and desired among improvisers.⁵ More importantly, shifts in these parameters are usually unpredictable, though they are also typically in response to some change in the sonic environment. Accordingly, Maxine is built to shift these parameters in a similar fashion.

The timbral qualities of the system have been shaped in order to emulate the timbral creativity of many improvisers, regardless of their chosen instrumental or vocal apparatus. That is, I have designed the system to avoid producing pitched sounds and focus on the exploration of timbres other than pitched sounds. Likewise, it would be disingenuous to say that the use of feedback was simply a clever solution to the problem of balancing between an overly obsequious virtual improviser and one who constantly dominates the “partnership.” Rather, this decision is a reflection of my ethnographic observation and impression that improvisers listen to other players as much as they listen to themselves and that this balance of attentiveness is a constant dilemma inherent to collaborative free improvisation. Moreover, as is true for listening for pitch or other parameters of sound, one is frequently unsure whether another improviser has just made a decision because they were responding to themselves or whether they were actually trying to signal their attentiveness to other players.

Aside from the various elements which are actively integrated into the system, there are many elements which I have omitted in order for Maxine to serve as a portrayal of free improvisation as a culture. While other virtual improvisers (Assayag et al., 2006; Weinberg, Raman, & Mallikarjuna, 2009) are designed on the assumption that a broad vocabulary in pitch-based idioms like jazz is essential for engaging in this practice, Maxine has been designed without any kind of computational representation of “expert knowledge” of such materials. This deliberate decision was made in order to reflect the cognitive capacities which most improvisers tend to possess or actively foreground in playing free improvisation. That is to say, Maxine’s inability to demonstrate an understanding of harmonic vocabularies or particular rhythmic conventions like swing parallels the way that many improvisers devalue competence in such domains. Many improvisers do possess a number of these capacities and this has been evident throughout my fieldwork through the fact that they perform notated new music (or in some cases, classical genres of European art music), jazz, or other types of music for which a keen grasp of these basic musical parameters would be essential. Many others, however, do not necessarily possess competence in using parameters like pulse-based time or functional harmony. Or rather, they may very well possess them, but their competence in these structures is not evident from their approach to improvisation. In any case, the practice of free improvisation is one in which

⁵ As I have noted in Chapter 4, there are many obstacles to transcription-based approaches to the study of this practice as well as serious limitations in what transcriptions can reveal about free improvisation. Though some have attempted transcriptions of free improvisation (Block, 1990; Westendorf, 1995), this work has tended to focus on pitch, a parameter of sound which is often of secondary importance to most improvisers. In addition to this basic issue, transcription itself, when based in the standard representational tool of the Western staff, is inadequate for capturing much of what is happening in a free improvisation with the same level of utility that is possible for other pitch-based practices. The principal reason for such difficulties lies in the fact that no notation system has been developed which adequately represents all the sorts of microtonal or pitchless, inharmonic sounds which improvisers tend to use; nor does there exist a coherent and efficient means of notating all the various ways that improvisers use timing for expressive effect. The use of standard Western notation results in a transcription so full of “arrows, dots, cent numbers, commas” (Bailey, 1980/1993, p. 15) and numerous other quirky notational contrivances that the score is rendered almost unintelligible.

one readily hears that even if such musical practices are a part of the player's regular working repertoire, references thereto are often hardly heard in how they improvise.⁶

Though Maxine is an individual, the system is hardly built to emulate any particular individual that I have encountered as an improviser.⁷ Instead, it is an amalgam of hundreds of observations and interpretations based on experiences watching, listening to, and playing with many improvisers. As such, it is a very impressionistic depiction of what improvisers do, how they listen to one another, and when this listening is manifested to others in the course of the interaction. The system is an interpretation of free improvisation as a culture which takes the form of an individual who in some respects embodies the characteristics of a "typical" member of this particular social world.

Naturally, however, this endeavor raises the question of what it would possibly mean to be a "typical" improviser. Generally speaking, numerous social-scientists have noted that even the smallest societies feature a significant range of individuals (see Drewal, 1992, for example). Thus it is impossible to speak of "typical" members of any society, irrespective of the highly valued individualism of free improvisation as a culture.⁸ The discourse of free improvisation in particular, however, is known for its high valuation of uniqueness as a goal in the development of each player, both in their personal sound as well as their way of listening and responding to others. Many do achieve this in practice as it is frequently the case that a given player's sound palette makes them so distinct that a familiar listener can identify them almost instantaneously on a recording. Thus the idea of a "typical" improviser is not only nonsensical by the strongly individualist principles and discourses of free improvisation but a concept which can be regarded as offensive to the ideals of this practice. Improvisers hardly aspire towards typicality, so why should I try to do this through how I have built Maxine?

While it will likely remain that one cannot necessarily predict what sounds will occur when or in response to which other sonic events in a performance of free improvisation, there are certain broad constraints by which the practice tends to take place. Improvisers largely avoid the use of pulse-based rhythmic structures, functional harmonies of tonal music, and in some cases, pitch itself. For improvisers generally, the pursuit of timbral diversity is a key goal, this remaining true even for players for whom pitch is a key structure of expression. Hence despite the ongoing rhetoric about free improvisation as a type of practice which delivers musicians from

⁶ It remains an open question as to why such competencies would necessarily be devalued in free improvisation. As a conjecture, however, the issue seems to be that the use of these structures spontaneously in an improvisatory interaction with others carries the risk of creating an uneven playing field. Those who are competent in these structures are not threatened when they are introduced by one or more players. Those who are not may feel differently and may find that the structure introduced is either an invitation for them to try and play along with it or an invitation to play against it by playing an opposing idea. For those who feel it is an invitation to join in the structure, they may additionally feel that the introduction of this structure creates a situation in which their inability to spontaneously join in it exposes their incompetence in this musical domain. Thus part of the reason why improvisers may tend to avoid these structures lies in the risk of offending or alienating those who are not comfortable with them.

⁷ Occasionally (and usually in an unkind, derogatory manner), Maxine has been compared to particular improvisers who exhibit certain irritating tendencies.

⁸ Much the same can be said of nearly any other kind of virtual free improviser, though George Lewis is the only designer to explicitly recognize that his system *Voyager* is a representation of a particular cultural legacy (2000b).

the constraints of genre, it is quite audibly the case that improvisers tend to conform to a certain set of general sonic restrictions.

But merely avoiding the use of pulse or harmony hardly specify what will happen. A whole world of possibilities remain. Even if one knows that other players will likely conform to a certain set of basic expectations, it is unclear what will happen at any given time. Moreover, prior experience with the same player does not necessarily mean that one can predict how they will behave. It is true that one can have some general ideas about what they will bring to the next improvisational encounter, but specific predictive knowledge remains impossible.

To the degree that such things are technically feasible, I have designed Maxine to embody this tension between commonality and idiosyncrasy. The system retains the general characteristic traits of an improviser while also retaining the unpredictability and idiosyncrasy of an individual player. This is both in comparison to other players in that Maxine is overall a different player and also in comparison to its own past behavior in that I cannot really predict how the system will behave in a given instance.

Despite my best efforts, it has always remained an open question as to whether Maxine would “pass” for an improviser. In the typical sociological sense of the term, “passing” refers to situations in which one is taken by others to be a member of a social group other than what one was born with or otherwise socialized into (i.e., to “pass” for middle-class when one was born in poverty, to “pass” for male when one’s biological sex identity may be otherwise). For Maxine, the goal has always been that the system “pass” for a human improviser just as many human beings have passed for members of various social categories other than those they were born or socialized into (Hobbs, 2014; Knadler, 2003).

Broadly speaking, the goal of creating artificially-intelligent systems which are able to convince their human interlocutors that they are engaging with not a machine, but another human being can be understood as a pursuit of the social passing of machines for humans. Nevertheless, artificial intelligence has rarely been framed as such.⁹ The framing of artificial intelligence as an exclusively technical task is particularly curious given that the original articulation of the Turing test (1950) is almost entirely framed as an issue of a machine “passing” for a human.

In his original proposal a means of verifying that a machine had achieved artificial intelligence, Turing describes a “test” structured in the fashion of a Victorian parlor game.¹⁰ In the “imitation game,” a male and female contestant communicate with a third player behind a blind and do so only through handwritten or typed messages. The third contestant aims to determine which of the two players behind the blind is a man or woman by asking them various questions which might reveal the answer. For the man, the object of the game is to deceive the third player while the woman’s objective is to aid the third player in arriving at the correct answer. Analogously, in a proper Turing test, the machine assumes the role of the man, while a human interlocutor assumes the role of the woman. The machine attempts to fool the third

⁹ There are handful of exceptions to this trend (Genova, 1994, p. 314; Hauser, 1997, p. 218; Keeling, 2005; Koistinen, 2011).

¹⁰ It is unclear whether this game was actually played in the era of Turing’s social world or if he described it purely for the purpose of his 1950 article.

participant into believing that it is a human being and the real human being tries to prove that it is in fact a human being.

Both the imitation game and the Turing test are fundamentally concerned with the issue of social passing and the performance of a particular kind of identity. In the imitation game, the man attempts to pass for a woman by demonstrating some sort of prowess in being able to engage in an interaction in which their interlocutor is convinced that they are a woman. In the Turing test, the machine attempts to pass for human by exhibiting an interactional repertoire which would conclusively prove to a human interlocutor that it was not a machine, but a person. Thus the issue of passing is essential to understanding what takes place in the canonical test for artificial intelligence of the last seven decades, this despite that few commentators ever discuss it in these terms. Moreover, the issue of passing also plays a major role in Turing's own life history (Halberstam, 1991; Hodges, 1983). In a society which prosecuted homosexuality as a crime, Turing struggled to conceal his own sexual orientation throughout his life and attempted to pass as a man possessing the normative heterosexual identity.¹¹

What takes place in an improviser's interaction with Maxine concerns the same issue of passing. The encounter between Maxine and human improvisers foregrounds the question of whether the system would be taken as an improviser in how it would interact with other players. The crucial difference, of course, is that in the case of Maxine, the improviser is fully aware of Maxine's true identity. I have never hidden the fact that Maxine is a machine from any musician who has engaged with it in my studio or in performance. Hence any improviser who evaluates Maxine in comparison to a person does so with the knowledge that Maxine is a machine and without the blind judgment regarding the system's human or machine status which would be afforded through a proper Turing test.

These basic differences between my methodology and the Turing test aside, the encounter between Maxine and improvisers staged in my fieldwork reveals all the same ambiguities and tensions which emerge in cases of social passing. When a social interactant successfully passes, this suggests that they have successfully acquired a significant portion of the repertoires and traits of the identity category for which they have passed. More accurately, the individual seems to possess these repertoires and traits according to those who evaluate or encounter the individual since for all intents and purposes it is these interlocutors who truly decide whether this person has "passed" or not.

When an individual passes for a member particular identity group, they reveal the tremendous ambiguities involved in claims about the "authenticity" of that particular identity. Similarly, when Maxine's behavior is found to closely resemble that of a human improviser, this precipitates a kind of crisis about the authenticity of humanness itself. All of a sudden, all of the idiosyncrasy and individualism one assumes to be special properties of the human being seem to be stolen. What was previously regarded to be an essential quality which defies any attempt at reproduction suddenly reveals itself to be a collection of features and parameters which might be recreated by anyone who wishes to do so.

¹¹ Tragically, the discovery of Turing's homosexuality led law enforcement to prosecute this "crime," leading to Turing's acceptance of hormonal "treatments," likely leading to his eventual suicide in 1954.

In many cases, however, the individual fails to pass. Elements of their performance in interaction with others reveal themselves to be inauthentic with respect to the identity they seek to embody. Still, not all will find fault with the same features of their performance. For some interlocutors, one element be suspect, while for others it is perfectly acceptable. Therefore, something much deeper than the authentic identity of this individual is revealed in these encounters. Debates about whether an individual has passed ultimately indicate which elements of the definition of the category in question are themselves a matter of contestation. For Maxine, there has only been one individual out of more than 100 who have played with the system who has taken issue with the notion that improvisers tend to avoid pulse and harmony. For all others, this design trait was never explicitly referenced as a critique of the system's depiction of free improvisation. Instead, these players took issue with a range of other issues, only a portion of which are discussed in the next three chapters.

Given that the methodology used in this project does not allow for the kind of blind evaluation Turing proposed, it is unclear whether Maxine has actually "passed" for a human improviser. Nevertheless, many improvisers compare the system to a human player, though this is more often a human player they would rather never encounter than one they would like to spend more time around. In any case, their foreknowledge that Maxine is a machine creates a context in which they are forced to articulate why it has somehow failed to do what a real or ideal improviser would do in the same situation. By articulating why it is not "human" or not "an improviser," they are forced to talk about what these things are in a way that they would never really do otherwise. Knowing that Maxine is a machine, there is a strong tendency for them to want to vehemently reject the idea that the system has achieved the musicality and social sensibility of a human being. Hence even when Maxine exhibits humanlike behavior, improvisers are prone to further articulating why the system has still failed to perform humanness, thereby outlining what they believe this attribute to consist of in terms of being and making music with others.

Maxine's Encounter with Human Improvisers

Initially, the purpose of testing this system with experienced performers was to use these critical encounters as a means of soliciting their feedback on how the system compares to improvisers they value and use this commentary in order to further develop and refine the system. While this goal has always remained an implicit element of my work with improvisers and this system, it quickly became apparent that testing this system with experienced performers could serve a far more interesting purpose. By stark contrast, improvisers become far more comfortable criticizing specific forms of listening and interaction when faced with a virtual improviser like Maxine. Among other purposes, such encounters allow for a far more detailed investigation of the particular ways of listening and responding to others in the practice of free improvisation that players find most conducive to the experience of freedom and truly equal partnership in free improvisation.

While the process of creating Maxine has been one which I have imagined as a slave's emancipation, the system has functioned as my subordinate and ethnographic assistant in practice. The system, like a slave, does not have control over when and how it is used. In

fieldwork, the system has functioned as a not-quite-human interactant that I have used as a means of eliciting commentary on how these particular human beings (that is, performers of free improvisation) define the performative boundaries of humanness. However, what the next few chapters repeatedly illustrate is how this concept of “humanness” is never universal and that the behaviors one player regards as “human” another regards as inhuman. Overall, asking participants “how can I make this system more human?” leads them to comment on the performative and interactive traits they regard to be essential in their definition and experience of “humanness.” In this way, I regard the system as a kind of “co-ethnographer” (see Banerji, 2012) in that I have learned as much as I have from my own interactions with people in fieldwork as I have from its interactions with the same set of individuals.

Within human computer interaction research, it is quite common for designers to subject their systems to the kind of critique I have solicited from numerous improvisers. Likewise, by no means is this the first time that an ethnographer has examined the reactions of those represented in ethnography as a topic of study in its own right. Numerous anthropologists have investigated the critical reception of their ethnographies as they circulate among those who feel that these texts represent (or more often, misrepresent) their lives (Abu-Lughod, 2016; Brettell, 1993; Fassin, 2015; Feld, 1987). In a manner similar to what has occurred in the critical encounter between Maxine and human improvisers, these studies reveal a great deal about cultural debates and discourses that might not have arisen in the process of ethnographic fieldwork itself. Said otherwise, this work demonstrates that provocation may be what is necessary in order for certain discourses of interest to the ethnographer to be rendered more tangible and thus more easily studied by academic and other critics.

At the same time, there is something missing in this kind of work and the kind of reaction it provokes. This is precisely because of its nature as a text as well as the fact that such texts tend to be written in a particular register which is often inaccessible to many reading publics. To give an example well known in the study of music, there is much that Steven Feld (1987) was only really able to learn when the Kaluli themselves were exposed to the way that he had rendered them in *Sound and Sentiment* (Feld, 1982). At the same time, as he himself notes, their access to the text was mediated by his spontaneous translations of various passages of the text into the Kaluli language.

Beyond this case, however, it is increasingly frequent that various publics represented in an ethnography are able to read and evaluate the text for themselves without the aid of the ethnographer themselves. Plausibly, then, it would seem that it would be unnecessary for me or any other practitioner of performed ethnography to do anything other than simply publish the text, allow the public to criticize it, and then examine the nature of this critical reception. Though his own work comes short of overcoming this issue, the answer again lies in Feld’s experiment with a dialogic encounter between his ethnography and those it depicts in which they are able to “speak back” to their representation. What Feld found rather consistently in how the Kaluli read his text was that they took issue with the generalized abstractions found in the text which were distilled from his repeated observation various patterns of Kaluli musical life. For each of these abstractions, they asked Feld to trace it back to a specific instance or simply drew on their own recollection in order to do so themselves.

Much of what the Kaluli desired from Feld can be found in the critical interactions of improvisers with Maxine, as well as the reception of the audience for many performances of ethnographic work in the field of performance studies. When one performs an ethnography — that is, when one puts actors on stage in order to portray ethnographic informants — one provides the audience with a very specific representation which can become an object of critique. Even when ethnographers write rich descriptions of their informants, as has become the custom in the two decades since *Writing Culture* (Clifford & Marcus, 1986), there is an embodied, sensorial presence that can never really be transmitted through the ethnographic text in the same way as a performance. A very literal *habeas corpus* takes place as the results of an ethnographic study become accessible to a public through a performance and from the earliest experiments with this methodology for presenting this work, publics have been quite vocal in expressing voluble, generative, productive criticism of this work (Conquergood, 1985). The written word is a far more oblique reference to what the ethnographer intends to convey than what the embodied performance of a performer transmits, even in silence.

Returning to the topic of free improvisation, one could certainly write long, detailed descriptions of the minutiae of one's interactions with other players and then ask improvisers to critique the nature of these descriptions of free improvisation as a social practice. At the same time, even those brutally exhaustive accounts fail to allow the informant to fully understand just what happened in those moments. Asking an improviser to play with Maxine and compare it to a human player is a far more effective critical exercise than asking them to read this dissertation or other related publications in order to assess how well these represent or depict what free improvisation is. The reason is very simple. When an improviser encounters Maxine directly, attempting to engage with it just as they would with a fellow performer, their criticisms are specific and grounded in a particular moment and context which is far more tangible than their criticism of any kind of generalized ethnographic representation in a scholarly text.

Karl MacDorman and Hiroshi Ishiguro (2006) have proposed that staging encounters between a humanlike machine and a human being has remarkable potential for social and cognitive sciences. Their rationale seizes upon the insights of robotics theorist Masahiro Mori's "uncanny valley" (Mori, 1970; Mori, MacDorman, & Kageki, 2012) hypothesis that the more humanlike a particular technology was, the more that human beings would find themselves repulsed by it. In MacDorman and Ishiguro's elaboration, the utility of this effect was that a humanlike machine prompts its human interlocutor to continually compare the machine to a human being and note the various differences between this "copy" and the human "original." Thus the critical reaction to such a system by a human interlocutor also prompts the human counterpart to enunciate the reasons why the machine fails to be act humanly, and thereby, the individual's conceptions of humanness itself. As the coming chapters illustrate, the encounter between Maxine and human improvisers has precisely this utility and serves as a powerful means of allowing improvisers to articulate just what they believe makes a human improviser human by criticizing how a nonhuman improviser fails to be human. Or rather, how Maxine may succeed in being human, but fail to embody an ideal human presence and interactivity that an improviser might desire from their preferred improvising partners.

The exercise of critiquing the "humanness" of a not-quite-human social interactant like Maxine has several different implications for the usual ways in which ethnographers practice

fieldwork while also overlapping significantly with many canonical approaches to this mode of research. The need for an exercise like critiquing Maxine is very much a product of the particular cultural psychology of freedom in free improvisation, which leads improvisers to habitually refrain from critique. For ethnography generally, this suggests that methods similar to the one developed in this project may be useful in cultural spaces where similar ideas about liberal freedom and personal autonomy are active in how actors coexist with one another. Outside such spaces, however, an ethnographer can often expect that their interlocutors in the field may readily correct or guide them, especially if the fieldworker's objective is to learn to live with their informants as they do. In such situations, there may be little need for the kind of provocation and elicitation practiced in this project.

But aside from all these details, a very general point must be made. Whether one is researching among egalitarians who may fear the consequences to their reputation as practitioners of this value as a result of criticizing the researcher or not, what this project suggests is that the ethnographer must be attuned to how and when their interlocutors practice criticism. Due to various kinds of values or practical contingencies, an ethnographer's informants may not be interested in engaging in criticism of fellow participants or of the ethnographer. Therefore, it is essential for the ethnographer to consider how and whether one's interlocutors in the field are comfortable giving feedback to either the researcher or other interlocutors on their behavior, particularly if the research question concerns norms of behavior and related cultural values.

To some extent, asking improvisers to comment on Maxine's humanlike qualities (or lack thereof) is inherently insulting. They themselves are obviously human and Maxine is clearly not. These encounters nearly always imply the designer's belief that the uniquely human qualities of the improviser's art are hackneyed and easily automated. Likewise, improvisers have always had a measure of skepticism about the mere idea of an improviser made from electronics. In many ways, part of what motivated my work on this project was a sense that there was an astonishing level of consistency in a community of practice that seemed to value novelty and surprise. Moreover, I also found that I was able to bring Maxine to exhibit many of the same sonic and interactive traits of human players through careful reflection on my own experiences as a player and from watching others. Nevertheless, I share much of the same skepticism about this project that my interlocutors; my ongoing experience with playing with this system continually confirms my own doubts about the possibility of ever achieving the kind of consistent results one might achieve with an ordinary improvisational partnership between humans. Thus when improvisers also express their doubts about Maxine, I hardly question their reasons for doing so.

Aside from the advantages MacDorman and Ishiguro describe, the use of a nonhuman performer as a means of eliciting the critique of human improvisers has specific advantages over the use of a human performer, whether in this case¹² or in the case of performed ethnography across performance studies. Again, the reason is very simple. In the case of a performed ethnography in which a human actor delivers a performance which depicts the behavior of an informant based on the participant observation of an ethnographer, the unavoidable fact of

¹² As noted in Chapter 5, improvisers often refuse to critique other players. Consequently, my own performance of free improvisation with other players has been unable to yield the kind of critical commentary necessary for understanding notions of ideal practice for improvisers.

human nature means that each performance will be at least slightly different. In the case of Maxine, it is by no means the case that each performance or encounter with this system results in the same overall shape or sound. Nevertheless, the cognitive architecture at work as Maxine encounters any of the more than 100 improvisers I have worked with in this project is identical.

Therefore, whereas a human ethnographic performance is subject to a basic fitfulness, the algorithmic ethnographic performance of Maxine allows for the comparison of how dozens of improvisers react to the same system. It is true that there are some improvisers who might have the same sort of systematic consistency of Maxine, reacting to every single situation they play in with nearly the same protocol of how to listen and respond. All the same, it is unlikely that such players have the same consistency of a system like Maxine, which responds to all information according to the same principles, regardless of who or what they are dealing with. For a human player, this would be a player who somehow never changes despite acquiring new experiences. Further empirical examination of whether some improvisers might have the same sort of consistency of Maxine. In the interim, Burkhard Beins' (2011) observations about his own experiences of adaptation between players suggests that it is highly unlikely that improvisers are as rigid in their way of interacting with others as Maxine is.¹³

Ultimately, the methodology developed in this project is an extension of the kind of “playing dumb” as a means of eliciting participant’s conception of cultural norms proposed by sociologist Harold Garfinkel in his theorization of “ethnomethodology” (Garfinkel, 1967). In a series of social experiments and provocations, Garfinkel created a variety of scenarios in which various actors would breach social norms in order to elicit other participants’ explicit articulation of the norm violated. While several cases bring participants to articulate the norms of the situation (according to their conception), there are many in which this did not necessarily occur. This was largely due to the fact that the norm in question was so obvious that the subjects of the experiment were often flabbergasted that at the idea of someone suddenly failing to abide by the conventional logic of a given situation.

Like Garfinkel’s ethnomethodological provocations, playing with Maxine is also concerned with the elicitation of explicit articulation of tacit norms. Be that as it may, Maxine’s breach of norms is far more measured and much less intentional. As I have noted previously, I find many faults in Maxine as a playing partner alongside the many joys and satisfactions I find in playing with it. All the same, I have never intentionally designed the system to cause the kinds of disagreements and discomforts which emerge in the next three chapters. Like a real improviser, the system simply causes these problems to emerge as a natural result of how it is designed, how it processes information, and as a consequence, how it makes other players feel. To some degree, the same problem of ineffability which arises in Garfinkel’s experiments also emerge in how improvisers critique Maxine in that where Maxine “errs” is often on a point so obvious and commonplace that the improviser is somewhat flummoxed as to how to explain precisely what went “wrong.” Nevertheless, the exercise, as was the case for Garfinkel, still reveals a great deal about an improviser’s sense of ideal conduct in putatively “free”

¹³ Elsewhere, I have raised the question of whether what Burkhard Beins and others report is a real experience or not (Banerji, 2018). Improvisers often speak of the desirability of adaptation and yet many have reported that they have found Maxine to adapt to them despite the fact that the system has no in-built capacity to do such a thing.

improvisation and does so in a manner which would not be so readily possible through other ethnographic practices.

Testing Maxine

Finding Improvisers to Work With

The next chapters closely examine the commentary of improvisers whom I have asked to play with Maxine in private studio settings and compare this system to an ideal free improviser. Participants of this study are all performers who are actively engaged in the practice of free improvisation and regularly give concerts falling into this category. More specifically, I have chosen to work with improvisers whose primary artistic outputs consist of concerts in which there is no explicit¹⁴ leader among the group, in which no form of written composition structures the performance, and who perform entire concerts (typically lasting from twenty minutes to an hour) that are entirely improvised. Crucially, an additional criterion for choosing musicians to work with has been that their improvisatory practices typically avoid the use of pulse-based rhythmic structures and tonal harmonic vocabularies, while privileging the exploration of timbres other than pitch.¹⁵

The primary methodology for locating musicians to participate in this study consisted of attending concerts or performing with musicians, either in free improvisation or other musical settings.¹⁶ Fortunately, with the advent of the internet, finding free improvisation events has been made far easier through various online concert listings. In Chicago, I utilized now-is.org, bayimproviser.org (formerly active as transbaycalendar.org) in the San Francisco Bay Area, and

¹⁴ Naturally, there are often small implicit ways in which some form of leadership within the ensemble can arise, but the role of this kind of leadership in how the ensemble functions as a whole when performing on stage or playing in a private session is extremely difficult to trace. The primary form of leadership exercised usually manifests itself when one member of the group takes greater initiative than others in organizing concerts or meetings among group members to play and try out ideas in a private improvisation setting, usually at one member's rehearsal space. Other forms of leadership manifest themselves through the status differentials between players as one player may be more famous than the rest in the group. Still, it is unclear how such matters would actually play a role in the course of a musical interaction or even how they constitute a status differential at all.

¹⁵ Strictly speaking, without this qualification of the category of "free improvisation," it would be necessary to include dozens of other kinds of musical practices in which players improvise over various kinds of grooves or modal frameworks. Such work includes artists such as the jam band Phish or the Grateful Dead. Over the years, the term "free improvisation" has led many of my interlocutors (particularly those not active in free improvisation as I have defined it above) to ask whether jam bands of this kind are a part of the range of practices concerned in my research. Thus it is necessary both here and those conversations to clarify what I mean by the practice of "free improvisation" in terms of a set of sonic parameters so as to avoid confusion. Yet the decision to clearly delimit the practice of free improvisation in this manner has been a hard one as it contradicts the sense of openness and tolerance that drives this practice itself.

¹⁶ Aside from free improvisation, I have been an active performer of popular West African music (from Mali with Orchestra Gold based in Oakland, Senegal with Tiliboo Afrobeat in Berlin, and Nigeria with Lagos Roots in Oakland) and music of the African diaspora over the past 8 years. On occasion, these activities have allowed me to develop a rapport with performers active in free improvisation.

echtzeitmusik.de in Berlin.¹⁷ In most cases, concerts listed on these websites adhere to the musical parameters I have used to define the irascibly vague term “free improvisation” as I have above, though there are frequent exceptions.¹⁸

In principle, I invite any member of the various scenes of free improvisation I have engaged with to play with the system that I have designed. In practice, however, I have not always had the occasion to invite as many members of these scenes as I would have liked. Though the practice of free improvisation traces its cultural roots to African-American civil rights struggles in the postwar era, a great many of its practitioners have no direct relationship with this cultural background. The overwhelming majority of my informants, both those included in the next chapters as well as those who are not, are white. Given the cultural heritage of free improvisation in African-American culture, this fact deserves explanation.

The main factors contributed to the racially-skewed nature of the set of improvisers I worked with in this project were time constraints, geography, and the overall state of de facto racial segregation in Chicago. Of the three scenes I engage with in this project, this was the only scene that had a significant number of African-American practitioners and therefore the only community of this practice in which I had the opportunity to work with nonwhite performers. When I first began this project, I lived in Logan Square, a neighborhood on Chicago’s near Northwest side. Though I would have preferred to live further South for various reasons, this choice was less desirable given that I worked on Devon Avenue in the far Northside of the city. Moreover, not having an automobile meant that geographical constraint was all the more consequential.

It is well known that the city of Chicago has been a major center for the practice of free improvisation in the half century of its history (Lewis, 2008; Radano, 1993; Steinbeck, 2017). However, like the city itself (Hirsch, 2009; N. Y. Moore, 2016), this community of practice is effectively segregated. Musicians have discussed this issue over and over again over the past several years, but little seems to have changed in this situation. When I back to Chicago after

¹⁷ The [echtzeitmusik](http://echtzeitmusik.de) (in English “real time music”) calendar website has, for the past 8 years or so, loudly broadcast on its front page <http://www.echtzeitmusik.de/index.php> that “the term ‘Echtzeitmusik’ was first introduced in the mid-1990s in order to distinguish the musical practices of a younger Berlin scene from music referred to as ‘Improvised Music’, ‘Free Jazz’, ‘New Music’, ‘Experimental Music’ and so on.” Superficially, this suggests that this website is a poor source of information for locating concerts relevant to the practice of free improvisation since the terms “improvised music” and “free jazz” often signify free improvisation (Borgo, 2002a; Lewis, 1996). Nevertheless, this concert calendar consistently lists events which fit the criteria of free improvisation I have outlined above. The policing of the boundaries of what constitutes a concert appropriate enough to list on the calendar by the various volunteers who manage the [echtzeitmusik](http://echtzeitmusik.de) calendar has been reported to me by numerous interlocutors over the years. Many of these individuals have repeatedly complained that the standards by which concerts are included or ignored when one asks that they be listed are vague or inconsistent. For further discussion of the cultural politics of this concert calendar, see Scott Currie’s essay on this subject (2015) or Tom Arthurs’ dissertation and related article (2015, 2016). Finally, it must be noted that at no time in my several years of ethnographic engagement with these three concert calendars have such issues been reported for either of the Chicago- or San Francisco-focused calendars mentioned above.

¹⁸ For all three calendars, such exceptions are usually made obvious by the indication that the concert is focused on jazz, features the composed work of a particular artist, or otherwise falls outside the category of free improvisation. In some cases, however, it is unclear until one travels to the concert or locates a recording of the group in question on the internet that the musical materials which shall be performed are not relevant to the area of focus for this project.

college in 2007, I asked one white bassist whom I had known for quite some time about how one can learn more about the city's various scenes of improvised music. Somewhat facetiously, he offered the following answer, commenting that there were basically two scenes: "there's a white free improvisation scene on the North Side and a black free jazz scene on the South Side." All present were made uncomfortable by this comment, but after the awkward laugh, he matter-of-factly explained that what he said was more or less the case.

During my residence in Chicago from 2007 to 2009, I was an active performer of free improvisation in various venues around the North Side, including the Heaven Gallery and Myopic Books in Wicker Park, Elastic Arts in Logan Square, and the now defunct Brown Rice in Albany Park.¹⁹ My living situation and lack of automotive transportation made it much more difficult for me to attend concerts on the South Side scene, though I did perform and attend concerts at the Velvet Lounge in Chinatown. Consequently, I had a far stronger rapport with musicians on the North Side scene than with those on the South Side. This rapport and familiarity seemed quite important in the task of arranging meetings with musicians. Even though many musicians were aware of George Lewis' work with *Voyager*, they retained skepticism of the very idea of a virtual improviser. Thus their greater familiarity with me as a person, player, and presence in their artistic world seemed essential in allowing them to feel the comfort and trust they required before making time to try something so unusual as improvising with a nonhuman, mechanical musician. Conversely, while I did request to meet with many musicians on the South Side scene, our lack of rapport resulting from the geographical constraints of my living situation may have made them feel too skeptical of the idea of meeting to play with Maxine.

In addition to these geographical constraints, limited time was another significant factor. I had only begun developing this system towards the end of my residence in Chicago in 2009.²⁰ As a result, I had very few opportunities to schedule meetings with musicians before leaving town for good. This meant that the locations and spaces in which I had developed a strong rapport were where it was easiest to find musicians to work with in this project.

Thus the combination of all these factors means that the majority of the musicians I have worked with in this project have been white. Accordingly, it is likely that what one learns about improvisers' conception of ideal practices of listening and interaction in free improvisation from their commentary on Maxine is a highly racialized perspective. Were I or another researcher to

¹⁹ Brown Rice was one of the few sites on the North side of the city which regularly featured African-American improvisers.

²⁰ I spent the first half of 2010 abroad in India and Europe (including Berlin) and did also spend the summer of that year working in Chicago. Even so, this was for less than three months.

replicate this work with a different pool of musicians, it is possible that the results could be quite different.²¹

On Chicago's North Side scene, I was frequently the only person of color. On more than one occasion, musicians had confused me for the only other South Asian participant of this scene, a man named Tushar Samant. Never active as a performer, Tushar's participation in this scene was nonetheless vital as he was the coordinator of the now-is.org concert listing website and his frequent, enthusiastic presence at many concerts. Since many musicians wanted to list their concerts on this website, there would be rather unfortunate incidents in which one of them would approach me in person to ask that I list their concert on the website, presumably concluding that the only brown person in the room would be the Tushar Samant who would allow members of the community to read of their upcoming artistic activities in the expected online outlet.

I can never be certain of the precise effect my racial difference had on my presence in the North Side scene. In particular, what I have often wondered, but will likely never be able to know, is whether the stereotypical images of South Asians played a role in how the mostly white improvisers I worked with evaluated Maxine. As is well-known, South Asians are very active in the work sectors of information technology and computer science. Conversely, they are far less active in the arts, though their presence is hardly unknown in this area either. When improvisers, whether in Berlin, Chicago, or the San Francisco Bay Area, encountered Maxine, to what degree was their evaluation of the system informed by these stereotypical qualities of South Asians in the American racial imaginary? Again, the answer cannot be known, but nonetheless the question may be worth pondering.

Meetings

In many ways, Maxine's encounter with improvisers was very similar to that of the typical encounter between improvisers in these various scenes. The main difference is that whereas players arrange meetings for themselves, I was responsible for arranging meetings on Maxine's behalf, naturally. As is true for many musicians, improvisers often meet in private to make music together, try out new ideas and instrumental combinations between players, or to get to know the improvisational personalities of the musicians they are meeting with. In this way, meeting with Maxine serves much the same purpose as meeting with new improvisers one may have just met and is curious about as potential playing partners. In the same way that improvisers are often eager to find out what may happen when a new combination of musicians is assembled, many

²¹ Over the years, I have worked with two African-American musicians in this project. The first instance was several years ago in the San Francisco Bay Area and then again more recently when one player I knew from Chicago was touring through Berlin. In the case of the first player, he found the idea of critiquing Maxine strange and instead deferred any "criticism" of the system by suggesting that the only issue was that he and the system had not been given enough time to get used to one another. The second player had a similarly ambivalent attitude about criticizing the system's playing and instead offered more appreciative commentary (i.e., by merely noting what the system did irrespective of what he necessarily felt about it). This is suggestive of a very different attitude about the notion of "norms" in free improvisation, one in which even the freedom to openly evaluate Maxine (afforded by the system's nonhuman status) does not lead the performer to discuss their criticism of the system. In the end, I have not included the commentary of these two players in the chapters that follow in order to focus on the experiences of players whose criticisms were directly relevant to the issue of egalitarianism.

improvisers have been curious about meeting with Maxine because they want to know what kinds of new artistic possibilities this may offer them.

Improvisers begin their musical and social associations with one another in a handful of typical ways. In many cases, players meet each other initially at a concert. This could either be that they meet as fellow members of the audience or that one performer seeks out the opportunity to attend another's concert in order to get to know their playing and possibly suggest meeting later to make music. In some cases, improvisers may meet in the context of a "session," or private playing meeting, where one of their associates has invited a player that they have yet to meet. In terms of the physical nature and feel of these spaces, concerts of free improvisation take place in a wild variety of spaces, from proper concert halls with comfortable seating, to bars, small theaters (for live acting or cinema), art galleries, apartments or personal residences, or really anywhere the host is willing to put up with or support the idea of hosting a concert. Sessions typically take place at either a private residence where it is suitable to make music (i.e., that neighbors tolerate this) or a rehearsal studio where one of the participants regularly works or practices.

Likewise, many of Maxine's encounters with improvisers began with my contact with players either at a concert, session, or in another gathering where improvisers were present. Meetings between Maxine and improvisers typically took place my studio (in Berlin) or personal residence (in Chicago or Oakland). In some cases, meeting at my space did not make sense if a performer worked with an unwieldy, immobile instrument (e.g., drum set, piano, or double-bass); in such cases we would arrange to meet at their residence or studio space. Once meetings finally took place, I followed many of the same social scripts which are common in meetings between human improvisers. For the most part, this means that there is a significant portion of time spent just "hanging out" and catching up a bit before actually making music, with this preamble to the principal event often involving a short trip across the street for a cup of coffee or a snack.

After this initial ritual of greeting, musicians would be asked to play a series of duets with Maxine and comment on the experience immediately after each piece. Duets typically lasted between five and ten minutes, though in some cases improvisers would play with Maxine for far longer. During the piece itself, I attempted to avoid any visible affective indications of my own evaluations of the piece in order to prevent the performer from being influenced by my own sentiments about the progress of the music. In most cases, I had strong reactions to what I was hearing, both in terms of how I felt about the way that Maxine was playing as well as the improviser I had invited to play with Maxine. As a performer myself, I am fully aware of how various visual cues of the enjoyment or disapproval of other individuals in such an intimate setting may influence the performance and so the simplest solution to the problem of avoiding this interference was to turn my face away from the performer as they played with the system.

Before beginning the piece, I would clarify to the performer that they were free to end the piece at any time. Their options for doing so mainly fell into two categories. The first would simply be to allow the piece to end with the same mutual silence that signals the end of a performance for human improvisers, with each performer either opening their eyes or looking up from their instrument to indicate that they are satisfied with the duration of the piece. The second option, however, was to speak up or otherwise signal that they would like to end the piece because they would like to tell me about what they were experiencing, for better or worse. Given

the strong anti-normative stance of most improvisers, it is rare that they have felt comfortable saying that something has gone “wrong” in a particular piece of music since the notion that something could have gone “wrong” seems antithetical to the very idea of a practice of “free” improvisation at all. In the actual practice of free improvisation between human musicians, I have never observed or participated in a situation in which one improviser stops in the middle of a piece to tell the others that something has gone “wrong” in the piece and that they need to stop the action in order to say something or otherwise remedy the “problem.” With Maxine, however, many improvisers (though certainly not all) have indulged my invitation to stop the piece before it reached a clear endpoint. This is quite understandable given that the idea that a machine would fail in the act of free improvisation is readily accepted by most, if not all, the improvisers I have worked with in this project. Yet many have declined this option and instead prefer to let the piece end “naturally” with the same mutual silence that ends most performances of free improvisation.

Once the piece is concluded, I then allow the performer to speak freely about whatever they feel is most relevant to their current sentiments about the interaction which has just taken place. In other words, my questions for the performer at the conclusion of the piece are general enough to allow them to speak their mind and only specific enough in order to reassure them that they are free to be as harsh or as direct as they like. For example, the question is often simply “what did you think?” More scientifically-oriented scholars may criticize this methodology for its open-endedness and argue that this lack of specificity leads to a research practice which is doomed to fail to answer any particular research question. I myself had this view until I experimented with a more pointed way of asking questions in a pilot study I conducted at the Center for New Music and Audio Technologies (CNMAT) in the fall of 2010 (see Banerji, 2012). In that experiment, I asked improvisers to complete a short series of numerical evaluations of the system on four criteria, as well as to respond to the open-ended question of what they felt was “missing” from the interaction.

While eventually this more focused approach may prove of value in the study of the social psychology of this form of musical interaction, the study at CNMAT revealed that asking a predetermined set of questions after each piece gets in the way of what improvisers really want to say after the piece. This remained true even with the use of an open-ended question about what they felt the interaction “lacked.” As is a routine component of such experiments, I debriefed each participant on the goals of this experiment at the conclusion of their participation. In nearly all of those conversations, musicians reported that they found it strange to answer such specific questions and that they felt distracted from their true feelings about the interaction. In fact, one participant, Lars, directly criticized me in the debriefing for using a numerical method at all, instead arguing that I should have just talked to him after each of the takes instead of making him fill out a form.

Given that free improvisation, at least in principle, opens the possibility for many different kinds of interactions over the course of a piece, a fixed set of evaluative criteria at the end of the piece may not be an effective means of facilitating the improvisers’ commentary on such an interaction. Specific criteria chosen beforehand may easily turn out to be irrelevant to a particular piece. This is all the more likely for a system capable of exhibiting a wide variety of behaviors as is certainly the case for Maxine. For example, if I were to ask an improviser to rate the system on whether they find it to take too aggressive or passive of an attitude in a particular

interaction, it may very well be the case that this particular criterion is completely irrelevant to the particular interaction which just took place. Thus this study merges the more clinical approach one might find in user experience studies in the field of human computer interaction, in which human subjects are often asked to comment on their engagement and comfort level with a particular technology, with the unstructured, open-ended interactions which are more common in various ethnographic research modalities.

The arrival at a more open-ended approach to understanding how improvisers experience their interaction with Maxine and what this has to do with interactions with other improvisers is a choice of approach which is not at all uncommon in ethnographic research. The researcher operates with a broad set of concerns but largely lets the research process unfold as a result of the interaction with the human subject. Therefore, for ethnographically-oriented scholars, there may be nothing unique or terribly insightful about the claim that an open-ended approach is of value. Be that as it may, I make this point because in the fields where very similar methodologies are practiced, such as human-computer interaction or experimental psychology, the open-endedness of this approach continues to be regarded as suspect. While each activity a researcher examines is unique, it is likely that many of the same justifications for an open-ended approach in which questions are not determined beforehand may be well-advised. Not all activities are like free improvisation, but if researchers are interested in understanding experience, and an individual's experience tends to be a rather opaque and indeterminate thing, then an open-ended approach should be considered.

Ultimately, the results presented in the next few chapters focuses on the commentary of improvisers who have foregrounded the issue of whether they want other improvisers to take a more cooperative or defiant approach to engaging with other players in musical interaction. As one can imagine, this is just one of many other issues which were raised in the course of conducting fieldwork over several years with more than 100 players. Among the other themes which emerged in this study, improvisers commented on various practices of listening and how and whether Maxine (or a human improviser) should engage in them, the question of whether or how an improvisation should develop a sense of form through sections which are distinct, whether Maxine should have a knowledge of jazz or other musical practices, and numerous other issues which cannot be addressed in this dissertation. I focus on the question of defiance or cooperation because of the relevance of this theme to the broader thematic of egalitarianism, with these two interactive attitudes standing as two interpretations of how equal partnership is experienced in spontaneous musical collaboration.

The Interactant Evaluates

As Christopher Ariza has noted (2009), there are many ways that the concept of a "Turing test" has been applied across the field of computer music and computational creativity. Many of these are in line with what Turing originally suggested nearly seven decades ago while many others are not. Broadly, Ariza emphasizes two reasons that it is essential for evaluations of the system to come from the human musician who collaborates with the system rather than from the standpoint of a third-party observer. The first reason is that Turing's original proposal is explicit that the evaluation must be from the interlocutor and not from another observer. The second, more

important reason is that third party observation of an interaction does not allow one to understand what the interacting improviser experiences in the interaction itself. Yet, as previously noted, improvisers hesitate to enunciate their account of their experience of how such interactions have proceeded out of respect for egalitarian ideals (among other reasons).

Aside from these issues, many scholars in the field of social psychology have consistently produced results which demonstrate the serious limitations of third-party observation. For example, in studies of rapport (Bernieri & Gillis, 1995; Bernieri, Gillis, Davis, & Grahe, 1996; Cappella, 1990; Lakin & Chartrand, 2003; Tickle-Degnen & Rosenthal, 1990), researchers have found that third-party evaluations of the nature of the rapport of two speakers are frequently inaccurate. With regard to free improvisation with a machine like Maxine, this suggests that one might assume that an interaction was positive or otherwise pleasurable when in fact the improviser who participated in it was thoroughly disgusted with it. In my own experience, this has occurred many times in the encounters between Maxine and human improvisers, including several of those discussed in the coming chapters. While my own intuitions might have suggested that the other improviser may have either enjoyed the piece or found themselves fully irritated, it has frequently been the case that my estimations of these reactions was completely inaccurate. Thus it has been imperative to allow improvisers to speak for themselves in this project rather than to attempt to surmise or divine what they have experienced in the course of the interaction.

As the phenomenological ethicist Emmanuel Levinas has proposed, there is a fundamental unknowability of what other human beings experience (Levinas, 1998; see also Throop, 2010). Beyond this epistemological issue of the “unassumability” of the Other’s experience, acknowledging that this experience cannot be assumed from one’s observation of it is also a part of respecting the Other as a human being. In the same way, this project and research modality, in its focus on the experience of those who have undergone an interaction themselves (rather than trying to conjecture what that experience was from a third party perspective) is part of my commitment to honoring improvisers as people and avoiding some reckless forecasting of who they and what they sense and feel in their transactions with other players.

Section 4: Improvisers Encounter Maxine

Chapter 11: Egalitarianism as Cooperation

As I have outlined in the previous chapters, when improvisers encounter a virtual musician like Maxine, it creates a context in which they are at liberty to articulate their personal preferences for how they want other improvisers to respond to them in musical interaction. Whereas improvisers largely hesitate to explicitly articulate their irritations with other musicians in routine social interactions with other players, meeting Maxine allows them to finally vent these frustrations. At their core, frustrations with Maxine (and by proxy, other free improvisers) reveal that the utopian conception of free improvisation as a practice in which musicians are liberated from the expectations of other players is far from true. Or rather, what this clarifies is that while musicians are essentially free to do what they will in musical interaction, this is clearly not a state of affairs with which all musicians are satisfied.

Criticisms of Maxine are multi-layered in terms of the target or object of this commentary. In one sense, discussions about Maxine concern the degree to which the system constitutes an accurate portrayal of the thoughts, feelings, and interactive presence of an improviser. In this light, commentary concerns the veracity or validity of Maxine as a depiction of a free improvisation as a culture. But these conversations refer to other topics than the issue of the accuracy with which a particular cultural milieu has been rendered. Improvisers talking to me about Maxine are also just talking to me about a new improviser, named Maxine, that they have just met and what it is like to play with this new player.

Because Maxine is not a person, the conversation is far more frank than it would be regarding a human being, for which most improvisers would refrain from any negative criticism. However, the conversation about Maxine refers to still more than its capacities to engage in an ethnographic performance of free improvisation or the system as an improviser itself. Complaints (or less frequently, praise) about Maxine also refer to other improvisers. As one can see from commentary on the system in this chapter and the next two, what players say about Maxine often implicitly refers to what they would say about other improvisers who would do the same. In addition to all these other referents, commentary about Maxine is also occasionally a general commentary about the nature of peer critique in free improvisation. As was the case for Torsten the bassist, complaints about Maxine can often prompt a meta-complaint about the fact that complaining about other improvisers is simultaneously something improvisers want to do, but are not able to.¹

In addition to revealing that many musicians are quite ambivalent about the notion that total freedom in these musical interaction is possible or desirable, however, the encounter with Maxine reveals each musician's concept ideal conduct in musical interaction. Such ideals are composed of several distinct layers and illustrate a diversity of ways in which players interpret the ideals of freedom and egalitarianism, as well as conflicts between these two. That is, critiques of Maxine offer players an opportunity to articulate the forms of listening and sonic interaction they find most conducive to the experience of equal partnership in playing with others.

On another level, however, critiques of Maxine reveal not only what players consider *ideal*, but what they consider to be the *inherent micropolitical effect* of certain ways of engaging

¹ See opening ethnographic scene in Chapter 1.

in interaction. In other words, commentary on Maxine's interactive behavior indicate whether a given improviser views a particular approach to listening in social interaction to have an effect which either creates or destroys interpersonal hierarchy. Given the egalitarian leanings which draw players to this practice, this commentary also suggests each player's view of the moral decency of various approaches to listening in the pursuit of an egalitarian musical sociality. While egalitarianism is a shared ideal, improvisers differ greatly on the forms of listening which are the most morally suitable means for pursuing or enacting this value in practice.

Thus, these conceptions of ideal conduct in free improvisation are reflective of three basic inter-related ethnotheories of social interaction. These concern:

- 1) the assumed micropolitical² effects of various ways of responding to others in interaction; namely whether these interactive approaches create hierarchies or encourage their effacement, or "leveling" (Boehm, 1993)
- 2) what it means to respect the presence and actions of others, and finally
- 3) the moral decency of each form of social interaction through sound (or sonic "interactivity" as I will refer to it) as a form of leveling

Preferred styles of practicing egalitarianism in sonic interaction with other musicians vary between two basic poles, as this chapter and the next two detail. At one extreme, players prefer to experience a sense of sympathy, cooperation, and closeness in the way that others interact with them. This form of social interactivity is regarded as a basic method by which one shows respect and appreciation for the contributions of others and also a belief that one is truly equal to other participants of the interaction. If each player responds in this manner to others, then it is less likely that one player will be more influential or acquire more power in the interaction. At the other extreme, other players regard supportive playing as frustrating in free improvisation as it re-introduces precisely the sort of interpersonal musical hierarchies they sought to avoid. Instead, these other players prefer an interactivity of defiance, implicitly assuming that greater independence from other players leads to a stronger experience, that no player is in charge, and that a nonhierarchical musical sociality has been achieved. Before turning to cases in which improvisers prefer this more defiant interactivity, the rest of this chapter details the many instances from my fieldwork in which improvisers preferred a more cooperative form of social interaction through music.

Markus

Markus is a German trombonist in his 40's and has been based in Berlin for the past 15 years or so. Born and raised in a region near the North Sea, he studied jazz at a conservatory in the North Rhine/Westphalia region of Germany before relocating to Berlin. As a musician, his performance

² By micropolitics, I mean the distributions of power and influence that often structure relationships between individuals in face-to-face, real time interactions. While the term usually refers to power distributions in units of analysis much smaller than whole societies, such as within institutions or other organizations (see Ball, 2012, for one example of many others), I am using the term to refer to a situation which is somewhat more microscopic than these.

interests stretch fairly widely and include a large share of free improvisation gigs, but also a significant amount of more obviously jazz-oriented and Afro-diasporic projects as well as the more recent minimalist, post-free jazz/post-free improvisation styles for which some musicians of the Berlin scene are known. While I had seen Markus perform with a few groups before, we finally had a chance to properly meet when we were on a gig together (playing improvised Afro-beat/pop music) in December of 2014 at a small bar in Neukölln, one of Berlin's up-and-coming districts in the former West and near the old border with the East.

Like many musicians, Markus' schedule is quite full of both gigs in Berlin as well as tours outside and so it took some time from our first contact until we were able to meet so he could play with Maxine. After a few months of emailing to coordinate schedules, we finally arranged to meet at my studio in Tempelhof³ on a typically dark, sad weekday February afternoon in 2015. Just as many others have done, Markus found that the system failed to exhibit a requisite sense of cooperation in his musical interactions with it. For Markus in particular, the main fault of the system (with respect to my goal of producing an artificial re-embodiment of a free improviser) was that it seemed incapable of registering or showing consideration for his relative level of interest or disinterest in specific musical ideas at a given time in the interaction.

The strongest example of Markus' irritation on the point of cooperation came during a moment in one of his duos with the system. At that point, Maxine seemed completely unaffected by his repeated attempts to get the system's attention and remained with the same idea for several minutes, all the while indifferent to the various ideas musical ideas Markus suggested in that interval. With Markus on trombone, Maxine was set to play a virtual instrumental setup that combined a digital version of a modular synthesizer with the control of various kinds of acoustic feedback.⁴ At the beginning of the passage that Markus found irritating, his playing focused mostly on small modifications of a pitchless gurgling sound.⁵ Around this time, Maxine produced sounds of a similar temporal morphology, mostly in the form of short slowly crescendoing feedback which would undulate in both its pitch center as well as its overall amplitude. Foreshadowing his later complaint, Markus appeared to try to do what he seemed to think Maxine failed to do by attempting to adapt to the system's sounds and produce like materials and gestures.

³ This is Tempelhof the district, not to be confused with the airport and large public recreation area of the same name. Over the course of my fieldwork, there were vague discussions in Berlin of converting the terminal and hangar buildings of the now-defunct airport into artists' studios. Given the city's more pressing needs for space to respond to the refugee crisis of the 2010's, the airport has been used to house migrants seeking asylum and refugee status in Germany.

⁴ This is distinct from the signal flow feedback that I describe in Chapter 9, in which part of the system's own output flows back into its input channel acoustically as one microphone is set directly in front of the amplifier or speaker. The feedback described here is the same kind that most people avoid in a live electric audio situation and results from the same setup described above in which the microphone is near the speaker where the same microphone's output flows to. In this acoustic feedback setup, the illusion that the system is creating synthesized sounds and not just feedback is created using a variety of signal processing effects (e.g., delay, selective frequency band amplification or suppression, or low frequency oscillators modulating the level to which these effects alter the sound).

⁵ This could very well have been the same flutter tongue technique that many brass players use but just without the sound actually resulting in a pitch.

Suddenly, however, M ceased to produce feedback in short spurts and settled into the production of one consistent undulating feedback sound for nearly three minutes. As this episode of the improvisation began, Markus first response was simply to let Maxine's sound choice, which was fuller and more constant than the intermittent sounds the two of them produced immediately beforehand, take center stage and let Maxine have a short "solo" on this material for around ten seconds. After his brief pause, Markus experimented with several playing strategies over the next few minutes in order to contextualize (or simply deal with) the rather indifferent interactive attitude that the system seemed to embody at this time. Over three minutes, Markus tried a number of different ideas: short semi-loud notes, long tones timbrally-modulated by his right hand covering the bell of the horn, silence, more long tones, and occasional atonal, melodic streams of notes with short duration. In the same stretch of time, Maxine was unaffected by any of these ideas, continuing to produce the same undulating feedback sound interspersed with short jabs of synthesized sounds. Shortly after three minutes of this episode, the system for no apparent reason⁶ finally cut out the feedback, with M and Markus playing another few minutes before the end of the piece.

At the end of the duo, Markus let me know that he was irritated with the feedback episode:

- M: There was this moment when there was...⁷this...thing...quite long like [imitates feedback noise]...for quite a—, for quite a while
- R: Yes. That was quite intense
- M: It was very intense.
- R: mmmhmmm
- M: ...and it was also annoying.
- R: ...and I can turn that off...if you want.
- M: [laughs]...I mean...whatever! I mean...but this is something like, I mean, as a person you would know:
'alright...it's good!'
- R: You don't need to keep it there...
- M: Or change it or do something with it.

Markus clearly finds M's behavior to be lacking a basic sensitivity requisite for human interaction. It was not necessarily a problem for Markus that Maxine produced the particular sounds that the system did, nor was it necessarily problematic that the system stayed in this area for so long. Rather, the issue, as far as what Markus had to say about this episode, was that

⁶ At the very least, Markus did not trigger the end of the episode. It is most likely that the system responded to its own output at that time in order to end the rather lengthy spell of feedback in this duo.

⁷ Throughout the transcription of these conversations, I have included numerous false starts and other small self-interruptions. They often seem to reflect the speaker's hesitation or reconsideration regarding the content of their speech. Given that the overall concern in this project has been what people experience as well as the elements of experience they hesitate to openly disclose, I have included these minor verbal misfires as a way of registering both the complexity of a subject's own attempt to narrate what they undergo as well as their continual self-evaluation of whether they should discuss such experiences at all.

Maxine stayed focused on just one particular sound even as the system's human playing partner, Markus, tried a number of different strategies. Considering Markus' comments and the recording of this episode together, one of the moments that most likely triggered the sentiments of disgust he shared with me afterwards occurred as he played what many improvisers would probably take as a strong cue to change ideas and shift to a new range of sounds or musical ideas. After the short, moderate-volume, pitched sounds, Markus experimented with long tones modulated by his right hand. After approximately half a minute of trying this idea, Markus ended one of these crescendoing long modulated tones with a short atonal burst of sounds.

Seeing that the system had no reaction to this gesture, Markus stared at the amplifier producing Maxine's output. It hardly takes an affect theorist to sense that there was a strong note of disgust in his response at that moment and indeed, it is quite likely that most improvisers (and, I hope, myself included) would have realized that a reaction was desired to the sonic gesture that Markus had made. Still, even as I suspected that Markus was displeased, I did not shut the system off. This is not because of my sadistic intention of torturing improvisers with unpleasant musical experiences like playing with Maxine. Rather, my hesitation to intervene stems from the fact that I have witnessed several occasions — as other improvisers have — when one player gazes at another as Markus did but that this gaze is never explicitly referenced later on as clear evidence of distaste for the choices that caused it as an affective response.

In other words, despite the fact that such moments of gaze are likely charged with a sentiment of disapproval, they are difficult to interpret for several reasons. For one thing, such gazes must somehow be interpreted against the general stoicism of demeanor of most improvisers during most performances. In a word, smiles are very rare and improvisers often seem to be either irritated or just very serious when on stage. If a gaze expresses anger or disgust, then we may as well assume that improvisers are often contemplating violent or angry thoughts regarding their fellow players. Additionally, there is the radical commitment to aesthetic openness that the general discourse that players like Markus reference. Even if I could have felt (as I very well did at that time) that Markus wanted the duo to move on to something else, I could not safely assume that this was what he would have wanted. Moreover, as we shall see in later examples, I had given Markus the option to stop if he wanted to. However, since stopping in the middle to tell others that "something is wrong" is such a foreign and completely unusual behavior in free improvisation, it is likely that it was just an option that he simply could not bring himself to take. Stopping in the middle is a social behavior essential to the maintenance of aesthetic normativities such as genre, tradition, convention, etc, and is a basic part of "rehearsing" composed material so that it is played "correctly." Since improvisers largely regard such normativities and the use of a composition as a barrier to personal expression and creativity, stopping in the middle is both uncomfortable and unusual in the regular social interactions of these musicians in private playing sessions.⁸ This is action that an ensemble leader takes in the middle of a rehearsal and hardly a kind of social tactic an improviser would take if they wanted to preserve the sense of egalitarianism so critical to the ethos of this artistic practice.

⁸ Of course, it would be unfair to not recognize that many improvisers are keenly invested in composition and routinely toggle between compositional and improvisational approaches in their work (see Lewis, 2008; Radano, 1993; Steinbeck, 2017).

In addition, my hesitation to intervene, and also my empirical hesitation to assume that this was what Markus wanted, resulted from the many occasions on which I have observed improvisers do what M just did without anyone calling them out for it. For example, in a performance of a quintet of improvisers on electronic and wind instruments⁹ in San Francisco in the fall of 2013, one player, Kevin, seemed rapturously lost and fascinated by the sounds coming from his setup, comprised of a hodgepodge of synthesizers and custom tactile interfaces for controlling timbre in real time. As the other three stared at him while he continued to sway back and forth, moved by the sounds coming from his own corner of the four-channel speaker setup the ensemble shared, he seemed not to notice the possibility that the others were waiting for him to be quiet.¹⁰ Though he made eye contact with one player for a period of time in the midst of his lengthy solo, it hardly stopped his body from flailing about as the other player stood still and watched in silence. Ultimately, it is unclear what consequence, if any, there was for Kevin for this indulgence (if that is what it was). Given that the group included two guests traveling from Europe, the likelihood of a direct confrontation about his playing was low. This is not only because there may have been limited time for a discussion of this kind, but also because improvisers rely upon a friendly rapport with foreign players as a way of maintaining connections needed for arranging concerts during tours.¹¹

Markus' frustrations with Maxine indicate the basic structure of the preference for a cooperative socio-musical interactivity in free improvisation. Markus' approach to dealing with Maxine really suggests that he understands his — and therefore also Maxine's — responsibility to lie in taking ideas from the other and producing similar, but sufficiently different material. When he does so, he expects the other (whether it is a person or a machine) to reciprocate.¹² In this process, no hierarchy emerges in the aggregate over time, though it could be said that this kind of approach to “nonhierarchical” musical interaction involves the acceptance of hierarchies which constantly shift in polarity. More to the point, it seems that while this approach would liberate performers from the command of a teacher, critic, leader, composer, or other figure with authority over the musical actions of others, this approach also involves an acceptance of a responsibility to constantly demonstrate to others that one wishes for all participants to experience equity in terms of how much influence each shares in the overall musical outcome. In this approach, no one is completely in charge. For proponents of a cooperative interactivity like Markus, failure to relinquish one's own autonomy and tacitly take turns sharing a leadership role is considered an offensive manner of conducting oneself in free improvisation.

⁹ Each of the five switched between winds and electronics during the performance.

¹⁰ See Chapter 2 for a discussion of the inefficacy of “waiting” for another player as a means of getting them to move on to another idea.

¹¹ See Chapter 4 for another discussion of this kind of socio-economic bond between performers and its effect on discourse in social interaction.

¹² In more Kantian terms, he obeys a kind of “categorical imperative” and expects that others will as well.

Laurie

Like Markus, another improviser, Laurie, found fault in M's inability to "listen," at least in her interaction with it. Born and raised in the United States, Laurie has emphasized to me that much of her path in learning her main instrument, the trumpet, took place outside the context of formal musical education for much of her young adult life. In college, she came in contact with some of the more well-known innovators of free improvisation and experimental music, experiences which encouraged her to continue her development through a Masters program. Since the early 2000's, Laurie has been based in Berlin, where the majority of her work focuses on free improvisation, though this ranges from projects with a large ensemble, to smaller regular working groups, to her participation as an invited member for the many ad-hoc improvisation gigs which form a major component of an average night's activity for the Berlin scene. As was the case with Markus, it took some time from my initial contact with Laurie before we were able to meet in December of 2014.

As I often do in sessions with M, I invited Laurie to stop the piece whenever she wanted so she could tell me if M's behavior was irritating. Though I invite all players to do so, many, as in the case of Markus, choose not to. Again, it is wholly unnatural, if not unheard of, for players to stop in the middle of a "free" improvisation to correct or comment on another improviser's choices in the middle, regardless of how they may feel about its progress. Rather than stopping the flow of the interaction to insert and assert their desires into it, most prefer, as Markus did, to take a moment to pause if they are unsatisfied with what the other is doing and see if they can find a strategy that might make the most of the situation. In the middle of the second piece she played with M, Laurie accepted my invitation to interrupt the flow of the interaction:

L: Now it's interesting because...it's way louder.

R: yeah...

L: and...it's gone totally in the other direction — which I also like. It's interesting, but I mean...

If I were playing with both these people...the first one I would think:

Hey, you're not listening.

and the second one I would think:

Hey, you're not listening.

Laurie describes the two different pieces as not two pieces with M, but two pieces with two distinct improvisers. This is not merely because the system behaved differently with her in the second piece and thus inspired her to playfully refer to the two pieces as a pair of distinct individuals. Rather, her reference to these two different pieces as resulting from the interaction of herself with two different players stems from the fact that in response to some of her criticisms of the first piece, I had made a quick set of changes to the system in the hope of making the system behave in a manner better aligned with her preferences.

As I describe in Chapter 9, the system uses a multi-agent architecture in which one agent is cloned and several instantiations of that one agent operate in parallel. In the first piece Laurie did with Maxine, I had set the system to use fewer agents than I normally do. In my own

experience playing with Maxine, especially immediately prior to the session with Laurie, I have often found that changing the number of agents active in the system's mix gives it a very different character and way of interacting with others. While Laurie's implicit ontological sense-making of this kind of difference leads her to articulate it as the arrival of a completely different player, I have tended to regard such choices as a cheap, crude, but effective method of simulating the all-important performative condition of a player having a specific "mood." Changing the number of agents, or changing any other aspect of the system's deployment, often has the effect of simulating either the moodiness or opacity that is natural in the experience of continually playing with musicians who are also frequently playing with others and being influenced by them.

In the case of Laurie, I set the system to play with just one agent controlling pitch/note events and the other controlling changes in timbre.¹³ This is far fewer than the setup I typically use in performance. The use of fewer agents leads to the system to be less active in terms of sonic outputs and less responsive to human or environmental sound. I made this choice without asking Laurie based on the fact that prior to our meeting I had seen her perform in a number of contexts that had suggested to me that she might appreciate a more minimalistic version, or "mood," of Maxine.¹⁴ It was this broader context as well as the fact that it was a cold, sad, Monday "afternoon" in Berlin — even though it was around 3pm, it already looked like it was well into the evening.

And so, I took a risk and set the system to this very reduced setting. As I had expected, this setup produced an interaction between the two of them that was quite meager in terms of the number of sonic events per unit time. Very little obvious interaction seems to have taken place¹⁵ between the two of them, though Laurie tried to adapt to Maxine's playing in various ways. For example, since I had set Maxine to play a simulation of metal percussion with a rather noisy brush, Laurie at one point shifted her own playing to focus more on making noisy pitchless sounds with her instrument. Again, like Markus, it is likely that many of Laurie's choices in this first take were driven by an intention to provoke Maxine, or at the very least, to see how (or if) the system responds to different kinds of playing.

She made it clear that the first take was not her favorite musical experience. Her comments after that first take suggested a number of different possible directions for her criticism. But despite being given the opportunity to criticize the system, it seemed that Laurie herself was not necessarily able to pinpoint exactly what it is that she would have wanted differently. It is worth pausing over this point as it suggests, as I have earlier in this dissertation, that while the encounter with Maxine produces a critical discourse on musical interaction in free improvisation that is not a part of improvisers' normal coexistence with one another, it is still not easy for them to clearly articulate what they want others to do. This by no means suggests a lack of knowledge on the part of these players. Rather, it is that this knowledge is largely procedural

¹³ Again, see Chapter 9 for further description of how these agents work.

¹⁴ I had seen her play a number of gigs which were sparse in their overall level of musical action.

¹⁵ This comment is based on my listening of the recording of this session. It is possible that the duo felt quite interactive for Laurie. The comment merely notes that I, as a third party observer and researcher, cannot really know more about whether it did feel interactive for Laurie beyond her commentary afterwards.

and implicit.¹⁶ That is, it is largely used practically and it is rare that one is confronted with situations where it might be articulated in the form of criticism or instruction.

Indeed, Laurie herself hedged her own comments about Maxine several times after that first take. For example, many of her comments end with “I don’t know,” almost as if this complete sentence becomes a discourse particle or conversational filler word like “um” or “right?.” Many of her comments or criticisms are contradictory at that point, though she also at times admits that one of her criticisms sounds quite a lot like a “paradox.” At one point, I asked her if she felt the system was too reliant on her. Given that I had set the system to use fewer agents, it is possible that she might have felt that the system’s resultant “personality” was too meek, especially since my own experience indicates that using this reduced setup can lead to just the sort of sparse, flavorless interaction she had just had with the system. She responded that Maxine was neither too independent from her nor too reliant on her. The possibility of an interactivity which is not just in between these two poles and is distinct or even lying on an orthogonal axis is difficult to imagine, though she herself seemed aware that she was giving a very confusing criticism of this first take.

In response, then, I modified the system by adding a few more agents. Unfortunately, this did not work for Laurie either. The use of more agents led the system to behave in a more assertive manner and Laurie immediately noted that this version was far more audible (or “louder”) than before. Yet this did not lead to her experiencing an interaction with Maxine that felt more like the system was really listening to her playing. As I had hoped, Maxine’s overall level of activity was far higher. Still, like the first take, there was a strong level of independence and indifference in Maxine’s “responses” to Laurie’s playing. On a technical level, the system is always “responding” to various auditory inputs within its sonic environment, including Laurie’s trumpet. Nevertheless, the mere fact that the system is responding cannot be equated with the human player’s experience that the system is responding. For this to occur, the system must engage in a display of attentiveness. Like Markus, there are clear moments in the interaction when Laurie seems to be trying to determine the kind of sounds that Maxine is prone to responding to or what kind of behavior might actually allow for her to experience that the system’s output is truly influenced by her playing. Laurie tries several different types of playing textures, including long tones with a sharp crescendo at the end, a series of percussive tones, and various mutes to manipulate the trumpet’s sound.

In the end, Laurie finds once again that the system is not “listening,” though this time the failure to listen occurs in a different (i.e., louder, more active) manner. As we shall see again in later examples, the term “listening” for Laurie and other improvisers refers not just to passive reception and cognitive parsing of auditory information. To “listen” or not “listen” for players like Laurie seems to be discursive shorthand for “reacting,” a collapsing of the whole process of interactivity itself. Formally, listening is really just one layer of this whole process, which also

¹⁶ Benjamin Brinner (1995, pp. 34-39) has outlined various forms of knowledge of music-making. In this particular case, it is largely a “procedural knowledge” that most improvisers possess of their own practice, while declarative or explicit knowledge seems more rare (i.e., an ability to describe what one knows). Again, this is as much in relation to the kind of knowledge that individual musicians have as it is related to the fact that participants of a given musical culture often end up acquiring certain types of musical knowledge more readily than others and that this variable acquisition is inextricably bound up in a number of factors particular to the culturally-specific musical situation at hand.

includes processing sonic information and then ultimately performing something that may or may not be conceived or perceived as a “response.” For Laurie, listening is so pivotal to the whole process that it essentially stands for the whole, rather than referring to just one element of a multi-stage process. As is evident in the various ways that Laurie adapts her playing to come “closer,” spectrally and sonically speaking, to the system’s output, Laurie wants to make it clear to Maxine (and perhaps to me as well) that she is listening to the system as a playing partner. In fact, she clarified after the second take that she is trying to be as “generous” with Maxine as she would with another person. But Maxine, from Laurie’s perspective, at least, is responding to her interlocutor’s generosity with a distinct lack of congeniality. As she puts it, “if she were a person, I would feel like ‘hey, I’m trying to meet you. Why aren’t you trying to meet me?’” A clear desire for reciprocity has been left unsatisfied. In this instance, it is not enough for Maxine just to receive sonic information without acknowledging that the information has been received. Moreover, Maxine’s failure to acknowledge the receipt of sonic input from the other is a failure to be “generous” in the same way that Laurie is with Maxine.

Neither Laurie nor Markus explicitly raised the issue of egalitarianism or even the relative status of Maxine and the human interlocutor as these variable positions of influence on the course of the interaction emerge over time. Nevertheless, the issue of equity clearly appears in Laurie’s framing of the situation as one in which one partner attempts to show concern or at least interest in the other while the other remains indifferent. While Laurie feels that she has made an effort to adapt to Maxine by trying to alter her playing in response to how the system responds to her, she feels that the system has not reciprocated. This kind of behavior makes Laurie feel that Maxine exerts an influence on the interaction which is excessive if the interaction is to be an equal partnership. Instead, Maxine seems to grab authority, counteracting the real-time interactive leveling that Laurie expects from both Maxine but also any other human player.

Thus, there seems to be more than simply aesthetic effects to the way that Maxine plays with people. As Laurie suggests, it is not merely that Maxine’s sonic interactivity bothers her musically. It is that Maxine has bad manners, an inability to respond and acknowledge the presence of another player. Based on my experience of the system as the designer and a frequent “collaborator” with it in improvised performance, I can hear elements in how Maxine plays with Laurie where the system’s responses to human input do seem to bear the influence of the human performer. But for Laurie, that rather minimal level that the system is influenced by her playing is just not enough and it causes an experience of interaction that feels inequitable. Again, as will become clear in the next chapters, it is hardly the case that all improvisers understand this kind of behavior as an inequitable distribution of influence across participants, and even for Laurie, it is not entirely the case that she would have preferred a more sympathetic and “generous” interactivity from the system. But what this portion of Laurie’s commentary on Maxine shows is that many improvisers feel that their sonic contributions are not valued when the other player does not do anything to develop them immediately in response. These players do not derive enough satisfaction from the interaction just by playing with Maxine’s ideas, and instead, they require an interactivity in which the other player is audibly inspired by their actions. This

inspiration should be made apparent through a relatively immediate response that clearly bears the influence of the player.¹⁷

Rather than sharing power with Laurie, Maxine sets the agenda and implies through its behavior that Laurie must follow along. However, this is not necessarily a disagreeable balance of power for all improvisers. While Laurie and Markus find this kind of behavior irritating, other improvisers regard being uninfluenced by the actions of the other as the optimal means of sharing power in an interaction. And so, certain ways of listening and responding to others cannot be regarded as having an inherent effect on the distribution of power in the interaction. Those effects are entirely a matter of an individual's interpretation, though many individuals do cluster around particular interpretations.

Fabian

Like Markus and Laurie, Fabian also found that Maxine "doesn't listen." Though he never quite put it in such direct terms in our session together, this was exactly what he said to me when we ran into each other at a show a few months after the session when he had a chance to play with the system. Fabian is a Swiss saxophonist in his late 30's who has lived and worked all over Europe, but relocated to Berlin a few years ago. A highly proficient player, Fabian's range of skills is quite broad, stretching from a high degree of competence in the modernist harmonic vocabulary of jazz of the past few decades to more adventurous extended techniques and preparations of his own instrument with a variety of mutes and other modifications of the saxophone. Unlike a great many saxophonists involved in free improvisation, Fabian's tone betrays a strong influence of more recent "tenor titans" of the American jazz world like Tony Malaby, Joe Lovano, or Mark Turner. Like Markus, his professional activities range from more jazz-oriented ensembles to small groups of collective improvisation which privilege the exploration of novel timbres and instrumental techniques. Besides these musical details, Fabian is an exceedingly polite and friendly individual, generally very hesitant to ever let a conversation come close to any moment when another individual would feel offended by any topic. Despite being intelligent, talented, and the fact that he increasingly receives wider recognition for his artistic activities, Fabian remains very humble and manages to maintain a certain air of innocence around himself, though like many improvisers he holds a generally stoic demeanor on stage.

In fact, I was surprised how friendly he was (as I often am with improvisers) when I had a chance to meet him when he was playing with a jazz-influenced improvising quartet at a small, cozy bar in Berlin's Wedding district, located in the north-central part of the city. Though I found his demeanor on stage to be stiff and somewhat intimidating, Fabian turned out to be quite approachable and open-minded off stage. Though he was often just as busy as many of the other players I have invited to play with Maxine, he was very open to the idea from the beginning. I offer a sketch of Fabian's personality as a means of contextualizing the nature of his comments on Maxine's playing, comments which really varied over time from the initial conversation we

¹⁷ What kind of interaction fulfills this ideal will become clearer in a later section of this chapter focusing on "Liam," a drummer whom I invited to play a session with Maxine during my fieldwork in Berlin.

had about it just after I had moved to Berlin for my fieldwork to the more direct and resolute comment referenced above.

While he never told me so bluntly that Maxine “doesn’t listen” in our session in December of 2014, the beginnings of this final judgment should have been more apparent to me from the nature of our conversation in that first session. Though he was remarkably hesitant to be direct with me about his irritation with it, one of the things that most confused and frustrated him about playing with Maxine was how one would make an ending with a system like this. Finding the ending of a “piece”¹⁸ in free improvisation is one of the classic practical issues of interpersonal coordination performing this kind of music.

While improvisation and composition clearly have much in common as approaches to music-making (Lewis, 1996; Lewis & Piekut, 2016; Nettl, 1974; Nooshin, 2003), a fully notated composition is distinct from improvisation in that it often (though not always) has a clear ending. In almost any improvisational practice, the ending of the piece is a matter of coordination in real time and cannot necessarily be predicted. This practical task is exacerbated by the exceptional level of indeterminacy inherent in the practice of free improvisation. In numerous performances of this practice, performers can be readily observed at the last moments of the performance struggling to know when and how the piece should end. Returning to the matter of egalitarianism, it is often of crucial importance that no single performer is unilaterally the cause of the end of the piece.

A more common form of irritation occurs when one player feels a sudden inspiration and keeps playing while the rest have more or less decided that the piece is done. Such situations can be irksome since such unilateral flights of fantasy present the rest of the ensemble with a dilemma: either one joins in with the maverick player who prolongs the piece or one simply sits out, waiting for this surprise coda to come to a close. Joining in possibly encourages this dissenting party to continue, though it also helps save face for the individual who extends the piece by making it appear that this extension is actually in accordance with the wishes of other players. Conversely, as referenced in the case of Manfred (see Chapter 2 and Wilson and MacDonald 2012), being silent in the face of the other player’s extension of the piece may not necessarily be taken as a cue that this individual should stop. Moreover, it is very often the case that players are simply unaware of just how long the piece has gone. After all, no one is using a score, to say nothing of looking at a clock the whole time. In my fieldwork in Berlin I did encounter one player who would routinely have his phone on a bar stool or other surface near him so he could keep track of the duration of the piece but he was an exception. Moreover, I would not have realized that this was what he was doing had his girlfriend not clued me in.

All this is to say that endings are a complicated matter in this form of music and the ability to sense the desire that others wish to end is considered a highly valued sensibility and personality trait for potential playing partners. In this basic capacity as an improviser, Maxine failed Fabian in our session, though again, being the exceptionally polite and patient man that he is, he expressed his feelings on the matter very indirectly. At the end of the first take with Maxine, Fabian motioned for me to stop. His signal came at a point which could easily have

¹⁸ While this term might connote the use of a composition as the basis of the performance, it is common practice for improvisers to refer to individual units of their collective improvisations by this term.

been the ending of a piece between two individuals: both “players” play short phrases simultaneously and then suddenly stop. At that point, however, as Maxine often does, the system kept playing, adding in a few other sound events which almost suggested the beginning of another section of a piece, like the annoying maverick player I just described above. After shutting off the system, I apologized for Maxine’s poor manners:

- R: Yeah...sort of...went on.
F: Yeah! For me there was already a couple of endings.
R: Yeah...
F: She wouldn’t decide for an ending, would she?
R: That’s the...that’s really difficult. I have to be honest.
F: Ok.
R: eh, yeah, But I...so, um...Do you want me to send the recording and-
F: That would be amazing!
R: -maybe tell me where you would maybe mark the endings if you get a chance to do that?

Fabian’s response is characteristically polite, in contrast to the directness of his comment to me a few months later. Instead of coming out with a resolute judgment against Maxine’s indifferent “attitude” or interactivity, Fabian adopts a more neutral tone, suggesting the possibility that multiple acceptable endings could have taken place in that piece. From the very beginning of their duo together, with Maxine on prepared and extended piano and Fabian on saxophone and preparations as well, the piece was riddled with silences lasting between two and five seconds. For many improvisers, as Fabian himself admits, these pauses could have been long enough to count as a mutually agreed ending point for a piece. In several instances, it is quite likely that Fabian was deliberately attempting to provoke Maxine, almost as if to wake up a sleeping bandmate or concertgoer.

This intention or desire is most strongly heard in his repeated use of either percussive slap-tongue techniques, semi-loud long tones full of distortion due to his use of mutes, and preparations.¹⁹ In only a few of these cases did the system really respond with the same level of energy. Overall, Maxine’s responses tended to be minimal compared to the intensity of Fabian’s inputs, though in many cases the system’s responses had been excessive in their energy level compared to Fabian’s immediately preceding playing. Maxine, if the system were a real player, it would appear that she was now interested in shifting from this sparse awkward style of interaction to an area of the piece with more continuously sustained energy. But each of these outbursts was short-lived and the system would then quickly return to a state of ambiguous inactivity. Fabian took these silences as a cue or request that he should be the one to pick up the next section of the piece and break the silence, but in very few moments did Maxine actually respond by joining Fabian.

In a word, the piece was awkward. If I myself were playing with Maxine or another improviser like this, I could certainly see myself finding it rather taxing and would be likely to

¹⁹ In addition to mutes, Fabian is fond of using various kinds of plastic or rubber tubing between the neck of his saxophone and the body.

assume that the person on the other end was almost trying to set a bunch of traps for me and embarrass, rather than support, their partner. But Fabian admits to little of this experience. Before I even finish my request that he mark where he felt there could have been endings to the piece in the recording, he first expresses his enthusiasm for even hearing the recording. As I listen to the piece myself, I wonder why one would be so enthusiastic to hear a piece that sounds like it may have been a rather trying experience, a duo that really does not go anywhere and seems to be more about conflict more than a cooperation.

As with Markus, I could have sensed then the possibility that Fabian wanted me to intervene. However, I hid my face from Fabian as he played with Maxine in order to prevent my facial expressions in response to the piece (both positive and negative) from influencing the performer. As a result, I was more or less unable to immediately notice whether Fabian found these silences to be unpleasant or desirable. In addition to this concealment of my own reactions and the resulting difficulty in seeing the performer's reaction in their face, the ambiguous state of affairs with regard to the use of such prolonged silences in the middle of improvised pieces for many Berlin improvisers contributed to my hesitance to intervene. Specifically, though Fabian ultimately revealed that he found such silences to be frustrating, it is not at all uncommon to see performances of improvised music in which such silences are intentional and considered a part of the piece rather than a cue that the piece has concluded (see Beins, 2011). Though some claim that the inclusion of lengthy silences, sometimes totaling as much as half of a typical forty-minute performance, was just a short-lived trend in Berlin and other scenes (Novak, 2010; Plourde, 2008; Toop, 2016), improvised concerts featuring long silences were common during my stays in Berlin in May of 2010, summer 2012, and the fall of 2014 to the summer of 2016. Within this local cultural context, it was possible that Fabian was also a proponent of such extremes in silence. Out of respect for this possibility, I did not intervene, as it is just as likely that Fabian would have experienced the silences of his interaction with Maxine not as possible endings, but rather as silences intentionally included for aesthetic or performative effect.

In the end, however, it was clear from Fabian's comments (especially when filtered through his tendency for indirectness on matters of potential disagreement) that he may have appreciated being rescued. Then again, his view of such rescues was quite the opposite when he, myself, and another improviser, Martina, worked with Maxine for a performance in January of 2015. In order to make ourselves familiar with what might be possible for the gig, we met once as a "quartet" of two saxophones, harmonium, and electronics to try some ideas out and just play. As Maxine's steward, I constantly felt responsible for the system's outputs and often intervened to "correct" the system's behavior, changing parameters of the system's functionality in real time when it seemed to me that its output was either irritating or just dissatisfying aesthetically.

Again, Fabian did not have much to say about the overall progress of the interaction. Instead, his only criticism was for me and that I should not be touching the computer during our play together because it "takes you [me] out of the music." All at once his suggestion was a relief as much as it caused more anxiety for me. On the one hand, it spared me the task of managing Maxine's behavior in performance and allowed me to focus on playing the saxophone. On the other, he inadvertently made me powerless to protect him, Martina, and the poor audience from Maxine's insensitive manner of playing. At the end of the gig we did with Maxine, neither Fabian nor Martina had much to say about how the system behaved. Instead, they wanted to

relax, have a drink, chat, and end the evening with a nice time with friends (just as I did). Ultimately, it seems that Fabian's direct evaluation which he shared with me some months later — Maxine doesn't listen — was one which he felt would have been obvious to me and not a comment for which he would have to mince words. In any case, outside the context of Maxine, Fabian has also made clear that he really appreciates improvising with players who really "listen." This was precisely the way that he once raved to me about playing with Liam, a drummer from Australia recently relocated to Berlin.

Liam

Likely because of the relative ease that their particular passport grants them in obtaining long-term residence visas in the Schengen territory, Berlin's scene of free improvisation is dominated by the presence of musicians from Australia. These include fixtures of the Berlin scene like drummers Tony Buck and Steve Heather, bassists Clayton Thomas and Mike Majkowski, plucked string player Clare Cooper, and cellist Anthea Caddy. Generally speaking, Australians are a major part of Berlin's contemporary cultural life and during my fieldwork visits between 2010 and 2016, I met numerous Australians who had come to Berlin to enjoy and enliven its cheap, empty, urban landscape, endless nightlife, and eclectic artistic scenes.

Liam was no exception. Having traveled to North America and studied with several well-known jazz performers in the United States and Canada, Liam was, like many players of free improvisation, rooted in jazz in his early musical experiences, but now continually pulled to forms of improvisation in which references to African-American musical history were no longer so audible nor considered a prerequisite competence. Soon after my arrival in Berlin, Liam and I began frequently running into each other at shows around town. The consistency of our encounters with one another was, as it often is for musicians, suggestive of similar tastes and the possibility of a meaningful collaboration based thereon. Then again, it could have also been a product of the fact that both Liam and I were men with a lot of free time to go to shows and meet people, this being a more or less intentional objective for both of us early on in our stay in Berlin.

What finally brought us together for our first session was a bassist, Travis, on an extended visit to Berlin from Canada. I had played with Travis in a session previously along with another drummer named Sten and a wind player named Roman. Since Travis and I had met so he could play with Maxine just a few days before, a portion of the conversation naturally turned towards Travis' experience with the system, though all he said in that context was that it was "interesting" and "thought-provoking." This seemed to further spark Liam's interest in the matter, though perhaps it was also the case that the fact that I demonstrated at least a minimal competence as a saxophonist and improviser in the trio with Travis and Liam roused Liam's interest in how it would feel to actually play with my mechanical improviser.

A week or so later, Liam and I met so he could play with Maxine. For that occasion, instead of just letting Liam and Maxine play in a duo, I had suggested to Liam that we all play together in a trio Maxine on guitar or electronics, and Liam on drum kit, and me on saxophone. Since drums were his main instrument and I had no drumset at my studio in Tempelhof, we met at his space, a room not more than 150 square feet where Liam would both live and play, located

in a large *Plattenbau*²⁰ building near the river Spree on the Eastern side of the former border of divided Berlin. Normally, I make sure the system is set up and ready to go before I ask an improviser to start playing with. Since I was working with a spare amplifier Liam happened to have lying around his room, matters were inevitably more complicated as I struggled for a moment to get the sound going. After the usual head-scratching and trouble-shooting to figure out how to get Maxine's sound output to make the analog-to-digital transition into the world of physical sound, the system finally suddenly started playing. Liam was already sitting at his drumset, with sticks in hand, and playing small figures to warm up. Without waiting for my cue, he started playing with Maxine, unfazed by the fact that we had not made a "proper" start to the piece.

This awkward beginning reflects one of the basic indeterminacies of free improvisation as a social activity between human beings: when exactly do we start? In most, if not all, sessions I have had with other improvisers (whether or not Maxine was involved) it is often unclear just when we should make the transition from the idle chatting of saying hello, catching up, and getting settled — or "hanging" as many will refer to it — to actually playing music. Again, percussionist Burkhard Beins' lucid (2011) essay emphasizes that part of the intrigue of an improvisation is that one really does not know exactly the moment when the other player will start or if they might be waiting for you to start.

But while Beins' essay on this experience homes in on that special moment just before a piece when silence turns into music, he skips over the minutes of getting ready to play and setting up that come right before that transition.²¹ When meeting to play, musicians invariably play something on their instruments just to warm up. Improvisers are certainly no exception. However, occasionally, those opening moments of warming up are in fact inspiring enough to one or more players that the short pause to more formally start the beginning of a piece is skipped and warming up flows seamlessly into a longer piece. This was just what happened with Liam and Maxine. Rather than waiting for a formal start, Liam jumped right in as soon as he heard Maxine start to play. As the "two" of them played a bit, I took that time to let them go

²⁰ *Plattenbau* buildings are a type of structure iconic of East German building practices or "architecture" and earn their name from the fact that they are literally constructed from large slabs of concrete. Built during the Soviet era as public housing projects across East Germany, these structures are continual reminders of the legacies of the Cold War and the division of the country during that time. Even when the outer façade of the building is changed (as was the case for Liam's studio building), the internal structure of the building remains as a reminder of the fact that the building was in fact located behind the Iron Curtain. This was a striking feature of Liam's building, especially given the fact that it is just down the street from one of the main hotspots of nightlife activity of Berlin's Kreuzberg district, a part of the former West Berlin located just next to the border with the East and a center of countercultural life during the period of division. On the very day we met to play with Maxine, Liam's building was in the process of being destroyed, with the audible presence of heavy construction machinery immediately outside Liam's window. In fact, the window itself was completely obscured, as the new proprietors had covered the entire façade with an advertisement for the new luxury condos they were about to build once the rubble of the building had been cleared away.

²¹ Beins is not unaware of these moments and their musically inspiring potential. In fact, during my fieldwork, I had a chance to see a duo of Burkhard Beins and percussionist Oliver Steidle. Stylistically speaking, these two musicians occupy drastically different ends of the spectrum of activities in Berlin's free improvisation scene. The idea for the duo came to them as they were both warming up during a sound check for a performance at the same time. They liked the sounds they had produced together and so decided to coordinate to arrange a performance to explore their pairing further.

while I set up my saxophone, briefly joining in myself at the end of their short introductory piece.

After that piece, Liam and I resumed the banter that one normally engages in just before “actually” beginning to play music in a session. He had not much criticism of the system at that point, though he did answer affirmatively when I asked him if he found that the system’s playing seemed to change ideas too much in this initial warm up piece. Immediately afterwards, however, he hedged that comment, pointing out that he himself was also trying many different things in that piece and that players frequently rove through many ideas quickly in their initial meetings with another player.

Following this short exchange, the “three” of us played in the trio formation that I had initially suggested to him. To some degree, the system’s output was very similar in its overall level of activity to the interaction dynamic that Fabian had experienced with it. In the context of a trio, however, this was far less jarring or stifling as the just the presence of one additional (human) player produced a situation in which the overall energy of the group interaction could be sustained more easily than if the system were to play as sparsely as it did in the duo setting with Fabian. The trio created a context in which the “indifferent” or disconnected nature of the system’s playing made more sense and seemed to balance better with the presence of other players, though the two human elements of the trio were significantly more present in the overall mix of the trio. In the end, this may have been just as much due to the fact that the system has its own interactional personality traits because of the way I have designed it as it was due to the fact that the amplifier used for Maxine’s output was tiny, weak, and perhaps slightly damaged (as is so often the case when Maxine and I are “guests” and working with loaned sound equipment). As a result, the trio felt more like a duo with a non-human accompanist at times, with Liam and I leaving space for Maxine to take a more active role when the system was more assertive and sonically present.

In contrast to the mutual independence of these three “players,” trio came to a close with a relatively high level of mutual agreement on an ending, with each of the three players ceasing their sonic actions simultaneously and with the same pregnant pause that indicates agreement that the piece is done. Overall, Liam said he had fun playing with Maxine. As I had hoped and expected, he found the experience of playing in a configuration of saxophone, drums, and guitar familiar. While instrumentation in free improvisation can be rather eclectic and to a significant degree unusual combinations of instruments are considered a positive value and goal in and of themselves, the trio setting we tried was one that could have been heard rather often in any scene of free improvisation either of us had been a part of between Europe, North America or Australia.

Naturally, however, Liam’s familiarity with this trio instrumentation was superimposed upon the startling unfamiliarity of playing with a musician with no face, arms, hands, or legs, and yet one who makes sounds almost as if they did have all those features. For Liam, what first came to mind as he pondered this unfamiliarity was that the system lacked the basic human capacity for partially mimicking the sounds produced by others and then embellishing or deviating from them in the course of the interaction. As he put it in our exchange:

- L: I mean I know I do enjoy playing in this combination, as well...and also with that sort of sounding²² guitar, I guess.
- R: mhm
- L: It wasn't unfamiliar to me.
- R: right...
- L: But there was some unfamili-, unfa-mi-li-arity²³ about it...
- R: mhm
- L: um...
Like maybe sometimes if I change rapidly to something that's sort of repetitive and...
But *only* for a short amount of time, maybe sometimes if I'm playing with a person,
they'll hear that, and play with me...for that...for that amount of time and there'll be
this...
cohesion...
- R: mhm
- L: ...like this...
I think it happened sometimes...
- R: mhm
- L: ...with eh, with Maxine, but...

At that point, Liam and I were interrupted by the cranes outside in the process of destroying the building where we were talking and playing. Just a moment later, I express my sympathy and common experience for Liam's difficulties with Maxine, prompting him to a more lively and expressive way of articulating his sentiments about playing with the system.

- R: Yeah, like a person would, like, pick up on an idea.
- L: But also because there's this like-
- R: I have that problem, too. Like, she suggests things and I wanna like respond to them...
- L: yeah...
- R: ...but then there's no actual conversation.
- L: yeah...yeah, I mean it's interesting as a...it definitely works really well as...like...uh...
shifting ideas and moving in and out of each other.
- R: uh huh...
- L: It's just sometimes those moments where you're like...you're doing one thing and then
there's this
drastic change...
[claps hands with "drastic"]
...you know and it's like

²² Liam is referring to the fact that the guitar's output is not solely pitched and is vaguely reminiscent of the more avant-garde instrumental techniques developed in the wake of Derek Bailey's pioneering work in the 1960's and 1970's.

²³ Liam stumbles on the word in a slip of the tongue and sounds it out.

[plays brushes stroked on snare head surface with snare off, then suddenly shifts to fast arhythmic semi-loud hits on the snare]
something as stupid as that! But... em...

R: yeah...

L: If you, for instance, might go [*dudadididudadididudadidi!*]²⁴ on the saxophone.

R: yeah...

L: and for this moment we're... one instrument together. I think there's—some of that isn't happening so much.

R: right

L: But I mean like...that's...that's her instrument, in a way. You have to deal with...with that.

In this long exchange, Liam and I describe how we both note that Maxine has a strong tendency not to engage in a basic element of social interaction through sound in free improvisation we both find valuable, if not essential to this kind of musical interplay. In a word, Liam wants to hear that Maxine, or another improviser, is listening. In the first portion of our exchange, he articulates this through a hypothetical illustrative example in which he describes himself introducing a particular music idea which the other player would (ideally, at least) take note of and then almost immediately mimic or reproduce with a slight difference. In the second portion of the exchange he makes this a bit clearer by offering a trivial musical example. As indicated in the transcription above, he does so by first playing a short example of brushes on the snare head which he then “drastically” changes to snare hits. So far as he is concerned and so far as his experience would tell him, a person would be likely to grasp that this change in sound form had taken place. Likewise, this is precisely the frustration I experience with Maxine so often in my own experience performing with it and it seems from the exchange I have with Liam that sharing this information proved valuable in helping him to continue to articulate his criticism.

At the same time, he does not really seem comfortable committing to a critical or evaluative stance on Maxine's behavior. Despite the fact that the opportunity to critique Maxine offers him a latitude to speak freely about what might not have worked for him in playing with another improviser, he, like many others, hedges his direct criticism to me, much in the same manner that Fabian does. For all that it makes them feel more at ease in engaging in this unusual form of critical discourse, the way most players express their opinions about Maxine to me in these encounters is often prefaced by either an apology or a clarification that their intention is not hurtful or other small discursive particles that equivocate the force of their point. For example, in the first portion of the exchange Liam stops short of declaring that another player would necessarily always respond the way he describes, minimizing this categorical statement to

²⁴ Liam onomatopoeically mimics the saxophone mimicking the drum passage he played just a moment previously.

“maybe sometimes.” Similarly, though he has yet to hear the recording, he admits that the kind of interaction he describes might have happened “sometimes” with Maxine.²⁵

More generally, however, Liam ends his thoughts on this point with a broader equivocation of his stance on the matter, suggesting that the way that the system plays is less something to be judged and more to be accepted. The sentiment there is much the same as what saxophonist Evan Parker has to say on the matter: “I think we accepted long ago those aspects of each other’s playing that we were never going to be able to change and we work upon the parts that are negotiable” (Bailey, 1980/1993, p. 141). In the end, even though Liam may find fault with how Maxine behaves, he feels that part of his task as an improviser is to accept the other player’s ways of being with others musically as givens, not as variables or modifiable character traits that can be improved or shifted over time.

Joel

Even as Liam qualifies his criticism of Maxine, his comments point to another aspect of how improvisers’ criticisms of Maxine implicitly express a desire for a sense of cooperation with other players. Though cooperation is not always what these players want, as I shall articulate further in the next two chapters, it is at critical moments that attentiveness, as well as a *display* of attentiveness, are desired. For stretches of a piece, it can be quite acceptable for a player to improvise in a manner that seems to take no notice of what others are doing. But at certain points in the interaction, improvisers want their fellow players not only to pay attention, but to show that they are paying attention through an unambiguous reaction to the others. I say that they must not only pay attention but *display attentiveness* because strictly speaking, an improviser may in fact always be paying attention even if nothing in their playing reflects that. The display of attentiveness is the only way that the other player may possibly sense that one is listening, though it can also be problematic to assume that a particular improvisatory “reaction” was a reaction at all and not simply a coincidence.

In one of my earliest sessions testing Maxine with improvisers in Chicago back in 2009, the system’s lack of an ability to display this attentiveness was a critical issue for Joel, a trumpeter active in the city’s scenes of free improvisation and experimental jazz.. Joel was keenly interested in jazz and improvised music throughout his young adult life, though like many musicians, this never prompted him to study music in a formal academic or conservatory context. Though he explored other career options beyond music, he eventually abandoned such pursuits in order to focus on music. Like many improvisers, Joel is well-versed in jazz and as it turns out, my first contact with him was in the context of a weekly jazz jam session he hosted with a few of his friends and fellow improvisers. Though each of these players was most known to their audiences as performers of more avant-garde, pulseless, atonal, or generally abstract music, the session focused mainly on early bebop jazz, a kind of improvising that virtually none of them did in most of their other gigs. Besides this session, Joel’s playing mostly explores more adventurous

²⁵ Liam’s precise intention for hedging a stronger claim about Maxine’s behavior cannot be known, but it is likely that it reflects his own acknowledgement of the limits of what can say with certainty without listening to a recording given the basic constraints of memory in such circumstances. For a fuller discussion of these matters, see Chapter 2 of this dissertation.

instrumental techniques and often exploits the power of his instrument to produce a range of inharmonic and noisy sounds at a volume more difficult to achieve on other wind or brass instruments.

As is the case with most busy players, it took some time and several exchanges of emails before any meetings could be arranged. This was as true of the one time we had a chance to meet and play some of my own compositions as it was for actually meeting to have him finally play with Maxine. However, just as has happened with many players, there was a significant difference in how much time it took to arrange a meeting to play just saxophone and trumpet duos compared to how long it took to “find” a time to meet for him to play with Maxine. For some players, their interest in playing with Maxine is the same as the interest they would have in any new musical or performative setting that they would be invited to join: experience something they do not know, see how they react, explore new possibilities, and possibly also find a situation that helps provoke them to finally get out of what they feel might be a creative rut or dead end (see Beins 2011a; Wilf 2013). It hardly matters to these individuals whether or not Maxine is human; what is important is that the situation offers them a musical experience beyond their norm and this is what they are looking for as improvisers. For other musicians like Joel, however, a project like Maxine is regarded with skepticism, particularly when its steward is an individual as young and inexperienced a performer as I was at that time. In the end, it took almost two dozen exchanges of emails over a period of three months to finally arrange a meeting with Joel and it seemed that what expedited the process of scheduling was the fact that I was about to leave Chicago for good.

At that point in this project my objective was simply to improve the system by asking players whom I admired to join in the task of helping to identify areas of improvement for the system. I felt that the system I had designed seemed to be able to improvise at the level of an improviser of moderate skill and experience based on my experiences as a concertgoer of free improvisation events in Chicago. In other words, it was my opinion that I had created an improviser that could easily “pass” for a human member of this performance community.

Naturally, I felt that my own evaluations of the system were — and continue to this day to be — biased by my perspective as the designer and commitment to demonstrating the validity of its function and construction. I thought there could be no real objectivity to my own evaluations of the system’s behavior. More importantly, throughout that period, I was continually perplexed by the anti-normative open-minded rhetoric of so many improvisers I encountered in Chicago, exemplified by the aphoristic claim of one player that “there’s no such thing as a ‘good’ improviser.”²⁶ What he said did not seem true, especially based on the varying size of the audience for different performers. It was clear that *something* attracted audiences and fellow performers to make the effort to get out and see certain performers more than others. I wanted to know what that *something* was and how I or Maxine could learn to perform with it. What constituted did the appeal of certain performers? What were the components of that *something*?

On another level, I still had a hard time dispensing with the sense of artistic progress and norms of practice I had inherited from my years of experience and interest in jazz as a performer, listener, and radio DJ at WKCR-FM New York. Just as I did with the jazz musicians I sought out

²⁶ See Chapter 4 for more context on that comment.

for lessons or other expert advice, I wanted to know how to improve by drawing on the experiences and wisdom of performers actively engaged in free improvisation. But, as I outlined in Chapter 4, improvisers have largely been hesitant to take this role of mentorship.

The encounter with Maxine, however, created a different context, one which allowed improvisers like Joel, who had significant playing experience, to feel comfortable offering this sort of mentorship indirectly, by clarifying their preferences for how they want other improvisers to play. Like Liam, Joel found that Maxine's greatest weakness was that it lacked the ability to take certain sonic gestures as a cue to shift its behavior and move the improvisation in a different direction. When we met in December of 2009 at my apartment²⁷ in Chicago's Logan Square neighborhood, Joel and Maxine played three pieces, each running between five and ten minutes in duration. Much to my surprise given his otherwise more discriminating attitudes about music,²⁸ Joel's main reaction to the first piece was one of confusion and admiration at the fact that the system had the functionality that it did. He found himself impressed with the sounds that the system produced — these were an improvement, for his tastes at least, over George Lewis' well-known work with his system *Voyager* (1993, 2000b), which Joel found to be “corny” in its reliance on basic MIDI sounds. Far from dismissing the system as an inaccurate representation of how he and his colleagues would improvise together, Joel found that playing with Maxine felt very much like playing with his favorite players in Chicago, even to the point of comparing the system to those players by name.²⁹

After this initial praise and a meandering discussion of unrelated topics, I asked to hear Joel play with Maxine a bit more. In this second take, Joel began by drawing on his jazz vocabulary, to which I responded by slowly adding a few instruments to Maxine's sound output possibilities in Ableton Live while he played. After a minute or so of adding voices, Joel and Maxine settled into a “duo” of sorts, though Maxine really played a few instruments at once (guitar, metal percussion, bass, and drums). Though much of what I most admired in Joel's playing was his sound-oriented explorations rather than his jazz- and pitch-focused playing, his interactions with Maxine in this second piece focused largely on pitch-based materials.

Following this second piece, I asked Joel how he felt about the way the system manages its choice of timbre at a given time, reflecting my own preoccupation with how the system

²⁷ This location, right on the neighborhood's Palmer Square Park, was the birthplace of Maxine, where the majority of the programming that produced this system was conducted as an after-work hobby project. Owing to that legacy, the first and only commercially-released recording I have produced with Maxine takes its name from that location (Banerji, 2014).

²⁸ These “attitudes” were not verbally expressed. Rather, I continually sensed that Joel possessed such attitudes by how he winced and reacted to certain players or discussion thereof.

²⁹ This was quite surprising for me and continues to be. At one point I suggest that playing with Maxine is like playing with alien musicians via Skype in that one is playing with musicians who have a “totally different way of thinking about music.” Immediately, Joel counters my view to assert that they “sound exactly like the people I play with.”

In our conversation after this piece, Joel tentatively asserts that his colleagues would have turned the piece in a different direction if they heard him play a certain melody, a musical idea which he demonstrates for me in the above exchange. As he said before, he has few problems with how the system behaves on a general level. But in this particular case he finds that the system fails to seize upon the signification of a particular musical phrase³¹ which one of his human collaborators would sense as a possible (though not necessarily certain) indication of a desire or request for the rest of the ensemble to shift to new musical ideas.

Compared to Liam, Joel is more confident in his assertion that the other players would have caught this phrase and exploited it as a signal to turn the piece in a new direction. However, it should be noted that despite the fact that Joel claims that this phrase should have been a cue, it does not occur once in the duo he played with Maxine. Neither he nor the system played this phrase or anything similar enough for an analyst of this interaction to be certain as to which moment in the interaction he might have been referring to.³² It is possible that he was suggesting that the system had played this phrase. However, given the intentional shift between one harmony and another by Joel's phrase as well as the fact that the system is not designed to intentionally produce harmonically coherent material,³³ it is unlikely that he could have been referring to the system's playing. But more like Liam, Joel also hesitates to assert that it would be possible for me to design a system that would be able to do that, though as he admits, he never thought that the level of simulation that I had achieved would have been possible either. Immediately after claiming it would be impossible, he proceeds to explain to me that other musicians would have grasped the meaning of the musical idea he plays for me in our talk.

As much as Joel admits that he *wants* certain things from other players — things they might not actually ever give him in quite the way he wants in actual performance — he continually wavers on the claim that they do what he wishes. This becomes clearer at the end of the last piece he plays with Maxine. Coincidentally, the ending of this piece was also the first time that a musician had voluntarily stopped the music with Maxine to tell me that something was wrong and that they had something to say. In many ways, it was from my encounter with Joel that I adopted this strategy in my fieldwork over the next several years since the passion he invested in his comments when he took this option seem to reveal sentiments that could not necessarily have been elicited by any other means.

In this last duo, Maxine again plays the multi-instrumental setup of the first piece with Joel on his trumpet. For whatever reason, this last piece features more of Joel's coloristic and pitchless playing. Just before Joel's artificial cessation of the piece, he plays a pitched sound which he also embellishes with a buzz so that this carrier signal is distorted. This is perhaps in sympathy or as a means of finding common ground with Maxine playing a distorted guitar

³¹ True to Gibson's original (1979) definition of the term "affordance," the interpretation of these phrases as clear cues for a shift is just one of many. Nevertheless, there is an "affordance" of the phrase that suggests that it is possibly a cue of this kind, though it retains all the other "affordances" that suggest that it means something else.

³² This example further establishes the point made in Chapter 2 that improvisers have a distorted memory of what has happened in the course of an improvisation.

³³ It is, of course, possible that the system may produce groupings or sequences of tones which resemble or imply harmonies of Western music.

sound, one which could have been produced by a human being muting the strings of the instrument while simultaneously exciting the string with the high-velocity blades of a small portable hand-held fan or an electromechanical vibrating device (i.e., toothbrush, vibrator).

- J: Like right here- like what would...[muttering] I mean every piece is different [end muttering]
but I think like right here, like you know that...that would be kind of coming up...
- R: mhm
- J: and maybe the...you know?, the gong sound would go away [laughs], you know?
- R: yeah yeah
- J: and that thing would come up and I would get the hell out of the way
- R: mhm
- J: you know?, and it would be about that
- R: yeah
- J: until they made another sound
- R: yeah
- J: Do you know what I mean? And like I do, like in my actual performances I mean I just...ton of not playing
- R: yeah
- J: you know? so... yeah it's true I'm doing a ton of playing, you know?, so there's a... setting to that that's also in the...people part of it
- R: Oh yeah that it would
- J: A difficult thing- a difficult thing to discuss is kind of like: you know what waiting is? You know?
- R: Yeah
- J: Like people don't really talk about that a lot...

Joel stops himself short before making an assertion with any kind of universal validity in terms of how a real human improviser would respond to a situation like this. Under his breath he tells me that “every piece is different” but then still indicates that at the moment he called for a stop, a group of human players would have understood that they should coordinate in the way that he suggests. That is, the metal percussion player would drop out and allow the other musicians to build in intensity and develop a new set of ideas before Joel would join in again. The certainty of Joel's claim is questionable, as he himself suggests, and thus one may wonder whether what he wants to have happen at this moment would have ever actually happened. Nevertheless, this is how he feels the piece should be have been executed. As he further elaborates, the silence and “getting out of the way” that this moment brings him to discuss are elements of improvised interactional practice that he himself feels are not as widely discussed as they should be. Again, this suggests, as I did in the example I used to open this dissertation, the fact that the methodology centering on Maxine reveals expectations that performers normally avoid discussing such normative preferences as they coexist with others in such scenes.

Karsten

Outside the habitually reticent world of free improvisation in Berlin and beyond, however, there occasionally exist social spaces in which such matters are openly discussed. The final example for this chapter brings us to consider the interaction of Maxine and a friendly middle-aged German pianist, educator and music researcher I will call Karsten. Like the others I have depicted in this chapter, Karsten found Maxine to be a system that simply failed to sense or react to his presence in interaction, almost to the point that he hardly experienced their co-presence as yielding an interaction at all. Within (or really, next to) the Berlin scene of free improvisation, Karsten occupies a special social position as a staff member of an entity I shall refer to as Institut-Improptu. Improptu is a unique cultural space within Berlin's cultural landscape but also within the international world of free improvisation more generally. Hosting concerts of improvisers from far and wide, Improptu is a kind of community arts center dedicated to free improvisation and specializes in offering a range of evening classes for amateur performers in Berlin to explore the practice of free improvisation, primarily through music and often through dance.

Among venues in Berlin, Improptu is exceptional for its consistent ability to maintain the financial means to pay its performers at a rate that provides their livelihood. At the same time, the venue is regarded as peripheral to the center stage of Berlin's free improvisation subculture, even as it often features many of the city's most celebrated local performers. Indeed, as one performer, Brian,³⁴ complained to me, Improptu's programming was often regarded by many performers as "irrelevant." Though it was unclear what Brian meant by this, he may be referring to the tendency of many performers and regular concertgoers to avoid improvisation events at this institution. For example, many performers who normally are quite popular tended to draw extraordinarily small audiences when they would give concerts at the Institut. Moreover, during the one opportunity I had to present my own work there, neither of the performers I had invited as guests had met Karsten before the sound check, even though both of them were players who were regularly to be found playing at any of the city's other venues for improvised music.

As staff at Improptu, Karsten's work focused mainly on arranging workshops for amateur musicians, managing the Institut's library, and scheduling artists to perform at the Institut. Karsten and I met at a conference and festival on improvisation in Eastern Europe just before I began my fieldwork in Berlin in 2014. While I had been aware of the Institut in my previous visits to Berlin in 2010 and 2012, I had never understood exactly what the Institut did or exactly who its main constituency might be. After meeting Karsten personally I became more curious and soon came to attend one of the many workshops offered at the Institut. While two performers I had met and worked with in other contexts in Berlin were in attendance, the vast majority of other attendees were individuals with whom I had never come in contact. I found this surprising since in the course of my fieldwork, I had rarely attended concerts that were not attended mostly by other musicians who themselves might have been just as likely to be on stage as in the audience. As Tom Arthurs has documented (2015), though there are some individuals

³⁴ This is the same individual I mention in Chapters 4.

who truly constitute the “public” for this music, most attendees who are not musicians are well-known to the performers.

Among performers I have asked to play with Maxine, Karsten’s role in the world of improvised music in Berlin is a unique one because of his activities as an educator and organizer of events at the Institut. His work as a teacher at the Institut came up explicitly when we arranged a session for him to play with Maxine near the end of my fieldwork in August of 2016. Specifically, when Karsten found issues with how Maxine behaved, he made it clear to me that these were playing and interactive tendencies that he would have immediately corrected if they arose in the context of any of his instructional activities with the adult attendees at his workshops at the Institut. In their duo together, Karsten played piano in the “usual” style and refrained from the extended- and prepared-piano techniques of many improvisers. Though he had a Moog synthesizer mounted on top of his grand piano at his studio where we met, his playing that day was limited to the keys of the piano. Maxine played a synthetic version of metal percussion, per Karsten’s request when I gave him several options for the system’s sound output. Though limiting himself to the pitch-domain, Karsten explored a variety of playing styles, from a steady swing pulse to expressive rubato playing which betrayed his many years of training as a classical pianist as well as his more modernist aesthetics with regard to harmonic vocabulary.

Respectfully, at the end of the duo, Karsten made it absolutely clear to me that he was basically disgusted with Maxine’s playing (though he remained enthusiastic about the concert and event he had asked me to present at the Institut later that year):

R: Was [ist] deiner Meinung nach?
*What’s your opinion?*³⁵

K: mhmmmmm, ja...eh...

R: Wie findest Du sie?
How do you find her?

K: Maxine?

R: Ja, als, als Partner[in]
yeah, as a partner

K: Als Partner[in],...macht die ihr eigenes Ding.
As a partner...she does her own thing.

R: Macht die ihr eigenes Ding. Sie, sie, sie bezieht³⁶ nicht mit Dir. Sie...
She does her own thing. She, she, she doesn’t relate to you.

K: N’ja, also es ist irgendwie was ganz, also ich kenn’ das wenn ich mit Leuten spiele die...
em...eh...ja ihr so sie für sich spielen.
*Yeah, so it’s somehow something very, I mean I know it when I play with people who...
.....yeah they just play for themselves.*

R: Ja

K: G’rad’ Schlagzeuger oder so was. Das kenne ich von Schlagzeuger auch. Na?

³⁵ English in italics, original German above.

³⁶ This was the term I used in German, which was an inappropriate choice given what I meant to say. Below is my intended meaning in italics.

- Like drummers or something like that. That's something I know from drummers also, right?*
- R: J-
- K: Die spielen dann um *schpum schpusch* irgendwas und irgendwie versuchst Du dann dazwischen zu kommen und darein zu kommen und irgendwie er mach's keine Reaktion. Also ich hab' die ganze Zeit ausgetestet wann Sie irgendwie auf mich reagiert. *They play then um schpum schpusch something and somehow you try then to come in between and or get on board and somehow they just don't react. I mean I spent the whole time testing to see when she might react to me.*
- R: mhm
- K: und irgendwie k-k- habe ich nicht 'rausgekriegt wie. Ich hab' ganz viele verschiedene Strategien verwendet und... *and somehow I never really got it just how [she might be reacting]. I tried a bunch of different strategies and...*
- R: Ja, zum Beispiel wirkliche... *Pulse*³⁷...Pulsus *Yeah, for example, a real pulse, pulse*
- K: Genau! Pulsus. Ich hab' dann auch oh... [plays loud mm7add9 chord with 9 falling to tonic] ja? Ich hab' irgend- m ha- Harmonie gespielt. *Exactly! Pulse. I also tried [chord], yeah? I also played some harmonies.*
- R: [unintelligible]
- K: Ich hab' em...eh...nicht zurück gehalten. Ich hab'- eh...am Ende ihr zu gehört und hab' Sie irgendwie versucht zu begleiten. [plays dissonant partial chord voicing] *I didn't hold back. In the end, I listened to her and somehow tried to accompany her. [chord]*
- R: yeah
- K: und herauszufinden an- an welchen Stellen ich darein komme, aber es war tatsächlich nicht dass ich das gefühl hatte da[t] passiert was auf den anderen Seite. *and [tried] to find out at what point I come in, but it was really not that I had the feeling that something is happening on the other side.*
- R: aha
- K: Also es war mal kann ich, k- kenn' ich von- sagen wir jetzt von schlechten Spielern. *I mean it was let's [say], I know this kind of playing, let's say, from bad players.*
- R: yeah yeah yeah
- K: Also es... *I mean, it...*
- R: von schlechten Spielern *from bad players*
- K: von schlechten Spielern. Also, die, die irgendwann dann immer nur so ihr Ding machen und nachher sagen "Oh das war aber toll!" *from bad players. I mean, they, they sometime then always just only their do their thing and then say at the end of it "Oh but that was just great!"*

³⁷ Italics denote the use of the English term.

R: yeah

K: und ich finde es
and I find it

R: [laughs]

K: [laughs] da da da

R: und die sagen so- so- so- solche Sachen: “Oh das war aber toll!”?
and they say that, that, that kind of thing: “Oh but that was just great!”?

K: Ja! und gibt es schon solche Spielern.
Yeah! and for sure there are such players.

R: ...am Ende?
at the end [of playing]?

K: -sind oft, sind oft nicht erfahrene und die irgendwie toll finde’ es mit mir zu spielen oder überhaupt und dann irgendwie du denkst irgendwas da ist nichts passiert...Also...
“passiert” heißt:
they are often, they are often inexperienced and they somehow think it’s fun to play with me or in general and then somehow you think something isn’t happening. I mean...
“happening” means:

R: yeah

K: Ich hab’ dann immer wieder ausprobiert. Ich hab’ dann auch mal so ganz einfach so auf intuit- in- in- Imitation gemacht [plays three quick chord jabs on the keys]
I tried throughout again and again. I tried sometimes to [play] really easy, [or] intuit[ively], [or] I imitated [plays chord jabs]

R: yeah

K: Ja, oder auf Schichten [plays wider chord, sustained briefly], also Layers [en] oder so was und irgendwie hatte ich immer das Gefühl dass s-s-s es ist irgendwie egal. Er macht irgendwie so weiter. *pluf Gking!* und *lubublublubu* und dann *Toof!* und so weiter...ja?
Yeah, or in layers [plays wider chord] or Layers or something like that and somehow I always had the feeling that s-s-s it is somehow just the same. It just keeps going somehow. pluf Gking! and lubublublubu and then Toof! and so on...yeah?

R: [laughs] yeah yeah yeah

K: ...und es hat mir jetzt Spaß gemacht weil ich...
...and it was actually fun because I...

R: [Laughing] Es ist mir auch aufgefallen!
I noticed that!

K: Ja? N’ja.
Right? Right.

R: dass Sie so spielt.
That it plays like that.

K: und und ich habe dann Spaß gemacht irgendwie zu zu gucken was kann ich davon lernen. Was kann ich davon jetzt lernen? [plays chord] also es ganz am Ende, ich habe auch so selber ähnliche Klänge gemacht wie Sie...
and and I had fun seeing somehow what I can learn from it. What can I now learn? [chord] I mean it right at the end, I tried also myself to make similar sounds to hers...

- R: yeah yeah yeah
- K: aber... es war, war schon *strange* [en] aber ich kenn' das Gefühl. Ich kenn' das Gefühl mit Leuten zu spielen, em, bis man irgendwann so Kontakt kriegt und es gibt Leute mit den'n gelingt es nicht. Ich kenn' das.
but...it was, was pretty strange though I know the feeling. I know the feeling of playing with people, em, until one gets some contact and there are people with whom it just never happens. I know that [feeling/experience].
- R: So dann es war fast egal ob es, ob die Mikrofonen gab'n?
So then it was basically meaningless whether the microphones were there or not?
- K: Ja, naha.
Yeah, oh yeah.
- R: Es war fast egal ob, eh, es Mikrophone gaben oder nicht.
It was almost inconsequential, um, whether the microphones were there or not.
- K: Richtig, exact, ja. Das war was ich hatte als Gefühl.
Correct, exactly, yeah. That was what I had as a feeling.
- R: Das könnte selbstgeleit, selbstgeleites³⁸ System sein und dann du wirst kein
It could have been a self-driv, self-driven system and you then would not
- K: kein-
no-
- R: Kein Unterschied bemerken.
not notice any difference.
- K: Ja. Also es gibt von dem eh er oh [Schweiz] er so Art Spielstrategie die man machen kann um selber zu lernen spielst mit anderen *mit*. Also ich nehm 'nen CD, spiel ihr ab, und spiel dazu,
Yeah. I mean there are from the ...[?] a kind of playing strategy that one can do in order to learn for oneself how to really play with others. I mean I take a CD, put it on, and play with it,
- R: ja
- K: ja, und dann reagiere den nicht auf mich aber ich muss irgendwie gucken was mir was mir einfällt. Das ist für mich sehr gut aber es kommt natürlich kein Kontakt. Also dieses, dieses tatsächliche em Interaktive- das hab' - hab' ich überhaupt nicht, nicht wirklich gespürt.
Yeah, and then it doesn't react to me but I have to somehow look and see what strikes me or not. That is very good for me but naturally, it brings about no contact. I mean, this, this real, em, interactive- that I, I, just totally did not, not really sense at all.

As one can see from Karsten's intensely negative experience with Maxine, he finds the system to be completely incapable of the basic human interaction he and so many others assume necessary for a genuinely satisfying collaborative improvisation. He finds that Maxine reproduces the personality of a rather selfish musician or at least one who lacks experience. The system reminds

³⁸ This is my poor German diction again, in which I try to communicate the idea of a system that takes no input from the environment.

him of musicians who just play whatever they want and come away from the interaction feeling that this was a satisfying experience. In particular, Karsten finds Maxine's interactivity reminiscent of drummers, perhaps suggesting more specifically a drummer most attuned to the high-energy nonstop and largely less obviously interactive playing of much free jazz.

At the very end of our conversation, Karsten even goes so far as to say that it simply was not an interaction. As he explains at various points (and also in the rest of the dialog which I have not included here), he tried to see whether or what at all Maxine might actually react to, testing to see if the system would react to harmonies, pulse, or other basic musical conventions. Despite all of these various stimuli he finds that the system just charges along, completely impervious to any human or other environmental inputs. In several ways, I find Karsten's complaints to be a more direct articulation of many of the matters that the other improvisers I discuss in this chapter tried to communicate about Maxine's irritating ways. Like other improvisers seeking some pathway of communication with the system, Karsten mentions that he first attempted to see if the system would respond to harmony, "layers of sound" ("Schichten"), or pulse. Finding that these do not seem to how the system communicates, he then attempts to see if the system will respond to imitation. Regrettably, he finds this too is only a path to further failure.

Karsten finds that it is not possible to reach any point of contact with the system. When I ask him later on if he felt it would have been the same if there were no microphones, he is very confident in his hypothesis that the system would likely behave no differently, or that he would simply not notice a difference if the system were not using any microphones to simulate a human being's ears. In the end, he compares it not only to playing with a bad free jazz drummer, but finds that playing with Maxine is much more like playing with a CD than it is like playing with a person. As he says, playing with a noninteracting device of this kind can be a good learning experience and as he himself admits, there was some fun to be had in trying to see if he could find a way to get the system to react. But by his tone and absolutely rapid-fire passionate speech style after the duo, it was clear that he had a lot to say about how the system drove him quite mad.

Later on in our conversation, he also explains that he found Maxine to remind him of his experience as a music therapist working with autistic patients. He tells me of the rewarding nature of that work and the very satisfying moments which came after hours with a patient at which point they would suddenly together find that one particular pitch or chord or melody was of great interest and caused great excitement. He felt that it would likely be impossible for such a thing to result from an interaction with Maxine. In the hopes that his experience would improve if I were to focus the microphones exclusively on his piano, we did also try another piece. For him, unfortunately, the piece yielded very much the same feeling of indifference and disconnection from the system's lack of reaction to his playing. He even stated that he would have felt that if a person were to react so minimally, it could only be due to the fact that they were simply disinterested in what he was playing. He felt that any possible connection between himself and the system as evidenced by a simultaneous or near-simultaneous focus or production of the same musical idea was purely a coincidence.

Beyond his own dissatisfaction with Maxine, Karsten also clarified — in this meeting as well as at another time — that the way that Maxine plays is precisely the kind of interactive playing behavior that he works to train his students at the Institut not to engage in. I had

mentioned to him in our meeting before the session that one of the most surprising results of my fieldwork, which was by then nearly concluded, was that while some players preferred a more cooperative interaction with their playing partners, interactions with Maxine had brought others to describe their distaste for this manner of playing and their preference for a more defiant attitude from other improvisers. In that conversation before our meeting, he had made it clear that as an institution, the Institut Impromptu was mostly committed to training its adult hobbyist music students to play in a cooperative manner. At that time he stated that he was certainly aware that there were players who preferred to play in this manner and that it was a kind of attitude in improvisational interaction that was quite popular in Berlin. Despite the fact that it was so abundant locally, however, he had no interest in teaching his students to play in this manner because, as his comments make clear, it was a form of behavior he essentially regarded as anti-social. On another level, it is also possible that his stance on anti-social approaches to musical interaction might arise from his experience working with autistic individuals in a music therapy context.

To some degree, Karsten's explicit commitment to a more cooperative form of interactive behavior in improvisation with others may have been a stance which would have allowed me to forecast his reactions to the system's behavior. However, the system's tendency not to obviously react to Karsten's playing was not always something that Karsten experienced as negative. After two pieces with Maxine playing "metal percussion," I suggested that we might see how he would feel if Maxine were to play a different instrument. As an avid synthesizer enthusiast, Karsten asked for Maxine to be set to this instrument when I gave him a handful of options: "Gib mir Mal Synthesizer" ("gimme some synthesizer"). Regarding Maxine's overall level of interactivity, Karsten felt exactly the same as before and found that the system really did not seem to be interacting with his playing at all. Nevertheless, due to his own passion for these kinds of sounds as a player and as a listener, he found himself feeling more animated and physically ("körperlich"), excited by playing a duo with a synthesizer. He felt that the change in sounds created a situation in which it was less important to him to experience a strong sense of obvious and unambiguous interactivity from the system because the sound were good enough for him aesthetically.

Conclusion

As I have tried to demonstrate in this chapter, a number of improvisers prefer an interactivity in musical play with others in which they can clearly and consistently experience that the other is reacting and listening to them. Thus, we see one clear sense of ethics at work in how improvisers interpret the lofty goal of egalitarianism. For a system, or player, to behave in a manner that seems totally uninfluenced by the other is to be considered imperious. In other words, these players want to hear that they have some power to influence the other and do not want to experience influence as a one-way path of communication. Returning to Woodburn and Boehm's concept of "leveling" (Boehm, 1993; Woodburn, 1982), these players feel that leveling is best achieved when the other responds in a manner that demonstrates that they are influenced by the first player. Conversely, these players experience another player's failure to demonstrate mutual influence as a behavior which implicitly creates a sense of hierarchy in the interaction as it

effectively reduces the amount of agency that the other participant experiences in shaping the outcomes of the interaction.

The sensitivity expressed through responding in an obvious manner to the other is a normative value held by these improvisers that manifests itself with regard to a number of aspects of making music. For Markus, this preference emerged in the context of a specific passage where Maxine failed to grasp that he was disinterested in the current musical idea and was also making some effort to show that he wanted to change the piece to something else. For Laurie, the preference was general, a feeling that the system's behavior demonstrated no audible trace that Laurie's playing was received or recognized at all. In Fabian's case, the matter of how one ends a piece became the specific issue that really triggered and elicited his ultimate claim that Maxine does not listen. For Liam, the human element that Maxine lacked was a more evolutionary development of a relationship or a rapport between players that reflects several layers of the history of their interactions, whether this is the immediate history of the past few minutes, or a longer history of the past several sessions and gigs over months. For Joel, the system failed to perform according to a principle of cooperation in that it did not seem to be aware of how to work with others to produce a sense of "form" and allow sonically distinct sections of the piece to begin and end over time. Effectively summarizing much of these comments, Karsten found that the system just fails to react to anything and remained relatively mystified after several pieces as to how, if at all, the system reacts to his playing.

As I mentioned in the discussion of Laurie's reactions to Maxine, these improvisers find that the system fails to "listen." This is a very specific sense of the term "listening" since it actually collapses the three layers involved in the process of interaction which includes listening, thinking, and actually reacting. For these players, "listening" is only to be heard in the resultant reactions of the system. If these reactions are absent, then the system, or human player, is said to be "not listening." As noted earlier, this sense of the term "listening" leaves no conceptual room for forms of listening in which the system, or player, is in fact *listening*, but this perceptual activity is not continually confirmed to the other. I shall return to this important ambiguity in the conclusion.

Thus this collection of reactions demonstrates that a number of improvisers prefer that their playing partners improvise with them such that they can hear that they are able to influence the choices of their fellow players. However, while this set of individuals regards Maxine's behavior as *offensive* in its one-sided and insensitive nature, a different set of individuals *prefers* this more defiant attitude in those that they play with. Their reaction to this kind of playing is just one "interpretant" (Peirce, 1931-1958) of these actions. According to Peirce, an interpretant is what allows a particular sign to refer to a particular object. For these players, the "sign" of indifferent interactive attitudes in musical play refers to possible "objects" such as autocratic tendencies, insensitivity, being a bad, inexperienced, selfish, or even mentally-ill person.

However, for each of these players, it cannot be said that they each have a global preference for the other players they work with to consistently demonstrate a sense of cooperation and mutual influence. Rather, it was simply that these moments of frustration with Maxine produced situations in which they felt compelled and enabled by the situation my fieldwork creates to articulate the nature of their preference. In a word, their preference for cooperation is situationally sensitive. For example, in testing a different system, "Bob," which I

had developed during my fieldwork in Berlin (but one which I will not discuss in detail in this dissertation), Markus was actually quite satisfied with the fact that the system did not necessarily react to every element of his playing. This was clear at one point when he played several loud blasts on the trombone over Bob's relatively quieter and more minimalistic tendencies. Completely contrary to his preferences described above, in that situation he really appreciated the fact that I had designed a system that would not react to such calls to attention. As we shall see over the next two chapters, improvisers often prefer to play with others who do not always demonstrate that they are listening through displays of attentiveness.

Chapter 12: Egalitarianism as Defiance, Part 1

As the last chapter began to detail, the encounter of a virtual free improviser like Maxine with its human counterpart brings improvisers into a situation in which they feel comfortable describing how they would prefer that other improvisers should respond to them in real time. The meeting of human and machine staged through my fieldwork allows for improvisers to transcend the numerous factors that keep them from articulating to one another before or after play what they wish to have happen during play. In other words, this approach to fieldwork creates a context in which the layer of egalitarianism that prevents improvisers from declaring their expectations is stripped away by the artificial sociality of interacting with a non-human musician. In turn, the removal of the egalitarian veneer which pushes improvisers to suspend (open, unambiguous, verbal) judgments of their peers exposes a range of other conceptions of egalitarianism that go far beyond the matter of prohibited peer critique and strike at the heart of what it means to *experience* an interaction as one between equals. That is to say, it offered a range of cases which outlined a specific notion of how participants experience, and wish to experience, an equitable distribution of influence in the final outcome of the performance in how others listen and respond to them.

While the last chapter illustrated how many improvisers prefer more cooperative modes of musical interaction in free improvisation, not all improvisers regard this cooperative way of engaging in musical interaction as conducive to the experience of an equitable distribution of influence in the ultimate outcome of the performance. Rather than understanding such modes of interaction as *conducive* to an equitable distribution of influence, these other improvisers — the focus of this chapter and the next — instead view egalitarianism as best achieved by avoiding this cooperative approach. As we shall see, this other view of improvisatory social interaction regards cooperative approaches as anathema to the goal of egalitarianism. Instead of circumventing hierarchies, opponents of this cooperative ideal find that it actually has more of a tendency to re-introduce hierarchy, even as these hierarchies are constantly shifting in polarity.

At the other end of the spectrum, then, the improvisers I discuss in these two chapters prefer to engage in improvisatory socio-musical interactions in which each player takes an independent role from the rest. By not responding to others in a way that marks their attentiveness to others — or “listening,” as some players put it — these improvisers work to “share” authority over the final outcome of the piece by taking paths that are relatively autonomous from one another. With no player influenced (or obviously, audibly influenced at least) by the other players, each retains their own equitable share of the overall results of the performance. Returning to the themes of the previous chapter, while some improvisers regard this way of interacting as autocratic, for the improvisers I examine in this chapter and the following, this more defiant attitude towards others in performance serves as the ideal means of realizing an egalitarian ideal overall.

Francis

Francis is an American cellist in his 60's. Having lived all over Europe for a few decades, Francis has been based in Berlin for the past several years and continues a very active

performance schedule in the global circuit of free improvisation. Originally classically trained, Francis studied at two major American conservatories before eventually discovering his passion for improvisation. Compared to most, if not all, the improvisers I have worked with in my research, Francis has been avidly engaged in this form of music-making far longer. Indeed, his career as an improviser began with collaborations with performers in Europe and the United States who were among both the earliest known musicians of this practice as well as those who remain the most famous to this day. Though Francis' notoriety is not quite the same as these early collaborators of his, his status as a "legend" among improvisers translates into his relative ease in filling his calendar with concerts as an improviser both locally and abroad as well as his ability to draw a sizable audience to most of his performances.

Unlike many of the other performers I describe in this thesis, Francis' primary musical activity as a performer in public is free improvisation and because of his longstanding relationship to this form of music, he enjoys the relatively rare luxury of mostly earning his livelihood from free improvisation. Still, aside from his activities as an improviser, Francis has also been involved in other performance activities including theater (often for children) and experimental improvisatory dance. These parallel or past artistic experiences often manifest themselves in Francis' performances of free improvisation. For example, Francis occasionally includes non-musical performance features when he improvises in live concerts. Over the several years I have had a chance to observe his performances, this can include dance-like actions in which might, for instance, Francis step out of his chair, wiggle around, shake his legs or make more representational physical movements that might pantomime specific activities.

Beyond movement, these dance-theatrical aspects of his improvisational performance practices often involve vocalizations which sound like or include language. When he includes language, there is a clear effort¹ at work to make sure that not much of it makes any sense (i.e., that the subject is unclear or that one utterance has no obvious relation to the previous²). But often enough, these "spoken" elements of his improvised performances are simply gibberish. In one instance I observed during my fieldwork in Berlin in the summer of 2012, Francis waited until a relatively quiet moment in the improvisation, the kind of short pause that some players exploit as an opportunity to turn the piece in a completely new direction. He seized upon the moment for this effect. He stood from his chair, holding his cello and bow, staring off into space towards the back of the bar. As if giving a passionate soliloquy, Francis then proceeded to give "line" after "line" of complete gibberish, gesticulating the emotional intensity of the theatrical action with facial expressions and waving his bow around.

Though I have seen Francis play many times and would frequently run into him at shows over the course of my several visits to Berlin, it was not until April of 2015 that I was able to arrange a session to have him finally play with Maxine. Unlike many other players I have worked with, he had a chance to actually see me play with the system on two separate occasions

¹ I have never spoken with Francis about these practices or about the effort they may require to maintain a feeling of senselessness to them. It is on the basis of numerous concerts I have attended that I make the claim that his speech-like performance activities are aimed at preserving an experience of nonsense.

² While one utterance has no obvious relation to the previous, single utterances on their own may have a clear subject, object, and verb. The clarity of these utterances individually is what contributes to the whimsical nature of how Francis assembles them in sequence over time.

a few years before when I was in Berlin during the summer of 2012. Though Francis' comments on the system are quite revealing and count as one of the more startling elements of the total body of ethnographic data in this project, I was hesitant to ever engage Francis in my project. Even though he made the effort to come hear me perform on two separate occasions, I remained unsure of whether Francis would find this kind of artificial playing partner interesting enough to consider making the time for it. More importantly, given his truly eclectic performance style — one which involves much more than music, and is perhaps not worth analyzing as “music” — I felt that a session with Maxine might not offer him much of a positive creative experience.

But over the course of our encounters during my fieldwork from the fall of 2014 to summer 2016, it gradually became clear that he was more interested, especially as he was often so kind as to give very positive introductions of me to other musicians attending shows in Berlin. As with any busy performer, coordinating schedules took some time and our interest in meeting was often stymied by the fact that Francis prefers to communicate by phone, but is often out of the country. After some time, however, it became clear that his greatest resistance to meeting was simply the location of my studio, its significant distance from the nearest subway station, and the sad infrequency of the bus that one had to take to arrive.

And so, finally, in April of 2015, we arranged a session not at my studio but at a performance venue for improvised music in Berlin whose owner would occasionally allow musicians to use it for sessions or recordings. In many cases, before I have the performer to play with Maxine in order to ask them for their feedback on the system, I first do a quick sound check to ensure a proper balance of volume between the instrumentalist and the system. Accordingly, then, I began the session by first asking Francis to play a bit with the system to see if we had an adequate match of his cello with the amplifier and also to get a sense of whether the microphones of the system were picking up enough signal from his instrument. Even though I explained to Francis that all I was intending for this initial “piece” with the system was just a sound check, Francis played with the system for nearly an hour without stopping.

Almost from the beginning of the piece, Francis closed his eyes in the way that many musicians do in order to either focus their senses on sound or just to focus their mind on playing. For the first twenty seconds or so of the piece, the duo of Francis and Maxine was characterized by a very diffuse kind of “interaction.”³ More concretely, this means that Maxine responded to very few of Francis' musical actions directly, immediately, or mimetically. The same is true for how Francis responded to the system. However, not all of their interplay could be described in this manner as there were still several moments during which one player seemed to respond immediately, or really simultaneously, to the other. In any case, at the end of this initial passage of around twenty seconds, a short silence came just after Francis played three short notes separated by a pause while the system played a series of flourishes more or less in the same

³ As Benjamin Givan has recently (2016) suggested, this form of “interaction” raises the question of whether the theoretical concept of interaction serves well enough to describe it. In the kind of interactive ideal I described in the previous chapter, players greatly desire to hear that an interaction is taking place. In the kind I describe in this chapter and the next, it remains an open question whether players want to consider it a form of interaction. Nevertheless, as social psychologists, particularly those focused on early child social development (Bakeman & Brownlee, 1980; Parten, 1932; P. K. Smith, 1978), have observed, this more diffuse form of independent actions of two or more individuals in the same room or space still constitutes an important domain of human co-action, even as some dismiss its status as a genuine social “interaction.”

rhythm as Francis. I had thought that this moment might make a good place to shut off the system for just a second or two and see if Francis wanted to do an actual piece with Maxine and not just a quick sound check.

At that point, I did briefly turn off the system completely and looked up at Francis to see what he might want to do. While I normally avert my gaze from the performer while they play with the system, in this case it was very necessary for me to determine 1) if Francis was still doing a sound check with Maxine, 2) if he wanted to stop the sound check and start the “actual piece,” or 3) if this was now the “actual piece.” I was unable to determine anything, however, as Francis simply never returned my gaze and for the rest of the hour, there was not one moment when he looked in my direction. In most cases when I have asked for players to do a sound check first, there has usually been a clear moment when they stop playing and thus leave a space of a second or two for me to jump in, stop the system, have a short chat, and then proceed from that point. With Francis, he simply kept playing without stopping. I would have had to interrupt him in the middle of a phrase or musical idea in order to talk with him about what we were doing.

With his eyes closed, Francis waited a moment or two into the silence before initiating an improvisatory figure that explored string crossing on the cello before moving into other more melodic ideas. For the next few minutes, Francis mostly played solo as the system hardly responded to his playing. He seemed completely unfazed by the fact that the system, if it were to be his duo partner, was largely unaffected by any of his musical ideas. Francis continued from one melodic idea to another, tapping his foot, playing long passages organized by pulse. All the while, the system’s “responses” to his playing bore no real relation to how Francis was playing.

After several minutes of observing all this — and staring hopelessly at Francis — it was clear that Francis did not care whether this was a sound check or not and that we were in the midst of the “real” piece. It is difficult to give general descriptions of nearly an hour of this kind of playing. For the most part, however, the rest of the duo proceeded in the same manner as what I have just described above, with Francis moving from one melodic idea to another, occasionally engaging in more noise-focused playing. Just as was the case with the informal nature of the “start” of a piece for Liam,⁴ the awkward initiation of this piece with Francis prompted me to engage in a bit more manipulation of the system than I normally do. However, since I was still interested in getting an accurate sense of Francis’ evaluation of the system, my manipulations were mainly limited to changing the instrument that Maxine was set to play from time to time and adding a few more agents to the system’s multi-agent architecture.⁵

For nearly an hour, Francis remained absolutely rapt in playing with Maxine. At times he sat in his chair bowing his cello passionately, making many facial expressions as he experimented with various ideas with Maxine. From time to time, Francis was inspired by the interaction to engage in the same idiosyncratic style of vocalization for which he is known as a performer. His eyes closed throughout, he seemed truly in a trance, often playing with his mouth hanging open. At one point, however, about 40 minutes into the piece, he did begin to slouch in his chair and had nearly stopped playing. His bow bounced on his strings, continuing to produce small *col legno* sounds, but it was hard to tell whether these were intentional or not. He gradually

⁴ See previous chapter.

⁵ See Chapter 9.

slipped lower and lower on the chair to the point that he was about to fall from his seat. Though it seemed that he had fallen asleep or was about to, he soon started “playing” in a more obviously intentional and awoken manner as the system made a few loud sounds, almost as if to jolt Francis from his stupor.

At the end of almost an hour, Francis and Maxine came to a mutual pause and it sounded as though the piece was finally over. Much to my surprise, Francis found that he really liked the duo, though he admitted that he had little idea what was going on during the whole thing and hardly had a clue as to how the system was working. He found that the whole arrangement was one that made him feel comfortable, not surprising given that he played with it without pausing for longer than anyone who I have ever asked to play with this system in a duo setting for the first time during a private session.

Immediately after the piece, I answered some of Francis’ queries about how the system worked, none of which seemed to help him make sense of what just happened. After that short explanation, I followed up to find out more about how Francis felt about the interaction as a whole:

- R: So what did you think? What was it like playing with it? You said you liked it.
F: Yeah! I...thought it was...I mean a lot of people, I could see that they don’t like it but... I’m not a person that reacts...that much...
R: What do you mean?
F: ...as an improviser... I don’t react...to...what someone else is doing.
So I found...I found it...—
R: [interrupting, overlapping speech] You try and keep a stream of your own.
F: —Interesting...that way...that it’s a machine...and so...it gives me a lot of distance, you know.
R: You felt like you had some space from it.
F: Yeah...
R: Interesting... and you didn’t feel like that was a problem...with it...that it wasn’t too sensitive to what you were doing?
F: No.

Even though the system behaved similarly to how it did for Laurie (see previous chapter), Francis’ evaluation is far more positive. Indeed, for precisely the same reasons that Laurie and others seemed to have found Maxine to be utterly irritating and offensive as a playing partner, Francis finds the system to be satisfying as a musical interlocutor, or perhaps more accurately, co-performer. Whereas Laurie and others found the fact that Maxine did not immediately or obviously respond to their playing — or “listen,” as they put it — Francis finds the fact that Maxine does not react to be useful and valuable.

This comparison is of special significance. In other conversations I have had with Francis about players in the scene, he has consistently emphasized how much he enjoys playing with Laurie and actively seeks out opportunities to do so. This is especially interesting in that these two players clearly have very different evaluations of Maxine, and as I have tried to demonstrate, those evaluations of Maxine are indicative of their values when it comes to playing music with

others. The fact that one player who seems to prefer defiance enjoys playing with another who seems to prefer cooperation is one that really demands further consideration. For the moment, however, it clearly suggests that the concepts of “defiance” and “cooperation” themselves are not only highly subjective, but may be found to overlap considerably when the conceptions of multiple improvisers are taken into account all at once. In other words, one individual’s “cooperation” is another’s “defiance” and vice-versa.

As one can see from this dialog, I find myself quite confused by Francis’ reaction to the whole situation. For the time that he experienced a reverie with Maxine, I sat in tension, quite worried that the situation was a terrible experience for him and that the system’s inability to respond to any of his musical ideas was bothering him. Whereas I had assumed that my task as a designer of a virtual free improviser should focus on bringing the system to respond as intimately as possible to the human player, I was surprised to find that Francis found value in the fact that the system does not really react to his playing very immediately. As I myself listened to the duo, I constantly wondered whether I should have moved the microphones or adjusted the pre-amplification settings⁶ of the system in order to bring the system to respond more directly to his playing. Again, to do so would have required a moment for me to intervene or an ending of a piece, two opportunities that did not present themselves as Francis was off in his own world for the whole of his improvisation with Maxine.

As we talked further, Francis helped me understand more of his thinking about why this kind of playing was of value to him. As he himself admitted in the dialog above, he could imagine very clearly that many other improvisers would not like this kind of interaction. Later on, as we spoke more about this way of interacting, he also confirmed that he felt that “there’s only a handful of people I feel are relating the way I relate.” After taking just a moment to discuss what he would like to do with the rest of our session, Francis and I had the following exchange which further clarified his views on the concept of ensemble (and solo) play and introduced a unique ontology of social interaction through music:

- F: I felt like the machine was supporting my solitude.
R: Is that a [laughs] goo- That sounds pretty bad! Is that a good thing?
F: I think it is, for, for me.
R: For you. Ok.
F: A solo, uh, I feel, I’m in...my world...
R: yeah
F: ...much easier sometimes than human...goings-on.
R: Right.
... [pause]
R: Right so you felt like, so it felt like a solo?
F: ... [pauses, thinks, prompts me to re-phrase question]
R: As opposed to a duo?
F: Not always. But I don’t react, you see?

⁶ This is a means of digitally amplifying low volume signal for whatever purpose necessary. In this case, this would be to ensure that the system’s input would adequately pick up Francis’ instrumental sound output.

- R: So you don't do "duos" in the first place? almost...or? Like even if you're playing with...
- F: A duo... for me... is a quartet, if you know what I mean.
- R: I, uh... [laughs] that sounds cool. What does that mean?
- F: Well it means that...uh, it multiplies...easy, that, I play with myself. I play with the other, uh, person or...
- R: Right.
- F: ...whatever it is.
- R: Right
- F: ...and...he or she would have that option too, so it's a quartet.
- R: So two people with two instruments turns into a quartet because there's human-instrument interactions on both sides and there's human-human interactions.
- F: Well that's, that's...the, I always consider that the duo can be a trio and can be a quartet...
- R: Yeah
- F: ...at the same time as we're in a duo
- R: So did this feel like, did this have any of that going on?
- F: Yeah
- R: You felt like it was playing with its, uh, self as you say.
- F: Yeah
- R: Interesting
- F: Or maybe I'm uneasily, uh, to gain a relative state of mind.
- R: mhm, what do you mean "relative state of mind?"
- F: um...that...I'm...relating to the possibilities... of our encounter.
- R: mmm, yeah
- F: you know?... Relativity! It's a, I'm I'm more...uh...apt, to be in that state of mind
- R: Right. Things, things are happening simultaneously or I...
- F: Exactly
- R: But not lining up
- F: No, not necessarily
- R: Yeah ok, that explains a lot.
- F: In fact, I insist on...non-reaction. Inter-reaction is a different story...

As we see from this exchange, Francis conception of what constitutes an "individual," interactional unit, or interactant in this situation is very specific. His notion of an individual does not align with the boundaries of a single human body and treats both instruments as well as people as interactants. Such thinking is hardly unique for improvisers as David Borgo has demonstrated in his ongoing analyses (Borgo, 2005, 2014, 2016) of saxophonist Evan Parker's relationship with his saxophone. For both Francis and Evan Parker, one finds Bruno Latour's actor-network theory (Latour, 1987, 2005) active as an ethnotheory when these performers conceptualize a musical instrument as a kind of collaborator in performance (rather than a mechanical object subservient to human will). Likewise, returning to classical sociologist Talcott Parsons' concept of "double contingency," mentioned in previous chapters, players like Evan

Parker and Francis assume a similar type of bi-directional indeterminacy and agency in their interactions with an instrument. To parse what Francis is referring to: when he plays his cello, he may begin with intentions of his own for the play. Soon afterwards, though, the transformation of those sounds from merely notional into physical vibrations has an effect on his own state of mind. Rather than simply being the case that the music is Francis giving the audience or other players his feelings, Francis begs us to consider that his own feelings in the course of performance are partially the result of the sounds he makes. A “solo” is already experienced as a “duo, as he implies.

Again, just as before, Francis’ account of the situation throws me off as he claims that the system “supported [his] solitude.” What he described sounded like a very unpleasant experience and one that many improvisers would actively work to avoid. He then further clarifies that the experience of another improviser nurturing his experience of “solitude” despite co-presence and the expectation for interaction implicit in performers being on stage *together* is one that he finds comforting. From the particular points of praise he gives on the system’s behavior, Francis clearly suggests that he values playing with individuals who are prone to the kinds of interactive attitudes he describes. In turn, these same interactive attitudes are the ones that he himself tries to bring himself to when he engages in musical interaction with others. He prefers to play with players who would be prone to experiencing a “duo” between themselves and their instruments in the course of solo playing or those who experience a duo of two musicians and their instruments as possibly resulting in a “quartet” or “trio.” Towards the very end of the exchange, he clarifies what he means in more concrete musical and temporal terms. When I suggest that his preference is for an interaction in which players play simultaneously over one another but that events do not always line up, he affirms that this is an ideal form of playing for him as a musician.

Francis’ views about what constitutes ideal conduct in musical interaction in free improvisation are consistent with a few other details of his musical life in Berlin and beyond that I was also able to gather through my extended and serial ethnographic stays in the city. For example, within a long career of many projects in free improvisation, one of Francis’ more recent passions is for working in a quartet of musicians with similar inclinations for more abstract forms of musical interaction as well as vocalization, gesture, and semi-comedic aspects of the performance. Though I never had him play with Maxine, I had a chance to perform a duo session with the bassist from this group, Marco, who offered further insight. The attitude that the group takes to the concept of group interaction is relatively obvious from their performances, particularly in the way that each player takes a very independent role from the rest. In many ways, this group embodies the ideals that Francis implicitly sketches for me in our session with Maxine. But beyond what one gleans from performances by themselves, Marco’s account of the group clarified the question of whether the way they interact with one another on stage is intentional. Indeed it is. As Marco put it, the group really demands of him the ability to never be fazed by the fact that the other players are doing something else, or even that no one at all is doing anything similar to any of the others. Though Marco is quite active as a performer of improvised music in Berlin, he remains the least established in the group. The result of that relative status is that it often creates a tension for him as he feels that he should do more to “support” the ideas of the others. But as far as his experience of the group is concerned, he feels

it is of much greater importance and effect for him, like the three others, to stay independent from the rest, even though he admits that this is a way of relating to other musicians that makes him feel, at least in part, that he may be letting them down.

Conversely, Francis' account of playing with Maxine clarifies in part the social psychology of other performances by him which I observed during my fieldwork. During my stay in Berlin in the summer of 2012, Francis was invited by a trio of younger improvisers to round the group out into a quartet. While the other three individuals were not completely unknown to Berlin audiences, they were not nearly as well-known as Francis, a fact that he may have been aware of or possibly reacting to. In any case, throughout their interactions during both sets, the other players would consistently respond to Francis' playing by trying to imitate or extend the ideas he had just introduced. By contrast, Francis was mostly unwilling to respond in a similar manner when another player introduced an idea. In most instances when the other players would begin to respond to Francis by producing similar material — or rather, act according to the cooperative principle of interaction in free improvisation I outlined in the last chapter — Francis relatively quickly (i.e., within a minute or thirty seconds) shift to new ideas. In other words, it seemed that Francis would quickly become irritated, rather than comforted, when other players would respond to his playing in this manner. Even though they may have intended their efforts as a means of finding a compatibility with Francis' ideas, he seemed to take offense at the idea.

Later in the afternoon when Francis and I met so he could play with Maxine, he indicated to me that he found himself frustrated by younger musicians who had a tendency to emphasize the importance of “listening” in their playing. Rather than taking an independent attitude and trying to remain autonomous from the other performers, these players tended to respond in a manner that extends and embellishes others' ideas. Again, he says often finds it difficult to locate other players who “are relating the way [he] relate[s],” and as he made clear to me, it is a frequent experience of his that he is invited to play with younger players who “relate,” or interact, in a manner that he finds to lack a sense of individuality, or even adventure. This is not to say that Francis does not appreciate a measure of obvious interaction in his performances. After all, he does admit that he is still open to the possibility that a duo will be an interaction of two people. However, what he misses (and wants) in that model of interaction is the sense that the other players are “interacting” with something other than the other player, whether this is the instrument they have in their hands, their own past, or a mysterious psychological or cultural force acting from within them.⁷

As I suggested above, much of Francis' preferences for how other improvisers should engage in musical interaction may reflect his background with other types of experimental performance practices, particular dance and theater. Improvised collaborations between dance and music have been a sub-genre of free improvisation performances for several decades, but during my fieldwork from 2014 to 2016 it seemed that they were increasingly more common in Berlin. This was in no small part due to a collective of dancers and musicians who worked to

⁷ Still, for all that Francis wants a sense of defiance from his improvising interlocutors, at a moment later that afternoon when we made a “trio” of myself on saxophone, Maxine, and Francis, he expressed an appreciation for the fact that I was better able to connect with him rhythmically than Maxine was. I will return to this example in the conclusion.

actively build connections between performers through a series of workshops and performances. Though Francis was already known for his tendency to include dance-like acts in his performances, to the best of my knowledge he was never a participant in that collective's activities. In any case, I myself participated from time to time in those workshops as a saxophonist purely out of my own interest.

Shortly before my participation in these workshops, I had begun developing a range of interactive virtual animated musicians whose movements were entirely driven by real-time spectral analysis of an improvising musician's output. In a word, this project focused on a close coupling of sound and movement, such that one could *see the sounds* or *hear the movements*. By contrast, the aesthetic (or really, ethics) of this performance collective focused on something more along the lines of what Francis preferred with Maxine. Whereas my own work with creating virtual "dancers" stressed a close mirroring of sonic and visual elements, the work of the collective tended to result in a situation where there was no clear relationship between what dancers did and how the musicians responded or vice-versa. In other words, this kind of improvised dance-music collaboration featured exactly the sort of independence and simultaneity of parallel streams of action that appeared to be at the core of Francis' way of "relating" in performance. The same sort of independence is true of Francis' own way of including dance-like gestures in his performances: these happen "on top of" or "next to" other actions but do nothing to represent them mimetically or otherwise.

As I shall discuss further at the end of this chapter and the conclusion, the kind of interaction that Francis and the rest of the players I survey here prefer presents an interesting set of ambiguities about how much each performer is actually paying attention to the rest in performance. Or rather, this mode of interaction creates a situation in which no one can tell whether the other performers are paying attention at all since there are few, if any, displays of attentiveness. Even if players are paying attention to the details of what others are doing on stage, one will never really know because each player is also making a concerted and conscientious effort to conceal anything that would demonstrate that awareness. In the case of the improvised dance and music experiments I participated in my fieldwork, this manifested itself in my frequent self-questioning about what, if anything at all, the dancers were listening for in our sounds. By the same token, I had no idea how the dancers might have wanted me to translate their motions into sounds (if at all). In other words, the preferences of those improvisers I survey in this chapter and the next for a diffuse, non-reactive interactivity raise a perplexing question of whether or not it is actually important to actually listen to others. If this is how players prefer for others to engage with them, the necessity of listening itself is called into question.

Udo

In addition to Marco and Francis, the quartet I mention above also includes another player, Udo, a trumpet player.⁸ Our session with Maxine revealed Udo's strong preference for just the same kind of diffuse interactions as his cellist colleague, Francis, as well as the fact that this preference

⁸ This is the same Udo I mentioned in Chapter 5.

is a strong feature of what draws him to playing in that quartet. Now in his early 50's, Udo was born and raised in the North Rhine-Westphalia region of Germany and grew up in a middle class household. While music was always an activity in Udo's life, he was mainly interested in soccer as a child and only later in life did his interests in music develop more seriously. This led to his pursuit of a few higher degrees in music, though in that capacity Udo focused mostly on the piano and composition, even as he maintained the trumpet as an aspect of his musical life. Throughout this time, Udo's interest in improvisation gradually expanded in the way that it does for so many improvisers from a first exposure to the possibilities of spontaneous composition through jazz, a sustained engagement with jazz practice, and finally an opening to more abstract and less predictable forms of improvisation in free jazz and beyond.

Over the years, Udo has gradually risen in notoriety to become one of the most "sought after"⁹ improvisers not only in Berlin but across Europe and in the global scene for improvised music generally. This began when he was still a student in North Rhine-Westphalia, and continued to increase as he moved to Berlin and really developed his unique performance practices which privilege the production of noise and inharmonicity on the instrument. The result of this is that it is very rare that on a given night Udo is not playing, and when he does play, I have hardly ever seen an audience of fewer than twenty.¹⁰ For this reason, Udo is frequently invited as a guest for concerts of improvisation, partially due to his intrinsic virtuosity but also due to the fact that he is, quite simply, a good draw for an audience. Though he is best known as a performer of free improvisation, Udo's performance schedule includes plenty of work in more jazz-focused groups (including one he has worked with for almost twenty years) as well as improvisatory experiments with African popular music. It is rare that Udo has a free night and often he is simply not even in Berlin. Nevertheless, of the performers I have worked with in this project, he is among the few that regularly make an effort to attend concerts of others on a regular basis, including a concert I gave with Maxine and two other improvisers in March of 2015.

I first became aware of Udo's work during my visit to Berlin in the summer of 2012. During that summer as well as my lengthier stay from 2014 to 2016, I frequently ran into Udo, both at his own concerts as well as at those of his colleagues. Though I have mentioned the stoicism that characterizes the demeanor of many improvisers, I find Udo to be essentially iconic in this regard. Even though we now have a very friendly and warm relationship — full of smiles and often hugs — my initial impressions of Udo were nothing but pure intimidation. Not only was he a famous performer, someone who seemed constantly to have a queue of musicians and others who wished to speak with him surrounding him, but he was notorious for having a scowl that rested across his face.

Eventually, however, in a comfortable and intimate setting of talking with friends after a performance when most of the audience had left, we finally had a chance to meet. Underneath

⁹ This term, along with similar ones (e.g., "in demand," "top/first call," etc.) is one of the most overused phrases to describe musicians in scenes of jazz and improvised music and is often an exaggeration of just how valued a player is. It is one that, nonetheless, very accurately describes Udo's status.

¹⁰ This may seem like a rather meager figure, but for concerts of free improvisation it is truly remarkable to achieve this level of consistency.

that stiff outer surface was a friendly, cheerful soul and so I mentioned my work with Maxine and suggested that we might meet so he could play with it. From the first time that I mentioned it to him, he always sounded interested. Indeed, as I came to know when we finally met in November of 2015, he was one of the very few musicians I have ever engaged in this study who had himself had a chance to play with one of George Lewis' systems, though it was never clear whether this was the same Voyager system that falls into the category of a player like Maxine. In any case, it took quite some time for us to arrange a date to actually meet and after a while I simply abandoned any hope, as I often do, that the polite interest he expressed to my face would ever manifest itself as an actual meeting. Moreover, in our first chat about meeting, he also concurred that there was a tendency for improvisers to constantly shroud their disgust for one another in obligatory praise, or as Udo put it, to end all interactions with "always something positive" (*"immer was positives"*). Similarly, enthused that he could attend my performance with this system in March of 2015, I reminded him that I really wanted to meet with him and also that the point of this kind of meeting was that he did not need to "be nice" to me.

After much emailing and polite reminders over a period of nine months, we finally managed to arrange a meeting at my studio in Tempelhof. Like Francis, Udo's encounter with Maxine both confused me and clearly indicated that he preferred a more obstinate attitude from the players he worked with as well as the fact that he himself preferred to take this tack. Unlike other encounters between Maxine and human improvisers, Udo's preference became clear over the course of three separate improvised pieces in which I changed the microphone setup and the system's resultant "awareness" and attentiveness to the two performers.

In the first piece, I chose to direct both of the microphones of the system's acoustic input at Udo's trumpet. As I mention in a previous chapter on the system's design, I typically set the system's microphones to balance between receiving acoustical information from the performer as well as from the system itself. Arranging the microphones in this manner allows for the system to simulate the way an improviser might divide their cognitive resources between listening to their *own* playing (to self-monitor and ensure that one is playing as much as possible what one intended) and to that of *others* (so as to respond to them and demonstrate that one is at least partially influenced by the other). But in the case of Udo, I decided to begin the session with the microphones focused more or less entirely on the bell of his instrument, placing them at slightly different angles from his horn. I did this because certain instrumental sounds do not necessarily diffuse through a physical space in an omnidirectional manner (see Meintjes 1990), especially if they are emitted from a particular point at the end of a long column of air as is the case with the trumpet. Moreover, because of Udo's tendencies to cover the bell of his horn and manipulate the instrument in other ways that would likely affect the way that the sound would diffuse in the space, I thought it might be of value to begin the session with two microphones focused on him. However, in addition to these practical, technical, and acoustic reasons, I also assumed that Udo would prefer an interaction with the system in which it was most keenly aware of his playing throughout. This assumption arose in part (and regrettably) due to my admiration of him as a musician, leading me to believe that because of his greater skills and notoriety that he would prefer a system that would be very intimately responding to the details of his sonic vocabulary.

During this first take, the system tended to respond to Udo in a manner that would reflect one player taking the other as the leader or perhaps a soloist-accompanist between Udo and

Maxine. For the most part this dynamic manifested itself in that Udo initiated the vast majority of sonic actions after the two had reached a moment of silence and that the system would often punctuate in close temporal proximity (if not simultaneously) with Udo's note onsets and changes. Still, the system could not be said to have behaved in complete subservience to Udo and often, its tendency to produce phrases or sequential ideas extended far beyond Udo's provocations. Nevertheless, there was a strong element of the interaction that made it seem as though Udo could easily trigger and control the system as they played together.

As the first piece was often peppered with small breaks of silence throughout, it was very easy for Udo to work with Maxine to find a mutually agreed upon ending for this first piece. After taking a few moments to collect his thoughts, we had the following exchange:

U: What I notice is very much reacting...to what I'm doing.
R: mhm
U: So if I start playing it also starts playing. Very often, sometimes not!, but very often.
R: right
U: and eh...yeah that's a certain way of improvising.
R: Yeah, right.
U: so...it's a possibility.
R: mhm
U: Always play when the other person's playing. It's a possibility.
R: Yeah, that's a possibility. Right. Yeah.
U: But I also notice the sound color of course...the...this instrumentarium is...quite limited, but...
R: Yeah
U: ...concerning the sound color.
R: Yeah, it's, it's uh, it's pretty fixed.
U: Yeah
R: Yeah
...[mutual pause for a few seconds]
so uh...it's just one possibility, to, play at the same time as someone else or to react like that. But then was it-? Did it feel like it was not changing enough to another idea about it, the interaction, or? Did you want it to change at a certain point, or?
U: Yeah, I sometimes prefer if — um but that's my own personal taste —
R: mhm
U: if I play with somebody, this person is not reacting so much.
R: You prefer that they're not reacting so much?
U: Yeah yeah yeah(!)
R: ok
U: More, I mean, there is an awareness, eh, what I do,
R: mhm
U: but not an immediate reaction always.
R: okay. Wha-, why is that?

U: Don't know. It...I think that, that has developed in, in, in eh, improvised music.
R: mhm
U: Em, when I started playing improvised music
R: right
U: I was also always reacting what¹¹ the others did, immediately.
R: mhm
U: and eh, and there's also...players who play like that.
R: Yeah!
U: also these days, of course.
R: mhm
U: eh, and...but there's also players who don't have this immediate reactions, so, they might...react, yeah, in a very different way.
R: Right
U: Lots of, eh...
R: immediate
U: not such an open reaction. More like...they continue with, let's say they're playing something then I come in they're just continuing what they're doing.
R: Right
U: n' then maybe later do something or,
R: mhm, yeah
U: Might sound like if it's complete chance,
R: mhm
U: almost. But it isn't.
R: What's the, what what sounds like chance?
U: Yeah if the two, let's say it's only two musicians playing
R: mhm
U: And it, eh, so you have the feeling they are not really...listening what the others, what the other is doing.
R: Yeah
U: But they are actually listening.
R: Yeah, yeah, that seems to be a pretty important thing, here, is the...[laughs]
U: I mean this machine is clearly listening. I can, uh, when I come in, when I play louder,
R: That's- so, so, so you feel that?
U: it also plays louder often.
R: Something like, so you feel it is able-, you feel that it is not just a tape?
U: yeah yeah yeah
R: yeah

¹¹ This direct transcription of Udo's words seems to represent the fact that his command of English is not so strong. While Germans born and raised in the former West often have a reputation for strong English skills this is not always the case. To be fair, I have also made an effort to represent my own mistakes in German. In spontaneous speech I hardly expect anyone to necessarily speak perfectly and the main point of the accuracy of these transcriptions has been to represent the flow of ideas in the conversation rather than the linguistic competence of any particular speaker. Readers will also note the many occasions when I make grammatical errors in my native language of English, for example.

U: I mean...yeah it could be a tape, also
R: It could be a tape, yeah.
U: and it could be also just...
R: And I've actually done that with people where I tell people
U: laughs
R: that it's listening and it's actually a tape.¹²
U: But, eh
R: yeah
U: ...in this case I...I thought there was a, quite an immediate reaction when I did something I came in it also
R: Yeah
U: went louder, or when I did certain stuff it also went louder.

Several points about Udo's real preferences for what other improvisers should do already start to become clear even at the end of this first piece. Though I did not necessarily notice it as I sat there in the studio listening to Maxine and Udo play together, Udo describes the fact that he experienced a very clear trend for the system to respond to his playing almost immediately. In particular, he continually emphasizes the fact that the system seems to almost try to mirror what he is doing measure for measure. Not immediately dismissing this approach to improvising, he simply acknowledges it as just "a possibility," though later it becomes clear that this is not a possibility that he himself is very interested in.

Running through his initial observations, Udo then turns to the subject of the system's limited sound palette (which I had set to play metal percussion). But then as I try to bring him back to the subject of interaction, he answers my question somewhat obliquely, seemingly prompted to now clarify his own preferences about improvised musical interaction on a general level. At first, Udo, like Laurie,¹³ is hesitant to be honest about his opinions of how Maxine behaves, hedging the universal applicability of his comments by insisting that I take them as signs only of his "personal taste." However, as I had reminded him before, the point of our meeting was to allow him to openly discuss those tastes in order to enable a closer examination of the nature of such tastes. Very explicitly, then, he admits, just like his more recent collaborator Francis, that he prefers to play with improvisers who do not constantly engage in displays of attentiveness. As I mentioned in the previous section, Udo's explanation of his preference immediately makes reference to the fact that when one wants this type of non-reactive attitude from one's fellow players, there always remains a doubt as to whether the other is paying attention and not reacting or is very simply not paying attention. Udo insists that despite the fact that the other player is not constantly engaging in displays of attentiveness, they are listening.

¹² In this comment I am sharing with Udo what I did in a previous study (Banerji, 2012). In that project, I asked improvisers to play ten short pieces with Maxine. In some of the pieces, Maxine was not listening to the human player live, but rather was being fed audio I had just collected from the system's previous interactions with the player. For all intents and purposes, the player was playing with a "tape" in those cases, but strictly speaking, this was not what was happening.

¹³ See previous chapter.

When asked to explain the origins of his own preference, Udo's articulation of the matter relies on the development of free improvisational practices both over historical time as well as over the biographical time of his own lifespan. Like Francis and many other improvisers, Udo's own life history as a player coincides with many key stylistic developments. Fittingly, then, he first explains his preferred interactive attitude as one which "has developed" in improvised music.¹⁴ Immediately after this comment, he then further explains this development as a change not in the tastes of a whole community of practice, but a change in his own tastes personally. As he says, when he first started playing improvised music he noticed that he had a tendency to always respond to what others were playing right away and that there were many players, both then and now, who tend to engage in this form of interactivity.

Coming to his own preferences, he finds that he really would rather play with those who would have less of a tendency to react to his playing in the way that the system would. He is very specific about this and offers a simple and illustrative hypothetical example. Another player is playing something and he comes in. In response to his entrance, Udo says that he would prefer to play with players who do not tend to respond to this type of a stimulus. In other words, he is looking for a sense of constancy, a sense that the other player cannot be so easily diverted and distracted from what they have just begun playing. He does not want the other player to respond to his counterplay with sympathy and instead wants to hear in them a sense of commitment to their own ideas, a feeling of constitution that prevents them from easily being interrupted by another player. In order to clarify my understanding of Udo's comments, I ask him somewhat facetiously if what he is saying is that he might in fact prefer to play with a tape rather than a human player.

Recognizing my self-deprecatory tone, Udo clarifies that he feels that the system is clearly listening to what he is doing, but that unfortunately, this is not the form of interaction that he would necessarily prefer to have from another player. Based on my own knowledge of how the system functions as well as my own previous experiences with it as a player, it seemed that the main cause of Udo's very obliquely critical comments on the system was the fact that I had directed both of the system's microphones at his trumpet. This was likely the cause of his feeling that the system was always reacting to his playing. In response, then, I decided that it would be best that in the second take we set the microphones such that one was targeted at him and the other targeted at the system's own electroacoustic output. I hoped that this would provide a better experience of the kind of interaction that Udo tends to prefer.

After I moved the microphones to create an even balance between the system's receptivity to its own and Udo's sounds, Udo also suggested that he would like to do the second piece with Maxine playing the guitar. The second piece, similar to the first, features several moments when the system would respond relatively immediately to Udo's playing. However, there were plenty of moments in this second duo when the system did not respond as directly or simply did not respond at all. For example, Udo often tends to play long tones which feature a splitting or crackling of the sound. In younger players, this is often due to the fact that they still have not mastered their ability to control the sound and often results when they are trying to

¹⁴ A similar comment on the historical change of improvisers' attitudes towards tight or loose interactivity emerges in Oliver Bown's recent report (see Bown, 2015, p. 131) on how players evaluated his system Zamyatin.

produce a clean, harmonic sound. Like many experimental trumpet players, Udo exploits this kind of sound in his playing and does so intentionally, unlike the junior players who have not learned to control this kind of sound. In any case, Udo played several such tones during the piece. Whereas in the first piece the system would tend to respond by taking this loud split tone as a call to action, the second piece featured several moments when this same kind of tone did not yield an immediate response from the system.

Later in that conversation after the second piece¹⁵ I also asked Udo how he felt about the balance between himself and the system, not in terms of volume, but in terms of overall action:

- R: Did you feel like it was too sparse, or...?
- U: No. Was not too sparse, I mean- I played more than it did.
- R: yeah
- U: But...
- R: Is that an iss- issue though?
- U: That eh...no it doesn't ha-...I mean, I think when there is two musicians playing,
- R: yeah
- U: they don't have to play the same amount of notes.
- R: right, yeah
- U: I would, I would say.
- R: not always
- U: yeah, so...
- R: But I mean, on average does it end up being...?
- U: Uh, it's mostly, many people think that it -'s has to be like that.
- R: That's what I've always wondered! and I've never really understood.
- U: Many improvisers think in that way.
- R: yeah
- U: I don't think in that way.
- R: ok
- U: I, I think that. There's one can...if there's two musicians going on stage then one can play constantly and the other not even a single note and it's still a duo.
- R: yeah
- U: That is a very extreme case but, eh,
- R: I've done some performances like that! [laughs]
- U: That is within the range of possibilities.
- R: yeah
- U: and, eh, or, one person can only play three notes and the other person is constantly playing...and that eh, but of course that rarely happens...
- R: yeah
- U: ...because there's eh...kind of unspoken rule that everybody should play a similar amount of notes.

¹⁵ Because this portion of the conversation went quite off topic and was generally much longer than the comments after the first piece, I have summarized what we discussed and excerpted the parts most relevant to the issue.

Beyond defiance, Udo also clarifies that he does not personally subscribe to the implicit notions of equity of participation and influence that other improvisers hold to with regard to how much each player participates in the interaction. Indeed, in some of Udo's performances, it can happen quite often that either he or the other performer (though mostly the other performer) simply stands or sits in silence while the others play. While many improvisers believe that participation is measured by the breakdown of how many notes each player produced, Udo pushes for a much simpler notion: presence is participation. Naturally, however, as Udo admits at the end of this exchange, it is really quite rare that something so extreme as one player playing the whole time and the other just sitting there actually happens.

For the next few minutes we spoke about other matters, including Udo's experience with dealing with these kinds of issues in playing with larger groups. Moving back to the subject of playing with Maxine, I expressed to him my curiosity as to whether he might find it interesting if the one microphone directed at the system's own output were to be moved a bit closer to the amplifier. Given Udo's preferences as elicited so far in his interactions with the system, it seemed plausible that this might allow him to have a more pleasurable interaction with the system, one in which he feels less that the system is reacting to him, and more that it is able to do things on its own and act unprompted. Suggesting this to Udo, we then had the following exchange:

- R: and you know what? I'm, I'm little bit more curious about if it was just a bit more that Maxine is hearing itself, just a bit more.
- U: mhm
- R: You know?, just a bit more. Unless you feel like it's gonna run away from you and you're not really gonna have a say
- U: No, I...I think that's more interesting if it's...
- R: If it runs away?
- U: Yeah
- ...[mutual pause for a second]
- R: yeah
- U: Almost, almost.
- R: Almost. Ok. I mean well 'cause the other idea- sometimes is if it's just, the microphones are just on the system, but then it's still picking you up because you're in the room, more than it. If you wanna try that we can try that.
- U: Ok.

As we both had hoped and expected, the "interaction" in this last piece was a bit more diffuse and difficult to detect. There were several moments when Udo would engage in significant changes (e.g., playing quietly for a while and then suddenly playing loudly) which would not necessarily cause the system to react by making changes of its own. The system tended to not react to much of Udo's playing at all and instead seemed to hold onto "ideas" of its own for longer stretches of time. Udo, in turn, spent more time during this take looking at the amp and also looking off into space while the system would play on its own. At nearly every performance

of his that I have had a chance to observe, Udo can be seen spending a good portion of the performance staring off into space, not playing, though possibly contemplating something to play.

After these first three pieces, Udo tells me that he really preferred the second two. As he has been suggesting the whole time, he did not like the first as much because the system was reacting too much to his playing. His preference for a system that literally did not listen to him was beginning to become clearer. Again, Udo expresses the fact that his feelings on the matter are “really a matter of taste.” As always, I explain to him that these “matters of taste” are precisely what I want to know from him and that I am perfectly accepting of the fact that they are his personal views. Once again warming him up to the idea that he is free to express his personal tastes about Maxine and other improvisers, Udo shares with me another of his laconic, sage pieces of wisdom: “I like it if it’s unpredictable.”

While we have tried a few pieces now, I begin to get curious about whether Udo might actually enjoy it best if the system were simply “listening to itself.” More concretely, this means very simply that both of the system’s two microphones are pointed right back at the amplifier. Again, as I explain in Chapter 9, pointing the microphone at the system’s own output does not result in the same kind of shrieking feedback that most people assume (especially sound engineers watching me in horror as I do this before a performance). While this kind of unpleasant feedback can result in situations where Maxine is playing with this kind of setup, the result is not always just a continuous blast of sound.¹⁶

In any case, his previous comments about the last three interactions with Maxine prompt me to suggest to him that we try this slightly unusual setup. In particular, I was inspired to ask him to try this by the fact that he says (in the dialog above) that he would like it if the system were to “run away.” Accepting my suggestion, Udo then begins a fourth piece with the system. In this piece, the system is, as one could easily expect, far more distant in its manner of interacting with Udo. There are far fewer direct and obvious moments when the system is reacting to Udo and as a whole the piece feels as though it is more a juxtaposition of two personalities than it is an interaction.

As one can see from the dialog below, I had low expectations for Udo’s enjoyment of this piece, even though he had already expressed the feeling that he might really enjoy it more than the others. Instead of allowing him to end the piece, I make a small mistake by assuming that a mutual silence between himself and the system was a place to make an ending for the duo. I had assumed that Udo was not enjoying the piece and so I preemptively brought it to a close in order to “rescue” him in the way I had neglected to do with other players. Checking in with Udo at that point, we have the following exchange:

R: What’s up?

U: Yeah, it’s um...uh this, I prefer this most.

R: Really!?!

U: Yeah! [laughs]

R: That’s the funniest thing! [laughs] You know? Because

¹⁶ See section on Markus in Chapter 11.

- U: [laughs]
 R: you waste so much time trying to figure out how to get it to listen and the thing that you like
 U: when it listens to itself!
 R: Not but I also find myself...feeling more relaxed playing with it when it's not able to hear me
 U: mhm
 R: Sometimes when I'm playing with it I'll move away from- I'll just not play into the microphone at all.
 U: hm
 R: and that feels better than playing into the microphone, you know?, because it doesn't feel like it's, it doesn't feel like it's waiting for me to do something, or it's doing whatever it's doing, yeah. Yeah.
 U: I think what it's needed is a combination of both...

Just as I do with Francis, I find myself confused by the fact that Udo prefers a more defiant type of improviser as a playing partner. For the improvisers who prefer cooperation,¹⁷ the behavior of this “version” of the system — to say nothing of the physical placement of the microphones — would have been a way of (dis)engaging from other improvisers that they would likely have found autocratic or anti-social. Instead, Udo reminds me of the value he finds in playing with a player who does not listen in this manner, prompting me to share with him my own experiences playing with the system.

Towards the end of the exchange, however, Udo clarifies that while he does find an improvement in how Maxine behaves by setting both of the system's microphones to listen to the system's output, he concedes that this mode of listening-to-oneself must be balanced with listening-to-the-other. Still, both Francis and Udo later explained that as much as they prefer to play with an improviser that does “listen,” or play in a manner reflective of a cooperative attitude towards musical interaction, there are moments when they still want another player to listen and display this attentiveness audibly. Still, as I will explain subsequently, it remains unclear just when one should switch from one mode of listening or playing to another.

Returning to the exchange with Udo after his first piece with Maxine, he outlines his preference for a very specific kind of improvisatory interaction. He clarifies this to me by offering a very specific explanation of a hypothetical moment in which another player continues their ongoing playing actions *despite* the fact that another player enters with sonic materials or musical ideas that clearly differ.¹⁸ Instead, Udo suggests that he really prefers that players not engage in such a display of attentiveness. In other words, Udo does not want others to take his entrances as a request for similar or sympathetic material in response. He would prefer that the

¹⁷ See Chapter 11.

¹⁸ Here I am making a basic distinction between “sound” and “music” which centers upon the fact that the latter tends to refer to timbre (at least in the discourse of improvisers) while the second term refers to structural principles for organizing the former. “Music” might refer to things like harmony, rhythm, and other conventional structures, while “sound” refers to basic differences between sounds such as the difference between a tone and a noise or a tone with a clear pitch versus one that lacks a pitch.

other player (in many but not all cases) stay the course and not be so easily shifted from a given musical idea.

Given this sort of hypothetical scenario, most of the improvisers I described in the previous chapter would be likely to respond by adapting to the sonic materials of the other player as they enter. Indeed, Clement Canonne's recent foray (2013) into more empirical responses to the problem of how improvisers respond to such discontinuities has revealed that many players have a tendency to immediately react to the introduction of new material. In that paper, Canonne creates a fascinating and highly productive experiment in which test subjects are asked to play with a precomposed tape and respond to the experience as if they were playing with another human improviser. In order to examine how improvisers react to the sudden introduction of material that significantly differs from the current material, Canonne created a tape composition in which clearly pitched materials unexpectedly appear in the midst of an otherwise noisy environment. Working with players whose backgrounds range from free improvisation to classical music to jazz to those with a limited background in music overall, Canonne finds that most players show an audible reaction to the discontinuity. "Reaction" means that these players take the discontinuity as a cue to make a shift in their own playing.

Among other conclusions, Canonne finds that players he puts into the category of "expert" free improvisers have a far stronger tendency to adapt to such discontinuities immediately. While the cases in the previous chapter sustain this conclusion, my own fieldwork finds several cases in which what Canonne might call "expert"¹⁹ improvisers demand a more defiant attitude from their fellow players. More specifically, they find themselves frustrated by the behavior of musicians who would behave in precisely the manner that Canonne says "expert" improvisers are more likely to behave. They do not necessarily want others to adapt to them as they are playing and would prefer that the other commit to their own musical ideas rather than just following the direction of the wind.

Brian

Another player's preference for defiance emerged when I asked Brian to play with Maxine. Brian is an American woodwind player who has lived and worked all over the United States and has studied with numerous luminaries of the world of free improvisation and experimental music.²⁰ After a few years of postgraduate study, Brian then moved to Germany for a long-term residency at a major cultural institution in one of the wealthier and more well developed regions of the country far from Berlin. Following that extended stay, Brian moved to Berlin in the mid-2000's

¹⁹ Canonne does not elaborate on how he uses the term "expert" to describe free improvisers, nor does he clarify how he defines expertise. In any case, the two cases of Francis and Udo demonstrate that expert improvisers do not always play according to such principles. While Canonne also finds that 8% of the expert improvisers he worked with did not respond to the discontinuity at all, further research (such as this thesis) will be required to really know what the breakdown between reactive and non-reactive responses to this sort of situation actually is across a larger pool of improvisers.

²⁰ This is the same Brian I have mentioned in Chapter 5. In that context, I discussed the fact that he refused to take me as a private student, instead preferring that we just meet and improvise together, this constituting the "teaching" that I had wanted from him.

to join the city's very active scene of free improvisation. As a performer, the vast majority of Brian's public appearances both in Berlin and beyond fall into the category of free improvisation. This includes his participation in several working groups which have had a chance to develop a group dynamic over a period of time through rehearsals, concerts, tours, and recordings as well as impromptu groups featuring musicians who may know of each other but have yet to form a collective rapport. In addition to these activities, Brian also participates in groups with a more compositional focus.

As I mentioned in a previous chapter, Brian and I have played together in various contexts over the course of my various stays in Berlin for fieldwork and he was an individual I frequently ran into at concerts, both his own and those of others. Brian and I first met when a friend of mine from the United States was giving a concert in Berlin with a few local improvisers during the summer of 2012. Though he never had a chance to hear me play that summer, he made it a point to come and hear me play when I returned to Berlin in 2014. This led to us meeting relatively often for saxophone duo improvisation sessions over the course of my lengthier stay in Berlin from 2014 to 2016. In working with this individual, it has been a consistent pattern that he has always been ready to respond to my messages when I write to ask if we can meet to play acoustic improvisations together. By contrast, Brian has been far less willing to write me back when I have requested that we meet so he can play with Maxine, or later on, the other interactive music system I developed during my time in Berlin.²¹

When we finally had a chance to meet in January of 2015, Brian and I spent several hours together from the morning till the middle of the afternoon, playing music with each other and with Maxine, talking about music and other matters, with a leisurely lunch across the street at the small Croatian-run *Imbiss* (bistro) where we both had *Schnitzel mit Bratkartoffeln* (breaded and fried pork cutlet with sauteed potatoes and bacon). Overall, Brian was not outright dismissive of the experience of playing with Maxine, though like many improvisers he was simply skeptical of why one would want to develop such a thing when there is an abundance of musicians interested in playing in the same manner.

Over the course of several hours, we had a chance to try several different types of settings. After an hour or so of trying various configurations with Maxine, I had Brian try a short piece with the system playing "electronics." My description of this particular setting may have inadvertently caused him to have a particular kind of bias towards or against it. Specifically, as I told him then, I was inspired to sculpt an instrumental setup for Maxine in which the system would simulate the range of sonic possibilities deriving from the use of a synthesizer and controlled feedback. This was in large part due to the critical commentary of another improviser who I had asked to play with Maxine, a bassist named Joachim.²² In that session (which took place in 2012), Joachim was largely ambivalent about playing with Maxine, though like many improvisers he found the idea quite interesting and was very encouraging nevertheless. But as far

²¹ There is as much, if not more, to say about all the issues mentioned in these chapters on improvisers' reactions and commentary on Maxine as there is to say about what players have had to say about this second system, known as "Bob." Overall, improvisers with whom I have tested this system seem to prefer it to Maxine, though this does not necessarily stop them from being critical of Bob. A duo of Bob and I can be heard here: <https://ritwikbanerji.bandcamp.com/album/bob-the-sun-of-maxine>

²² This is the same Joachim I describe in Chapter 5.

as his criticisms go, Joachim felt that Maxine's biggest flaw was that the system (at least at that point in my work with it) should not play sounds reminiscent of real acoustic instruments or their electrified relatives such as the amplified guitar or keyboard. Lightly teasing me for the fact that I have compared my work in developing Maxine to the task of raising a child,²³ Joachim told me that "Maxine shouldn't just play what her father tells her to." Since I have described Maxine as a kind of intellectual offspring of mine, naturally Joachim takes this to mean that I am her father. Indeed, my relationship to the system is somewhat analogous to that of a parent-child relationship. This is especially with regard to what instrument the system is set to play and at times, when switching what instrument that Maxine will play I cannot help but imagine picking Maxine up from the synthesizer and moving her over to the guitar, metal percussion, or whatever instrument for which the human player states a preference.

At the time when Joachim and I first had a session for him to play with Maxine, I had yet to develop an instrumental practice for the system that would simulate what can be done with a synthesizer. I was most inspired to do so by Joachim's repeated criticisms of my choices of which instrument the system should play. While it is beyond the scope of this chapter and the dissertation more generally, Joachim's criticisms on this point reflect a deep valuation of a sense of individualism and authenticity. Specifically, Joachim continually stressed to me that he wanted to hear Maxine play "her own sounds," this being his reaction to the fact that at that point the best developed instrumental sounds I had made for the system consisted of a setting in which Maxine plays largely what is possible from an electric guitarist experimenting with the natural sonic limits of that kind of physical instrumental object. Rather than hearing a guitarist or a drummer, Joachim wanted to hear Maxine's own "identity" as a machine in the sounds that the system made and not some adopted identity of trying to emulate a human range of sonic outputs.

Joachim's suggestion during that session in the summer of 2012 set me on a course to develop a set of sounds in which Maxine would sound more like her "self" or sound more like a machine.²⁴ For the rest of that summer after meeting with Joachim, I worked to sculpt a synthesizer sound for Maxine using the sonic possibilities of Ableton Live as a means of simulating what famous exponents of improvisation with synthesizers tend to do. However, while I had tried to follow Joachim's advice and produce a sound world for Maxine that would be authentic to the system's identity as a mechanical (and not human) player, I realized later on that much of the way that I sculpted these sonic possibilities was actually inspired by a concert of the famous synthesizer improviser Thomas Lehn. The first time I had a chance to see Lehn was at a free concert during the Fête de la Musique at the Maison Française in Berlin, located in the city's Charlottenburg district. Even as I had tried to bring Maxine to express her or its "self" by

²³ I develop these ideas in full elsewhere (Banerji, 2010). In a nutshell, I have compared the process of creating Maxine to raising a child because a computer, like a child, has the power to do things that I never could. At the same time, the child (like the computer) requires the guidance of an adult who has been in the world in order to learn to use this power constructively. Moreover, just as a child poses naive questions which can potentially cause adults to rethink their views of the world, getting a computer to do what a human adult does easily requires the designer to acquire an understanding of these basic tasks on a level that is not required in order to simply do them with an adult human body.

²⁴ This led me to create several synthesizer setups for Maxine's sound outputs. Strictly speaking, all of Maxine's sounds are "synthesized" as all of them are simulations of a number of instrumental sounds.

moving away from simulations of acoustic instruments, I found that I had been already working with a mental model from attending this very inspiring performance by Thomas Lehn!²⁵

Before beginning the duo with Brian and this synthesizer setup, I mentioned that a lot of the way that Maxine plays the “synthesizer” was really inspired by Thomas Lehn, a player with whom Brian himself has worked with on several occasions. Just as I have always admired in his playing, Brian’s duo with Maxine on synthesizer featured plenty of the extended saxophone techniques I have often loved hearing in his playing. Alongside this avant-garde approach to his own instrument, the system’s actions focused in this duo on the exploitation of the various ways that acoustic feedback resulting from a live output from an active microphone can be shaped in various ways using Ableton Live’s various mechanisms of manipulating the envelope and frequency profile of an incoming sound (e.g., through an array of “effects” such as reverb, delay, and something called a “corpus” effect which mostly manipulates the variable frequency dampening or amplification across the audible spectrum).

I personally enjoyed hearing the duo and felt that it resulted in a wonderful combination of sounds between the two players as well as a nice balance between both players taking their own approaches but also finding ways of connecting to the other by working with similar sonic materials from time to time. The piece came to a “natural” ending point as both Brian and the system played at rather intense volumes towards the end, with both ceasing their sounds rather suddenly at the end of a little more than four minutes. After a short awkward silence, Brian looked up to me, laughed and gasped slightly and we had the following exchange:

R: That was cool! *I* liked that...

B: Okay...[laughs]

R: How did you feel? You don’t have to feel the same way.

B: No, I there were, there were times, when it, the program seems to, we seem to make a lo- there’s one issue I maybe have, it’s that, the, the program seems *fickle*. Like it kinda commits.

R: yeah

B: and then it leaves

R: Yes, it does.

As I have mentioned before, I work hard to not disclose my opinion of what I have just heard when I am listening to an improviser play with Maxine. In this case, I break this protocol, mostly given the fact that Brian and I had already begun to develop a more collegial rapport that made me feel comfortable doing so. In certain ways, I am glad that I took this risk as it might have nudged Brian towards being more articulate and direct about his opinion of what he was experiencing during the interaction. As he says, he found that the program was fickle and unable

²⁵ The “sculpting” of the sound possibilities of Ableton Live’s synthesizers consists largely in setting limits for how far a particular virtual “knob” in the simulated synthesizers of the program may be twisted, the most constraint being simply to avoid causing pain or otherwise unpleasant sounds from the system’s output. That said, much of this work of tweaking the way a particular sound comes out of the system is a very subjective and idiosyncratic process, one which I have engaged in much as my predecessor George Lewis did by simply following my intuitions rather than operating by any sort of scientific principle.

to commit to a particular idea for a stretch of time. Where this sort of issue was only a hypothetical topic in Maxine's encounter with Udo, it becomes an explicit problem for Brian. Like Udo, Brian also wants another player to stay with an idea for a little while in order to allow tension to develop. A moment or so later,²⁶ Brian elaborates on this:

- B: Like, yeah, there was a time when we were super close together. I don't know if it's because the program used a sample of me or whether it just had very similar material. It was like this *ding-ding* [imitates sound], this very stepwise stuff
- R: mhm
- B: and um... it was very... I don't know ... square-wavy, blocky, *du-de-de* [imitates sound] and fast and then it just left! and it was like 'wow *this is really kind of cool*' and it- and that's the thing: it's...I mean it's like you said, it's a child, in a way
- R: yeah
- B: ... so it's in a way that's very similar to children. They can super focus on something for maybe even a minute but then after that they just *byfvfv!* [imitates sound of car peeling away] they just kind of...they can't hold it.
- R: yeah
- B: and that's...I mean I think in the case of me improvising with a lot of people, I like that like, you could be, things could be scratching and sniffing all over the place
- R: right
- B: but then suddenly you...people can hone in and just stay with something and then just pull this thing out that you're like "whoa!" and it kinda screws with the whole form of the musical event or concert or whatever
- R: right
- B: by having some thing just lasts for five minutes! That's just Whoa!, out of the blue! with no prior decision it just happens
- R: yeah
- B: and I'm, I'm not expecting the computer to do this but I notice that that doesn't happen. It c-, c- it can't commit, it maybe, it doesn't perceive when, that that's happening, and that's the problem.
- R: yeah
- B: I mean not "the problem": that's maybe the "reason."
- R: yeah
- B: yeah
- R: no, it has probl-
- B: I'm not tryna' be down on it. [laughs]
- R: But the-, I don't know if I told ya but that's like why I want you to, it's *what* I want you to do, is to *rag* on it.
- B: I mean this is criticism but it's not like "it sucks!" more like I know, it, it can't sustain it, I mean but what what is continuity is another basic question

²⁶ For a moment or so, Brian gets distracted and goes off topic. Specifically, he balks at the fact that I am recording the conversation even though he had been aware for the previous hour that this was precisely what I was doing, and that I was doing it for the purpose of my research.

R: Yeah

B: because, also, my sense of like “wow this moment could go on much longer” is also not shared with tons of *human* players so why would it suddenly be shared with a computer program? So this is...

In this exchange, Brian clarifies his desire for what he would have liked for Maxine, or a human player perhaps, to have done in the duo that they just played. To be fair, Brian is not explicitly articulating a desire for greater defiance. In fact, there is much in what he says that actually reflects a preference for the system to engage in a more cooperative approach, echoing the desires of like-minded improvisers I described in the previous chapter. As he describes, there was a moment when he felt that he and the system were in proximity, presumably in terms of the sonic materials that they were producing, though the distinction between sounds originating from Brian’s horn and the system remains clear throughout the duo. Nevertheless, Brian reports this experience as one in which he and the system felt “super close together.” The “problem” for Brian occurs when the system suddenly departs from the sonic materials that led him to feel close with the system.

Thus, Brian’s experience with the system would seem to reflect a desire for greater cooperation from an improvising partner, not greater defiance. However, because of how I have designed this system, there are elements of Brian’s criticism that suggest that the system might have been better able to meet his expectations if it were less sensitive to auditory input. When Brian describes the system as “fickle” he is describing the fact that the system is — despite many improvisers saying nearly the opposite — too *sensitive* at times. As I myself have experienced in numerous situations, the system has a tendency to unexpectedly abandon certain sonic materials in the middle of its use of them. Though I do not know what specific moment Brian was referring to, the unexpected cutting out of a particular sound likely stems from the fact that the system “listens” for pitch. As described in Chapter 9, I chose this strategy because it allows the system to simulate the sense of subjectivity that is essential in designing a system of this kind. Just as improvisers often value working with players whose interpretations of certain sonic moments is idiosyncratic, the use of pitch-based sound analysis for material where there is not a clear sense of pitch leads the pitch-detector to bizarre conclusions about what is going on in the sonic environment. The pitch detector’s parsing of such sounds is *almost* random, but is still very consistent and certainly is a reflection of the nature of those sounds themselves even though the interpretations given are basically meaningless from a scientific standpoint.

While this strategy has been consistently effective for generating a sense of surprise in how the system behaves, it often leads to interactions in which the system is inexplicably triggered to move on to new material, leaving players like Brian (and me) longing for a bit more of the previous moment. What likely took place in the duo with Brian was that the system heard some “pitch” in the midst of all that sound that caused it to change some aspect of its internal state. It could just as easily have been the system that triggered itself in this way as it could be the result of Brian’s playing. More importantly, even if Brian were to feel that he himself was staying very clearly within one sonic area (e.g., not just multiphonics generally, but a very specific multiphonic), there is no guarantee that the system would interpret this as a single area at

all. No matter how consistently one is playing, it seems that Maxine (because of its reliance on pitch-based real-time analysis) parses this kind of steadiness as a world of flux and change.

Complementing the previous examples with Udo and Francis, Brian's experience of playing with Maxine demonstrates the complexity of the ideal of defiance in musical interactions of free improvisers. On the one hand, Brian very clearly articulates a desire for the system to remain close to him in terms of exploring similar sonic materials together for a stretch of time. On the other, the reason that the system is unable to do that is that it fails (or I have failed to design it) to filter out certain sonic changes in order to remain constant and fixed upon a certain sonic concept. In this case, the system's behavior was simultaneously too sensitive and too insensitive. If the system were a player, the problem would have been that this individual would have been paying too much attention to their environment, taking an attitude in which they are too prone to responding to what they hear and adapting (howsoever they might). For just a moment, Brian wants the other player to not pay so much attention, or at the very least, to not demonstrate that they are aware of the other player through a display of attentiveness.

As these three cases each illustrate, there are players who prefer that the musicians they improvise with take a less sympathetic and more intransigent attitude towards playing with others. For Francis this comes out as he appreciates the way that Maxine does not seem to listen (or at least, constantly mark the fact that it is listening). Later in our conversation, he further corroborates that his preferences about Maxine are reflective of his preferences for how human musicians should conduct themselves as well. Similarly, Udo prefers the system to be listening to itself and finds himself least enjoying the duo with Maxine when the system's microphones are focused on the bell of his trumpet.

However, Brian's case begins to show the complexity of this kind of preference. Whereas the previous two cases showed a clear preference from two well-established improvisers for the system or human player to respond in a relatively *irrelevant* manner, Brian wanted the system to stay in a particular sonic area (though I have been unable to determine which sonic area that was in his case). Nevertheless, Brian's experience compels him to explain to me that he would have wanted the system to be a bit more committed to a certain sonic idea. In some ways, his preference can really be classified as a preference for cooperation because what he really wants (on an interactive, behavioral plane) is for the system to do as he does (or similarly) for a little while. This is precisely what the musicians of the previous chapter claim that they want and as we see, they do indeed speak up when this is not what they are getting from Maxine even if they would not explicitly call other human beings out for similar infractions. Still, Brian's comments about the system must be considered in light of how the system is designed. As the designer, I know that how Maxine responded was a result of an unfiltered sensitivity to what it perceives (or parses) as pitch changes. As the reader may recall from Chapter 9, it is most likely the result of this unfiltered sensitivity that the system responds to Brian in a way that he evaluates unfavorably. Its sensitivity leads him to experience its behavior as insensitive.

Taken altogether, the three cases advance a consideration of the central paradox behind this preferred attitude towards others in social interaction: if A do not want the other, B, to engage in displays of attentiveness in social interaction, then how is A supposed to know that B is paying attention at all? Moreover, if A wants a lack of displays of attentiveness from B, then has A now resigned themselves to the eventuality that B may not be paying any attention? Has A

now accepted that B not paying attention is a positive outcome? As I shall show in the next triptych of cases in the next chapter, this ambiguity has various interpretations, though no improviser necessarily frames their account of the situation in my terms precisely.

For now, however, it must be noted that one actor's "sensitivity" may be taken by another as "insensitivity." This is especially true in Brian's experience, but is made more complicated and corroborated by Francis' experience. As I mention in a footnote in that section, Francis likes playing with Laurie. Laurie prefers cooperation. Francis does not. There is still too little data to make a more authoritative claim about the matter, but their affinity (which I can neither confirm nor deny from my chats with Laurie) suggests that whether one prefers more cooperation or defiance, one can still find a way to enjoy the musical company of another who has articulated a diametrically opposed conception of what is actually going on.

Finally, there is also the fact that neither Udo nor Francis really want to play with a player who has no ability to parse what they other is doing, a point to which I will return to after the next chapter. For all that they like the senselessness of Maxine's way of interacting, they are not always interested in playing music with someone who cannot hear what they are doing and react to it. As I will make clearer after the next chapter, the major issue and frontier for the analysis of this way of making music together as a type of social behavior is the issue of knowing when cooperation or defiance, the two broad attitude types I have outlined, is most appropriate. In a nutshell, this amounts to what one might call either Kant's concept of "practical reason" or the more classical Aristotelian concept of "phronesis," the ability to know how and when a particular virtue ought to be exercised given a certain situation.

Chapter 13: Egalitarianism as Defiance, Part 2

Carl

While the improvisers I discussed in Chapter 11 found an excessive degree of independence in the system's actions unproductive or musically unsatisfying, the players I am examining in this chapter and the previous demonstrate the fact that many improvisers find themselves annoyed with players who lack a sense of independence when they engage with others in musical interaction. Such was clearly the case for a Chicago-based improviser named Carl who I asked to play with Maxine early in my work with this system back in 2009. For Carl, the problem was not so much that the system was too sensitive to his playing. Rather, he found that the fact that the system was clearly aware of what he was doing or whether he was playing was precisely the problem.

As I mentioned in an earlier chapter, Carl was among the first contacts that I made in the free improvisation scene in Chicago when I moved back to the city from New York after college in 2007. Now in his mid-50's, Carl is one of Chicago's most active improvisers and is a key figure both as a performer as well as a concert organizer. In terms of musical background, Carl has studied with a variety of central figures of the wider world of new music as well as the more specific subculture of free improvisation. This has taken a variety of forms, from formal higher education to more informal studies with various teachers over time. Additionally, his musical background also includes some work with computer music, though given his age and the particular historical moment when he first made such experiments he was not as lucky as I was to start working with such tools in an era when designing real-time systems like Maxine had become much easier.¹

In terms of performance activities, Carl's public appearances and recordings mainly focus on working as a free improviser, and while he has acquired some recognition and exposure for his work as a composer, playing the cello in improvised contexts remains his primary activity and professional identity as an artist. In Chicago and beyond, Carl performs with a wide variety of groups within and at the margins of free improvisation. These range from a number of small (e.g., trio to 10-piece ensemble) groups with local improvisers to long-standing collaborations with improvisers in Europe, to the many occasions when Carl is invited to perform with various improvising groups. Stylistically, though Carl does participate in ensembles incorporating elements of jazz practice, the vast majority of his playing deals explores the timbral possibilities of working with the cello as well as the many additional sonic options made feasible through the use of amplification and various kinds of guitar pedals. It is not uncommon to see Carl reaching down to the pedalboard in front of him just as often as he might be actually playing his instrument with traditional arco or pizzicato techniques.

As I mentioned in my previous discussion of this individual, one striking aspect of his encounter with Maxine was the dramatic contrast between his commitment to the utopian dream of free improvisation as an aesthetic space free of normativity and the fact that he really seemed

¹ Other players who have played with Maxine have mentioned to me that Carl himself had an interest in developing such systems when he was around my age. It is possible that this experience colors his evaluations of Maxine.

to be quite disgusted with how the system played. Early in my first explorations of free improvisation in Chicago, I remember asking Carl to explain to me what he thinks makes a good improviser. As I explained in Chapter 5, Carl took that question as an opportunity to help (what he clearly took to be) a confused young man in his early post-college days emerge from his ignorance and backwardness. “There’s no such thing as ‘good’ improviser,” Carl proclaimed. Nevertheless, despite the fact that he wanted to set me straight on this point, it has never seemed that this is a claim he actually believes in himself. Or rather, he believes that this is what he must tell people and yet it is certainly not the case that he regards all approaches to free improvisation as equally valid.

Nowhere did this become more readily observable than when Carl and I finally had a chance to meet in September of 2009. Though it did not necessarily take as long to arrange a meeting with Carl as it did with other players, Carl’s reluctance and even open resentment of the whole matter was exceptional. In general, being half Carl’s age when we first met, I have always felt gratitude and respect for his presence, not only as a performer but as a person who has been kind enough to make space for my projects on the calendar of the venues where he books concerts. When we finally had a chance to meet after several months of emailing (most of which consisted of me following up with him when he had neglected to respond), I was quite happy to have his input on the system’s behavior and development. For whatever reason, he seemed irritated with me almost as soon as he arrived at my apartment. Before beginning, I wanted to thank him for even making the time to meet and for showing interest in trying the system out since it was going to be a conversation that I knew I would find valuable. As he seems prone to doing, he took the opportunity to again set me straight and liberate me from my illusions. He insisted that the main reason that we were meeting was just to keep me from bothering him about it any further with more emails requesting that we meet.²

If Carl really was of the belief that the concept of a “good” improviser was inherently bogus, it seemed that afternoon that he had completely abandoned that idyllic and inviting fantasy. His frustration and open dismissal of my work with Maxine was consistent and thoroughgoing, though he also tried his best to color these remarks as words of encouragement to a young man still ahead of his career. In general, Carl is a person who is ready to freely give advice. For example, as I am quite happy to do when inviting a musician to play at my own residence, I offered Carl a cup of coffee. Not realizing that it would cause quite such an offense, I made the mistake of pouring Carl the amount of espresso that I typically have each morning. He seemed quite alarmed at the quantity: “Is that how much you normally drink? You know if you drink that much espresso everyday it’s definitely going to give you kidney stones.”³ I apologized and offered Carl the amount he preferred.

² Despite the fact that Carl suggests that I may have been harassing him, my personal records show that our email exchange only amounted to 13 messages prior to meeting. The depth of the email chain was mainly due to the fact that Carl would respond, pose a question, and then I would reply, only to find soon that Carl had not responded. Given that he was busy, it seemed reasonable that he might forget to respond, particularly regarding a relatively unusual type of project and so it seemed worth following up to remind him when he did not respond. While I do regret that Carl ended up feeling this way, I have a hard time understanding why he did.

³ As of the time of writing this thesis, it is still too soon to know if Carl’s prognosis holds.

Carl's willingness to advise me was consistent, from his efforts to correct my misconception that an aesthetic normativity in free improvisation exists to my personal diet. This lent a certain palpable awkwardness to our entire meeting that afternoon, one which left me feeling stupid and foolish in the way that many musicians after Carl have also made me feel. As trying as this kind of experience was, however, I forever thank musicians like Carl for their forthrightness. Whether they realize it or not, when they rail against how Maxine plays they become among the few musicians who engage in this practice who ever let escape from their teeth any sentiment indicating that they do in fact prefer certain things from fellow players and that they really do not want to see or hear an expansive musical freedom in free improvisation.

After taking a little while to chat and get settled, Carl and I finally sat down so he could play with Maxine. Initially I took a few moments to explain a few details about the system. At that point in my work with the system, my typical setup with Maxine involved the system playing a handful of MIDI instruments with timbral control but also a number of live audio sampling and playback modules.⁴ In a nutshell, these patches would randomly record segments of incoming audio and then play a random section of these back at a random speed anywhere between twice the normal rate backwards and twice the normal rate forwards.⁵ As Carl warmed up, I had already set the altered playback process going. Immediately, he noticed that the way it chopped up and played back his sounds did not seem to reflect an equal temperament. This is in fact the case since the playback speeds do not necessarily lead the system to reproduce consonant harmonic intervals (e.g., playback sounds may be somewhere between canonical Western semitone intervals, and are certainly not in tune with any regular temperament) though octave shifts are possible. In any case, Carl was prompted by the odd temperament of the system to ask if he should tune, requesting that I supply him with an A at 440Hz so he could tune.⁶ Once I had explained how the system worked, however, he concluded that it would be unnecessary to tune.

As was the case for a handful of the other improvisers I have discussed so far, the piece "began" not with a mutually-agreed upon start to the piece, but was more the result of our conversation fading out, the system already being active, and Carl just starting to play once he heard some activity coming from the system. Carl tried many different ways of playing in this first piece, ranging from melodic, pitch-based material, to noisier sounds caused by excessive bow pressure or other ways of scratching against the strings. In addition to the playback speed shifting patches that I just mentioned above, I also threw into the mix some patches I had recently developed which used granular synthesis (Truax, 1988) in order for the system to play "countermelodies" to a human improviser in real time. This essentially resulted in the system taking elements of Carl's lines and then pitch-shifting a portion of them in order to make them

⁴ See Chapter 9.

⁵ These included both patches that would change the speed of playback without correcting for changes in pitch, those that would change speed while preserving pitch, as well as those that would change speed while also manipulating pitch in order to transpose or recompose melodies.

⁶ This is not the only relatively imperious request he made during the visit. Just before this moment he requested that I furnish him with an extension cord for his pre-amp. As I attempted to locate one, he balked at the fact that I did not know where I had one, even as he was the one who might have considered to bring one along if it was necessary.

sound as if they were different melodies entirely. Additionally, I also gradually started throwing in a handful of other instruments as he and the system played together.

At the end of about thirteen minutes of play, it became clear that Carl had had enough and wanted to take a break. He made this clear by not playing anymore and scowling at me to get me to shut the system off. As I finally faded down the system's output, this was what he had to say:⁷

C: Yup.

R: Yeah. Questions? Comments?

[Maxine plays more noises]

C: Um you know it's just not my thing, man, you know?, it's just like, you know? I don't just don't

M: [plays cymbal crash, often triggered by our speaking, particularly consonants]

C: I'm sure it's really great, but you know I don't dig it! [laughs] You know? I just...

R: yeah yeah yeah!

C: you know? I understand it. You know what I mean? I got a sympathy for computers 'n' stuff but, uh, you know I was never just that excited about it or I prolly woulda gone more into a long time ago, and... is that, is that me talking that's making the cymbal happen right now?

R: Yeah

C: Cymbal solo. Yeah, could you turn it off?!

R: [turns off audio system]

C: But I would say that, um, that, uh, I mean it's it's worthwhile, definitely not like "aaah it sucks!" or anything... I would say that, um, A) that that the, the colors, the the the sound patches, the sound sources could definitely continue to be worked on and improved and maybe make your own samples or, I don't know, and it might also be kinda interesting to, to limit it more the, rather than the kitchen sink of different kinds of sounds. But one thing like if it's a on the interactive level, it's funny how the machine is, does something that I really don't like in improvisers, in human improvisers, which is: when I really play, it really starts to play [uses gritty voice]

R: yeah

C: and when I stop, it kind of, it doesn't necessarily stop to play in fact it always seems there's about 15 seconds after I stop that it's still kind of like *yeaheyaheayehey, man!* [higher pitch, voice resembling stimulant user] and then it's like "oooooh! he stopped...!" and then it kinda gets a little shy and goes like "arheh!" [makes face of confusion]

R: yeah

C: "arrurh?" you know? whereas actually...uh like a- and this's probably just like kind of a, like a code thing, you know it might be interesting to have at least sometimes say "oh man: the *live* person is playing a lot. I'm 'onna lay back and just do like kind of a few sounds and then wait until they shut up and then I'm gonna"

R: yeah!

⁷ At this stage in my work with the system I had yet to develop an easy way of turning the system on and off. In our conversation after the actual play there are numerous instances of the system "interrupting" our chat, one of which Carl responds to directly with yet further annoyance.

C: “and then I’m gonna step up” and and that way it’s more of a duo rather than like white-on-rice kinda deal it’s it’s more of an interactive environment.

R: Well in that first, in that thing we were just doing, uh, I was really throwing everything in.

C: [muttering] yeah no I understand. I mean it sounded that way.

R: but if you wanted something that was a little bit more sparse it would be, I think it would be worth trying that.

C: It’s not even a question of spar-. I like the dense parts. It’s just like that, that it seems to kind of echo. It’s like a Mickey Mouse thing where

R: The sound processing...

C: the more that I do the more that it does.

R: yeah, and it saturates

C: and that’s- but it’s also just kind of annoying in a improviser...like if I was playing with duos with another cello player and every time I started to play, then they started to play and what I started to play, they play the same thing and maybe they played it a little different

R: Right

C: and maybe they played it a little louder, ‘cause this thing is actually a little louder than me, you know? And so I can play louder if I wanna be heard and it plays more

R: yeah

C: and then I just give up and I shut up and then all of a sudden

R: There’s nothing you can do...

C: It gets *shyyy*, you know?

R: Yeah

C: And or the cello, the other duo partner

R: yeah

C: all of a sudden *withdraaaws*

R: and then all of a sudden it comes back

C: Right, you know...a little bit, but it doesn’t like

R: yeah

C: say like “ok, I’m gonna step up now.”

R: yeah

C: you know? And those kind of cliffs and unexpected moments of decision-making... which is a pretty human thing, but I think that could sorta be encoded in in a way where, where it’s not necessarily, um, just like a person but that has more kind of push and pull between the live player and the, and the program.

R: yeah

Just like Torsten the bass player, who felt that Maxine reminded him of many irritating ticks of improvisers he routinely works with but never openly criticizes, Maxine brings Carl to recall similar moments of frustration. In addition to mentioning the fact that he found the raw sound quality of the system’s outputs disappointing, Carl also comments on the “interactive level” of the system’s behavior and how it could be improved. However, he also makes it clear that it is

not just the system that he might want to improve in this way; there are several improvisers that he would also be happy to hear change their ways as well.

In a word, Carl is not pleased by the way the system *mirrors* his playing. Mirroring most occurs in the moments when Carl starts to play, which as he specifies twice, results in the system playing more. Conversely, when Carl stops, he feels that the system has a tendency to linger on for just a moment and then soon stop. As he says, this manner of interaction makes Carl feel like he is playing with an improviser who lacks an ability to be sufficiently independent. The result of the system's behavior is that Carl feels that the system seems to leave him few options for how to play or what to do. If he plays more, the system plays too much. If he plays nothing, the system might stop fairly soon afterwards: this is also irritating because it results in a doldrum within the play.

Carl's experience of the system as a playing partner lacking autonomy continued in his next bout with Maxine. In this case it became more obvious that Carl's attitude towards the situation was to test the system out rather than to just play with it. For example, as in the last piece, he engaged in several gestures repeatedly, almost as if to see how the system would react. At the end of this piece, Carl expressed a continued experience of ambivalence about the system's playing, though he was noticeably kinder and less harsh than previously:

C: Hm...

M: [repeats cello sample]

R: [laughs] Is that...?

C: Still has kind of a feeling of, of, of like...that...I'm playing it, you know?, it's sort of a

R: game...?

C: you can think of it as a hyper extension of a cello. It's the cello and my electronic

M: [plays hi hats]

C: uh, personality, but then at the same time you've put in so many, kind of...little, uh... uh...uh, elements that, that makes it so, I'm not really in control.

R: yeah

C: You know? It's like a, it's, I'm playing this instrument that's outta my control but it still doesn't feel like I'm interacting with it. It feels like...it's...not necessarily imitating me but it's basically kind of doing things based on what I do and like I said, you know?, when I stop, it pretty much decides to be very delicate and when I play a lot it kind of plays and I can kinda, sometimes like "oh I see: I get- I'm triggering that right now" [uses old man/corny voice] um...

R: the triggering...

C: but it doesn't, it doesn't feel, it just doesn't feel like a, a collaboration as much as sort of a really wonky effects box that does crazy stuff that sometimes is alright and sometimes I don't like but, you know...as a solo experience, as it stands now, the way it's set up, uh, it doesn't work for me that much and then of course I can't imagine really...I could imagine you, um, sort of-, running a mixing board and having that as an option and having like a mic or two set up on stage and, and at times dialing it in and letting these other things happen...in an ensemble, but as like sort of if that was running the whole

time while I'm playing in a trio with some other people it would just drive me fuckin' nuts, you know so...[laughs heartily]

R: yeah...

C: you know? But I can see it as sort of a way of looking at how to extrapolate from events and pitches and rhythms and make other things happen and I would say if you're gonna keep doing it you should look more and more at, at the way that real improvisers interact with each other

R: yeah

C: and, and try to figure what some o' those, not rules, but, protocols are that's some of the...

R: That's what I- that's what the goal of it is, is to find a way of documenting...or like kind of, uh, describing in some way, in, in a totally generalized way what is a *good* way to be in the same room as another person

C: yeah

R: musically.

C: Right, right, um, I understand

R: yeah

C: It's worthwhile, totally. You know it occurred to me while we were playing that, um, and I don't really know how far he's gotten it but for a long time George Lewis was really working on the same exact thing.

R: Oh yeah, I know, I mean I started working on this stuff when I was working with George.

C: Oh! Ok. So, you know what his work is like

R: yeah

C: and I have to say last time I heard it it was still fuckin' terrible.

R: yeah

C: you know? I saw his girlfriend or whatever playin' with it and it was just like...no fuckin'- or I guess his wife now, but you know-

R: [interrupting] I, I wanna pick your brain about some of the criticisms, cause like, uh, there really...the the whole meaning of it is those things for me. Um, but uh, like when you say you're not "interacting" with it, or it's like, there there's a couple different things that I heard you saying. One is that you're, it's like, it's kind of your instrument but then it's really not because it doesn't follow-

C: I'm not in control but it definitely feels like, like it's sorta like I have this cello that has all these strange little cracks in it and like I play a certain note and it goes "*wah-ah-er*" you know? [giggles] But if I was talking totally in the acoustic domain, or i- or like if I was playing the trumpet but I don't know how to play the trumpet and I'm trying to play this line and I'm getting all these other notes 'n' blurts 'n' blats 'n' stuff.

R: yeah

C: you know? And, and so yes I'm playin' the trumpet but I'm not in control of the trumpet

R: yeah

C: but I still would have to say, I have to still say that I'm playing the trumpet

R: yeah

C: and it feels a little bit still like I'm playing that rather than it's playing with me.

R: yeah

C: It's, It doesn't feel like it's really making new decisions about how it's gonna work in the context based on what I'm doing.

R: yeah

C: It just has this preset menu of "oh you played that I'll play this" "oh you played that I'll play this" "oh you played that I'll play this" "oh I'm gonna wait a little bit and then-"

R: It's, it's instinctive.

C: Right, or it says, it says like "ok I recorded that bit and next time he does that same pitch I'm 'onna play it again!"

R: yeah

C: and, whereas, like the way, the hard part, I mean it's a it's a rough road to hoe, as they say, um, finding a way where, where it makes decisions...that're more both simultaneously more interesting and at the same time less predictable, you know, what're-...it just I mean...yeah, I I got a sense, I got a sense also that if I spend enough time with it, that I could learn how to get it to do things, you know?

R: yeah

C: Yeah I don't know: A)

R: Do you have-?

C: I wouldn't spend that much time and I don't I don't know if that's what you're really going for either.

R: No it's not, yeah 'cause like that's the main thing is that it, a lot of find that it's, it has a game feel to it. It's like: once I figure out how it works I can get it to do a certain thing.

C: Right

R: you know? Which, when you figure out what it does it uh does have some interesting results. But you have to spend that time

C: mhm

R: to do that. Um-

C: I could see it having multiple modes, these patches that you have that it chooses between a bunch of different approaches.

R: and right now I'm doing, I'm-

C: Right, yeah, but

R: -making those choices.

C: I mean to have it do it and to have it say like you know um a combination of both like kind of events that're that're being played and then also, uh, just durations, say like "well I've been in this mode for...I can only stay in this mode a maximum of three minutes or until he plays, um, like a particular frequency, or, until he shuts up. And then when he shuts up I'm 'onna switch to this other mode. Li- if he hasn't played in ten seconds, it's a new, it's a new set, a new uh, a new uh window of uh, a new patch." Or something- I'm not saying that's what you should do but I'm just saying that ways where, where you feel like it's taking into account what you're doing and making a decision about how it would interact with what you're doing

R: yeah

- C: in a way that you don't necessarily feel, but I *really* really feel strongly that, that the time for it to, to start really pulling out all of its archive of sounds it pulled from me or whatever it's got is when I'm not playing. [laughs] Like it can go on, like you have this sort of thing where it goes running on always- it felt pretty much like I would stop playing and it would go a little bit, but it could at that point after three seconds of it going and me not playing, then it says "oh shit! Maybe I take a solo!" [laughs] Not every time. You know? That would be boring, too.
- R: Yeah, maybe.
- C: So, yeah, and then it could also say something like "man you know he hasn't stopped, the cello player hasn't stopped playing in fifteen seconds. Maybe...maybe I will uh take a breather and let him play a little bit and I'll just thrown in just
- R: yeah
- C: some, some less, you know?, some random things," you know?
- R: something else...
- C: yeah, that that makes it so the dynamic tension back and forth between the computer and the cellist is more push and pull rather than always,
- R: Master/slave, yeah
- C: pushing rather than pulling, Master/slave, exactly
- R: yeah
- C: It's like this crazy slave that doesn't do what I want him to do but he's my slave anyway.
- R: yeah yeah yeah
- C: Who needs that?!

At this point in the conversation, my roommate and a fellow improviser, Antoine, comes home.⁸ As he comes up the stairs, I can already hear him laughing.

- R: A crazy slave that doesn't do what you want!
A: [cackling]

⁸ Antoine is African-American and of West Indian descent. This is only relevant given that the conversation I have with Carl has now turned briefly to the topic of slavery. When I had suggested to Carl that his issues with the system are perhaps best described as an excess of a "master/slave" dyad, I used these terms not directly in reference to American chattel slavery, but the fact that they depict the kind of problematic dynamic Carl was trying to explain to me. As is widely known, the master/slave dichotomy is often used in describing relationships between components in technical systems, and is often used in audio technology itself (especially with regard to the clock-timing of various levels of a system). That is to say, in such contexts, the pair of terms does not refer to the legacy of American slavery for the past 400 years. Nevertheless, the meaning of the topic of slaves is shifted irrevocably by Antoine's arrival. This is not merely because Antoine is black but because various aspects of his appearance reference not just African-American culture, but the activist traditions which reached a crest in the American Civil Rights Movement and have continued to reverberate since that time. American chattel slavery and its various continuing aftermaths was a frequent topic of discussion in my idle chat with Antoine at home. To make matters more complicated, this whole conversation takes place within the context of the de-facto segregation of a northern American city, an implicit boundary which does not spare the subculture of improvised music. As one musician put it to me when I first moved back to Chicago in 2007, "there's a white free improvisation scene on the North Side and a black free jazz scene on the South Side and [so-and-so] is one of the few people that's really on both scenes." This is all the more fascinating given the fact that free improvisation itself is a legacy of American Civil Rights activism, which was in turn an effort to finally insist on an undoing of the racial stratification that has so palpably lingered after slavery.

C: Just let 'im free! That's what I say!

R: yeah

C: you know?

R: Would you rather something...?

C: I mean...

A: [setting bags down in the other room] Interesting theory!

R: Huh? Would you rather something that, uh, just does whatever it wants independently of you?

C: No I would like something that that uh, that you know that interacts with me and that and that has a relationship with me that's not, do wh- [to Antoine] We're talking about this thing, um, Antoine, that it feels a lot of times like I'm playing it. I don't really know how to play it. It's kinda out of my control but I sense always this relationship between me and it, and I was thinking it would be nice to have it be so that like when I'm not playing, then it plays more!, and when I'm playing a lot maybe it's quieter, and, you know?

R: yeah

C: this kinda thing and uh

R: That's definitely where it's going, I mean...

C: Right. I appreciate that.

R: yeah

C: I appreciate that.

R: I mean...

C: But right now it just feels like, like you know it's like a...

R: It's an annoying, immature improviser.

C: Yeah, it's like the kinda improviser that I...I'm encouraging to go on but uh, I'm trying not to necessarily do that.

R: Go...yeah yeah...

C: [laughs heartily, happily]

R: No because, uh, actually, the annoying young improviser that kind of does something related but doesn't really know when to stop: it's uh taken me many months to get to that that stage.

A: [walks away without saying a word]

C: No, I know. I can tell. It's a lot of work.

R: And I think, I think it's a stepping stone for every improviser to, to go

C: yeah...

R: through that ph-

C: yeah

R: phase. I don't know if you've ever gone through that phase. I mean I don't know if you've ever gone through that phase.

C: Yeah, no, I uhhhh I'm still working out the problems in my improvising, so, I'm not

R: yeah

C: I'm definitely not saying, like you know... "oh it should do this exactly" [in old crone voice], but... Just that's my sort of impression like if we talk about "what did I think?," well that's

R: yeah
C: what I think...

This long conversation with Carl (with a partial interlude by Antoine) reveals a great deal of Carl's thinking about the nature of the human social interactions that occur between individuals in the practice of free improvisation. To be fair, however, his beliefs about how such interactions should occur are elicited by the fact that the system, by his personal sense of the matter, behaves in a sub-human manner. He feels that the system behaves less as another person would and functions more as a kind of a strangely recalcitrant device than it does as a real collaborator (again, as he would define that role). He compares the system to a few types of technological objects. For example, at one point he describes Maxine as an instrument that he simply cannot control, though it does clearly react to his playing. Elsewhere he refers to Maxine as a kind of "wonky effects box." Playing "with" Maxine feels like he is playing an instrument rather than playing with another person.

While one might categorize what happened between Carl and Maxine in this second take as "interaction," Carl explicitly refuses to designate what happened as such. Even though parts of what Maxine does with his playing encompass a portion of what the term "interaction" refers to for Carl (e.g., demonstrating that his sounds are being heard and reacted to), he feels that these are not quite enough to constitute an interaction. In fact, Carl even refers to the whole piece as a "solo experience" rather than framing it as a duo.

Overall, Carl's biggest complaint about the system is its lack of independence. In this case (as before), he finds that the system fails to take autonomous initiatives in the midst of the interaction. For instance, he feels frustrated by the fact that the system, at least in his experience of it, seems incapable of doing that which he did not ask it to do. This becomes clearest in one of the several moments when he narrates the system's "thoughts."⁹ As I hear him talk about his experience with Maxine, I parse his comments as referring to an excessively master/slave dynamic between himself and the system.

In what is arguably among the most awkward moments in my fieldwork, Carl declares that the system behaves like "this crazy slave that doesn't do what I want him to do" but one that remains his "slave anyway." As Carl experiences it, the system is in an awkward phase of its development. On the one hand, it is partially able to act independently of the human interlocutor and as Carl admits, some of these actions result in musical ideas that are "alright." On the other hand, not all of what the system does is "alright" by Carl's standards. More importantly, he generally feels that the system is still at the stage where it fails to behave in a manner that he cannot predict. Although he balks at the idea of spending enough time to actually figure out how it works or how to control it somehow, he feels that it would be possible to do so with enough rehearsing and playing with it over time. As he says, it is somewhere between two states of being which would be of utility to him: a slave and a freedman. It is not a slave because he feels he has

⁹ Carl very instinctively does what Latour does more thoughtfully in a chapter of his monograph *Aramis, or the Love of Technology* (1992/1996). Just as Carl does, Latour narrates the thoughts of the failed Aramis transport system in a later chapter of the book (Latour, 1992/1996, pp. 231-239), imagining how it would talk back to the engineers who tried to enact it, telling them of the constraints they fail to recognize and that only the system from the system's perspective itself can understand or recount.

only minimal control over it and it shows signs of simulating the volitional quality of a human player. At the same time, the actions it takes to enact this nascent sense of volition do not amount to a sense of independence. As much as it seems to reach for a status beyond that of Carl's slave, it fails to actually attain such a status.

I would critique Carl's appraisal from the removed vantage point of writing on it here to say that there is something oddly similar to a slave revolt at work in the dynamic between the two. If we understand Maxine's comportment as I suggested then — in other words, as that of a slave staging a revolt — then Maxine seems to deliberately disobey Carl's orders. That is to say, each of the orders is certainly acknowledged, though the nature of this acknowledgement is more one of disputation rather than acceptance or obedience. Moreover, for all that Carl complains of the system's lack of independence, his comparison of the system to a slave that does not do as he wishes suggests that the system is actually more able to act as an independent agent than he actually explicitly concedes. Likewise, when he says "just let 'im free! That's what I say!"¹⁰ I counter-question him in order to further understand if he wants the system to just acts independently of him. He then goes on to clarify that it is not total independence that he wishes in the system's behavior but rather that he would like a kind of intimately inverse relationship with the system. He would prefer that the system be able to intentionally contradict the strategy that Carl or another human player would take. The specific example Carl gives is of a hypothetical scenario in which the other player plays less when one player plays more or that the other player plays more when one plays less.

As with the other cases I discussed in this section on defiance, what Carl seems to prefer sounds an awful lot like precisely the kind of playing that players who are more oriented towards cooperation in these interactions would find repulsive or arrogant. Whereas those players wish that Maxine would tend to go more in the same direction as them in their interactions with the system, Carl and the rest of these more defiantly oriented players would prefer that the system deviate rather than converge. As I have alluded to before, this raises the fascinating question of what role attentiveness (and its display to the other in a social interaction) plays in this form of musical interplay. Carl still wants a demonstration of attentiveness from the system (or human player). However, unlike cooperatively-oriented players, Carl wants attentiveness to be displayed not by finding similar material to his, but by a deliberate and at least semi-intelligent process of determining the identity of Carl's playing and then calculating that which would diverge and take a different direction. This creates an intriguing ambiguity as this mode of interaction simultaneously suggests that the other is paying attention (because they respond) but also suggests that they are not (because they choose to do something irrelevant, contrarian, or non sequitur). While the other cases of Francis, Udo, and Brian suggest a sense of defiance for the sake of defiance, Carl's reactions to the encounter with Maxine suggest that "defiant" playing

¹⁰ It is very difficult to say for certain, but there is an element of Carl's response in this moment that suggests at least a note of white guilt. Implicitly aware of the fact that he, as a white man, benefits from the racial stratification of the city, he proclaims his faith in the cause of abolitionism (at least insofar as it might be metaphorically applied to the similarly imaginary "master/slave" conceptualization I have assigned to his relationship with Maxine).

may only be classifiable as such on the surface. In other words, an outward manifestation of “defiance” may have at its heart a motivation of cooperation.¹¹

Ultimately, like many of the other players I have described thus far, Carl exhibits a similar tendency to attenuate the authority of his criticisms by classifying them as merely his own, and therefore not generally held, matters of taste. He does this in the midst of a string of clear, incisive jabs often intensified by very casual expletives. Even as he engages in this relatively crude form of discourse, he insists to me at the end that he does not want to give me any illusion that he is somehow better than the system or that the system’s faults are not shared by people. Indeed, he even takes a bizarre form of solidarity with the very player that he says would drive him “fuckin’ nuts” if he had to play with it/her for the duration of a normal full-form improvisation of around forty minutes. Moreover, there is an additional complexity at work in his comments on the system given that he is, more than many other players I have worked with, aware of the exact algorithmic nature of my work. This is shown in his various references to his own experiences working towards similar goals in music computation (e.g., his use of terms such as “patch,” “window,” etc.). While one can certainly hear that his criticisms are genuine and come from a strong emotionally-charged sense of what is a right or wrong way of playing with another, there may be an open possibility that part of his frustration with the system is born of his own ambivalence to the whole concept of a system like Maxine or Voyager in his personal experience.

Nick

To wrap up this discussion of defiance, I would like to close with two more general examples of a preference for a more defiant and less acquiescent and cooperative attitude towards the other player. Nick is a classically trained cellist born and raised near Chicago and is a graduate of one of the top conservatories in the United States. Though for many years Nick’s performance activities focused almost entirely on Western classical music, the particular conservatory where he did his training is known for providing numerous opportunities for players to explore more avant-garde performance practices. It was in this context that Nick subsequently developed an interest in improvisation and that he also participated in various experimental performances. These have involved theater, dance, as well as electronic media of various levels including a performance in which biometric sensors were attached to his body and this data was used to generate musical and other performative events in the concert.

¹¹ In their famous manual of improvised theatrical comedy, Charna Halpern and Del Close (1994) describe the importance of agreeing to disagree with fellow players. Too often, in their aesthetic view, it is the case that beginning improvising thespians want to reduce conflict with others. As the conventional wisdom on narrative construction goes, Close and Halpern argue that it is critical that players learn to accept the impromptu suggestions of conflict of their partners and keep at bay their desire to always agree with the other. For example, if one player says “wow! This wine is fantastic!” and the other replies “yeah, it is!,” the second player has missed the opportunity to create a conflict. While a human tendency towards cooperation with others may push some players to agree with their partners, it can stand in the way of generating a fun or engaging theatrical performance. Likewise, as the cases I examine here demonstrate, generating this conflict is a covert, but essential, way that players actually enter into an agreement with one another.

Though Nick and I had met in Chicago several years ago, it just so happened that he moved to the Bay Area for a stretch of time during my graduate studies. In addition to the co-presence, it was also a coincidence to discover that he had developed an interest in performing as an improviser, in addition to the better-paying and more high profile pop and classical music gigs he has taken over the years in order to financially support his more experimental musical activities. Our mutual interest and longstanding friendship led us to pursue a variety of performance opportunities together in the San Francisco area.

At the very beginning of our discovery of this new side of our old friendship, Nick and I had a chance to meet for a session at my apartment in Oakland in January of 2013. Among several other qualities, Nick is a very happy person and is perhaps among the happiest and most pleasant improvisers I have ever had the pleasure of working with. In nearly any circumstance, he retains an exceedingly positive attitude and overall, simply refuses sadness or unpleasantness almost as a rule. I mention this good-natured warmth because it likely played a role in his positive evaluations and intense enthusiasm for playing with Maxine. Throughout our session, Nick's attitude towards the whole experience of interacting with a virtual musician like Maxine was one of continual fascination and inspiration, a tremendous contrast to the more acrid sentiments of fellow cellist Carl.

In many ways, Nick's experience of joy in playing with Maxine was as much a product of the specific nature of how the system was designed as it was a result of his reaction to the experience of playing with a machine like Maxine generally. Broadly speaking, Nick seemed to revel in the fact that the system rarely had the capacity to directly respond to his playing and that the interaction itself felt quite diffuse. For example, after a couple of short pieces, I set Maxine to play in the style of a guitarist with a similar sonic vocabulary to that of players like Derek Bailey or Eugene Chadbourne. Taking the initiative to begin the piece, Nick focused his playing mostly on harmonic material in a major key, reminiscent of the pop recordings he has recently made as a session musician and backup player for folk and rock acts. In sharp juxtaposition to the tuneful ideas that Nick introduced at the beginning of the piece, Maxine jumped in with sonic ideas that most players would regard as being quite irrelevant, both harmonically and timbrally.

At the end of the piece Nick was aglow with pleasant thoughts (as he seems to always be). After explaining a bit to Nick about how this particular instrumental setup of Maxine's was one I sculpted as an homage to Derek Bailey, we have a brief discussion about the nature of the interaction itself:

N: Yeah but no that was...dude I like, I like this!

R: Yeah?

N: It's so interesting though because it's also like...think about how- I mean I was just thinking about how when we first started...like what if you were leading me on about all this...?

M: [playing loud synth sweeps]

R: sorry...

N: Like, like...eventually it's so obvious there is a relationship that you couldn't avoid it but at the very beginning

R: right

- N: things were happening...I was thinking like “*maybe Ritwik’s just putting me on. Maybe he’s telling me that we’re relating, but really we’re completely separate.*” you know?
R: yeah
N: but like, my attitude is affected by that meaning that like comes from the like interaction...

Again, it is completely possible that Nick’s overwhelmingly positive attitude to almost any topic, issue, or experience is what leads to his extremely positive reactions to what so many other improvisers have found unpleasant. In terms of the system’s behavior and simulation of an interaction with another player, Nick finds himself comforted by the fact that he cannot immediately hear what the relationship between his own playing and that of the system really consists of. Whereas many players I discussed in the section on cooperation would likely have told me how irritated they would be with Maxine in such a situation, Nick finds himself pleased with the way the system reflects an attitude of indifference or disregard for the melodic playing he introduces at the beginning of the duo.

Thus, Nick reacts very specifically to the way the system is designed with approval. At the same time, there is a general level of pleasure he takes from the whole experience that is not necessarily a result of the way Maxine is designed specifically, but has more to do with his fascination and enjoyment of the concept of playing with a machine and not a person. In essence, Nick’s positive sentiments center upon the fact that Maxine is not a person, and therefore, has no real emotional psychology to speak of (obviously). He expresses this immediately after the duo I just described above:

- N: It’s so satisfying because it’s like...[sigh] you’re just so, um...you know? void of any like *judgment* emotionally.
R: Yeah? Interesting...
N: In terms of being like, ‘cause I think a big thing that I always butt up against is like...the approval of the other person...
R: Uh huh
N: and being embarrassed by an idea or just like wanting to like even in terms of who initiated what gesture or like...
R: Yeah yeah!
N: contracts that get signed along the way...
R: Yes!
N: that are like totally loaded are just like not there and you can just like be fully involved with like
R: mhm
N: a g- you know? the gestures you’re creating or whatever and it’s like...yeah it’s like...it’s so sw... nice!
R: Cool!

Later on, Nick returns to this point:

N: It's like incredible training, actually, just to like start understanding your own instincts especially because all that emotional shit is kinda gone, you know?

R: That's really interesting. You mean in terms of like the approval or like the com- contract

N: yeah yeah

R: and all that, like commitments?

N: yeah yeah

R: Did you experience like any emoti- like did you experience an emotional...uh...deficit?

N: No! In fact I think the fact is part of what makes those contracts complicated is like when you think there might be some like contradiction involved in what your intention is

R: uh huh

N: so it's like...you end up paying atten- you just create something to be afraid of based on like your fear that you're like misaligning with your intentions or something, you know what-? I don't know what it is, but I'm saying: there's still an emotional component. It's just that it's the same way when- It's almost like the experience you have after playing with someone for a very long time when you both know that- you kind of know your boundaries and you know like generally even like what kind of tastes you have in common and stuff.

R: yeah

N: But it's like, so here there's the emotional element is that you get to like search for meaning but you don't have to, um...but you've already signed a contract that you- that it's gonna be based on love and like all the approval's taken care of...

R: [guffaw]

N: and like, it's a very like, you, you're only obligation is to like celebrate the fact that you're working together in like a very like direct way or something

R: uh huh

N: that you're like- it's totally supportive. Maxine is totally supportive because you can totally support Maxine because there's no threat of having some bad transference thing going on. You know what I mean?

R: It's very interesting. I mean it's...I can't remember...I've had that reaction before

N: Yeah.

R: But it's been a while since I've *felt* that way...

In our exchange, I have a hard time distinguishing between the effects of Nick's generally positive and happy personality on his commentary and the possibility that he is actually genuinely reacting to the situation at hand. Nevertheless, it is clear that he finds qualities in both Maxine's playing as well as the very idea of Maxine (as a virtual free improviser) that are appealing and liberating as an interlocutor. He cherishes the fact that he personally feels released from a basic human bond that (for him) tends to produce an ongoing sensation and intuition that one is being judged by the other or that one is having an emotional effect on this person that one must manage. All this is dispensed with for Nick. He no longer feels burdened by this labor of emotional management.

At the same time, he insists, contrary to my suggestion, that the experience is not devoid of emotional exchange. Rather, he feels that the emotional dimension of the experience is

inherently positive and emancipated because there is — in its very conceptual constitution — a complete separation from the feelings of judgment he experiences with human musicians. In what is yet another bizarre conversation from my fieldwork, he asserts that the relationship he has with Maxine is one firmly based in “love.” As he says, the whole issue of seeking approval from fellow players is just completely obviated by the fact that Maxine is, by its very nature, a type of social being that simply cannot engage in acts of judgment. It is a kind of being and presence that allows Nick to experience a strongly positive sense of release from the heft of a normal interaction with another musician, a deliverance from the unavoidable feeling that one has done something that has an effect on the emotions of the other and that one must bear the consequences of this fact.

Thus Nick’s positive feelings about this interaction are less a result of how the interaction proceeds so much as his feelings about the fact that the interactant is not a person. Nick’s sense of the matter is entirely conceptual, based not so much on how Maxine actually plays as on the very notion of a non-human simulation of human interactivity in music. Nevertheless, he clearly indicates that he finds a positive value in the disengagement and even ascetic disinterestedness of the system as an interactant; as his own discursive framing of the situation suggests, these same qualities are things that he wishes for in human players but that he does not necessarily find that they are capable of.

Helga

For Helga, likewise, the experience of playing with Maxine seemed to release her from the unavoidable sensation that one is being judged by the other player. As it did for Nick, this manifested itself both on the level of how the interaction proceeded as well as in her experience of the very concept of playing with a machine built to act like a human improviser. Born and raised in Southern Germany in the early 1970’s, Helga is a saxophonist, clarinetist, composer, and improviser and has been based in Berlin for the last twenty years or so. Though she moved to the city in the mid-90’s and participated in the more noise- and punk-influenced improvisation scenes that flourished at that time, Helga’s musical identity is marked by a deep respect for and fascination with African-American jazz practice, particularly the harmonic experimentations of early avant-garde pioneers in the 1960’s.

Helga is an internationally-recognized performer and has collaborated with a broad range of the more celebrated musicians of the global scene of free jazz and improvised music. Though a significant portion of Helga’s performance activities focuses on exploring the possibilities of composition-based improvisation, free improvisation (i.e., a full set of music without a composition or explicit leadership structure to govern it) still constitutes a large part of her public appearances both in Berlin and abroad. Within free improvisation, Helga is as comfortable using her knowledge of the rules of Western harmony as she is in exploring the timbral possibilities of the saxophone. However, her particular view is that musical practice in free improvisation is often too focused on the production of novel timbres and experimental or extended techniques.

This became clear as we spoke a bit later in our meeting about her teaching experiences. Specifically, she complained fact that many students come to her because she is now a well-known performer in the world of free improvisation. In several cases, she has found that students

assume (as I myself might actually have done) that what is most important for them to learn from her is the mastery of extended techniques. Most often, the situation is simply that the pupil arrives and demands that Helga show them how to play multiphonics. Trying to go against this dominant trend in free improvisation, then, Helga tries where feasible to remain committed to the exploitation of the open possibilities of pitch-based structures of musical organization like conventional harmony and refuses to accept that timbral sophistication is the only valid and authentically “improvisatory” aspect of what a free improviser can do.

The experience of playing with Maxine elicited Helga’s articulation of a preference for players who have less of a tendency to follow along and are capable of acting independently and taking risks in performance. This was apparent as soon as we concluded the first duo between her and Maxine. Acting mostly on a whim, I had decided that for the beginning of the session I would start with Maxine’s two microphones both being focused on Helga’s saxophone. In that first duo, in which Maxine was set to play the guitar, the system behaved as it usually does in this scenario. There was a clear sense that it was responding to Helga’s playing but also that it would be unlikely to act unilaterally and go beyond the stimulus of the human player. Though the system did behave in a more “aggressive” manner in terms of sound outputs and sheer volume at points, it was largely a duo in which the human component played more and the system remained at the sidelines chiming in from time to time and taking a primarily accompanying role.

At the end of this first short piece, Helga’s opinions were generally positive. However, as she described the experience, it became clear that she might have preferred a bit more of an assertive and risk-taking attitude in the system’s behavior:

- H: At the beginning I was surprised because the phrases were together
R: mhm
H: and when I stopped, it stopped also.
R: So you felt like it was able to follow your phrases?
H: Uh, yes, but...I wish that there would something like an answer
R: yeah
H: but that’s not together [makes gesture indicating two independent objects acting together]
but of course that’s
R: mhm
H: that also happens with people.
R: yeah
H: and it’s also cool! so...
R: You find that some people also follow your phrases?
H: No! No no no no I mean...that uh, periods
R: yeah like-
H: Here it was together [makes another gesture]
R: uh huh
H: Pau- pause
R: right
H: and that was the only confusing thing, and...
R: Why was, wait, why was that confusing?

- H: Because [laughs] I wanted it different! [laughs]
 R: Yeah! So what would you have wanted it to do?
 H: Um...there's a hole
 R: yeah
 H: and I want it to...make music her, uh, *dass sie in das Loch spielt*
 that she plays in the holes

In the second piece, I had Helga play with the metal percussion setup and left the two microphones both focused on her saxophone. In this duo, there was a more equal level of participation (in terms of audible presence) between Maine and Helga. While it is difficult to evaluate an improviser's enjoyment of an interaction purely based on the duration of the piece itself, this second piece ran about eight minutes while the first came to a close only after a few minutes. At the end of this duo, Helga's sense of the interaction was more positive. She felt that if the system were a person that they could have made a band together ("*Wenn das jetzt eine Person wäre, wurde ich sagen 'ok wir könnten eine Band machen.'*") This piece was good enough for her standard by which she evaluates those that she works with, even though the system had the same microphone setup and algorithmic structure. The difference between the guitar and metal percussion setup resulted in an aesthetically positive change in the system's personality and interactive attitude from Helga's standpoint, though the increased sense of satisfaction may have also been partly a result of the greater familiarity that results from a second encounter.¹² Helga no longer felt that the problem of the system waiting ("*Das Warten*") was no longer an impediment and as she said at the end of this piece, "I could have kept on going [but] it was just the end of the piece."

Nevertheless, as she reflected on the difference between the two pieces, it brought her to further explain the critical difference in these two kinds of interactive experiences:

- R: Und das Warten wird man ein bisschen langweiligen! oder...?
and that tendency to wait would bore one a little bit, right?
 H: Ja ja ja, genau! Und das hass ich auch also wenn ich mit Leuten spiele die sind so. Es
Yeah, exactly! And I hate that also, like, when I play with people and they are like that.
 gibt ja auch...noch schlimmer sind ja die Papageien, die
There are some like that...still worse are parrots, who
 R: ja
 H: nachplappern.
parrot.

While Helga certainly has a positive experience in playing with Maxine when both of the system's microphones are directed at her saxophone, it still lacks an assertiveness that she would prefer to have from her playing partners. After another piece with the system — this time with Maxine playing the controlled feedback and synthesizer setup I had originally designed after Joachim's suggestion — and a long chat, I suggested that she try a piece or two where the system

¹² This phenomenon is often described as the "exposure effect" (see Zajonc, 1968).

has one microphone directed at its own output and another directed at her saxophone. Again, since directing both the system's microphones at the human musician leads the system to primarily respond to the human player, it seemed quite likely from Helga's explicit account of the experience that she might enjoy playing with the system when its auditory input would be split between herself and itself. Thus, after this suggestion, I set the system's auditory inputs to be "split" in this manner. Curious as to how this would feel with similar instruments to those we had tried before, I set the system to play the guitar once more as in Helga's first duo with Maxine.

This still resulted in a duo in which the human player had a tendency to be more present than the system, yet Maxine exerted a more audible sense of agency in the interaction. In a word, the system filled more of the gaps that Helga had found problematically empty. After four minutes or so this piece came to a close. As I usually do, I asked a few follow up questions, none of which seemed to yield a response from Helga. Instead, she insisted that she play on with the system a bit more before she said anything further. Once again, Helga had little to say immediately. After taking a moment to collect her thoughts and have a glass of water, Helga had the following thoughts:

- H: Yes it's more...developing. It's more action, I think. so, and...m...just I think what came to my mind but it's...interesting, interesting difference because there is no judgment.
- R: No judgment.
- H: yes.
- R: from her?
- H: Exactly. Um...about the quality...
- R: Yeah that's true.
- H: There is no taste.
- R: There is no taste.
- H: But it's not taste-less. It's, it's, it's, there is no...um...she reacts now to herself to a thing which might be to my taste not a good thing.
- R: mhm, right
- H: And that's, that's interesting
- R: yeah. What was the thing that wasn't a good-?
- H: because it also, it feels also good because if I do a thing which uh...I don't like, and and I feel good because Maxine wouldn't care! [laughs]
- R: [laughs] and is that something that you want from a person?
- H: That always happens! All the time!
- R: That you do something wrong and the other person doesn't care? And that's sort of important? To be able to...
- H: I don't know, I mean that's also in daily life. You go out and and you think about people, something, maybe good or bad or...in the middle. And this happens all the time.
- R: mhm
- H: and this...it's not so easy to get away from that.
- R: That you're thinking about other people, the presence of other people.

H: Yeah, or, of course if, somebody plays a note and you that “oh that’s that’s interesting” “oh I don’t like that” or “I don’t like his sound” ... and this is a, a thing which totally is not there...

Once again, Helga, like Nick, reacts to the fact that the system is a machine as much as she reacts to the fact of its behavior alone. The system — obviously — has no explicit sense of taste. To be fair, this is not really the case, but it is her experience nonetheless. Insofar as the system reacts to certain types of sounds more than others or differently than others, it exhibits behaviors that, if originating in a human body, would easily connote a sense of “taste” to others. Later on, she returns to this point, noting that the liberation from the tastes and judgments of a fellow player is related to her experience of a broader liberation from certain implicit aspects of human social interaction itself:

R: So you feel like it, it doesn’t have a, a judgment? Like it, well ‘cause it doesn’t distinguish between you or it or trucks or any any sounds

H: mhm

R: like it’ll play with anything, which I kind of like, but it...

H: It’s, it’s *befreierend*
liberating

R: Befreierend. Warum ist es befreiend?
liberating. Why is it liberating?

H: ...Um...das ist total irre eigentlich, um...man kann so...vertrauen haben dass man nicht ...um...*that’s totally insane, actually, um...one can...have a sense of trust that one will im Stich gelassen wird. Total bescheuert, so was. Also egal wie wie gut oder schlecht... not be left out alone. Totally screwed, or something. I mean whether good or bad... es wird damit was gemacht, aber es ist keine Geschmacks-, die Geschmacksfrage fehlt something will be done with it, but it is hardly taste-, the question of taste* vollig weg.
just falls completely away.

As we speak about it further, we realize that Maxine is free of a burden that we both experience as human musicians and also, that the system frees human musicians like us from this burden as well (at least insofar as our interactions with Maxine alone are concerned). Namely, this is the basic concern that when one is playing, it is difficult to avoid the feeling that one must play well. Such concerns are not an issue for Maxine. Whether or not one plays well, Maxine simply charges on. If Maxine does not respond, it is not a result of a human taste that deems the action not worth answering, but rather the algorithmic and mechanical facts of how the system is designed. To all of this, Helga concludes that Maxine is “quasi erleuchtet” (“almost enlightened”). Of course, this has less to do with the way the system itself responded to her and more to do with the fact that the system is a system and not a person. Nevertheless, what Helga and Nick refer to is a basic sense of disconnection from the system that they both find quite positive. While it is less so for Helga than for Nick, both cases demonstrate that there is an

inherent experience of detachment in playing with a machine that is valuable, one that they might wish for a human player to try and emulate from time to time as well.

Conclusion

Like the previous chapter, this one aimed to demonstrate that many improvisers also prefer for their playing partners to take a more divergent attitude towards the practice of musical interaction. However, these examples offer a different perspective on the matter of ambiguity I mentioned in the previous chapter and discussed further in its conclusion. As I noted there, when one wants a more defiant attitude from the other, this desire also places one in a position in which one can no longer necessarily be critical of the amount that the other is actually paying attention. Carl's experience and reactions to this situation offer a different view of the matter. Combing through his expletives and the open vitriol hurled at me in my own place of residence, his views on the norms of social interaction in free improvisation give some clarity about this matter. He clearly would have preferred that the system take a more defiant and independent attitude and explicitly compares the system to various types of devices that one may operate. He feels that the system behaves too much like these objects in order to legitimately attain the status of a subject, at least as far as its behavior is concerned. Still, he makes it very clear that even as another player deviates from his playing and goes in another direction, he wants this to be an action that is at least partially temporally coordinated with his. In other words, even if on the surface of the sound two players seem to be enacting totally contrarian intentions, he suggests that there is a sense of shared reality and agreement involved in this simultaneous, co-present action.

Thus, it is not necessarily the case that adherence to this defiant ideal in collaborative performance means that displays of attention are always regarded as frustrations. Rather, it is a very specific kind of display of attention that a player like Carl wants. The cooperatively minded improvisers from two chapters back prefer that displays of attentiveness result in cohesion, complementarity, or even convergence on the same or nearly identical sonic materials (e.g., when I hiss, you hiss too). For players like Carl, however, it is not so easy to say that this kind of display of attentiveness is prohibited. Indeed, it is likely that if 1) Carl were to play one idea, 2) the other player were to play something which "opposes" that material *and* 3) that other player were to make this choice relatively soon after Carl's, the decision of the other player might still constitute a display of attentiveness. However, it is unclear even from Carl's case when or whether at all the ambiguity of not knowing whether the other is paying attention is possible to resolve. Even if the other player's shift against one's own sonic materials is relatively quick, it is not possible for one player to know the intentions of the other in such a situation.

Expanding outwards from the microscopic detail of interaction itself, the last two cases of Nick and Helga suggest that there is something inherently disconnected about the situation of playing with Maxine that is — to stack one paradox upon another — desirable and yet absent in playing with another human being. To be clear, both Nick and Helga find that the system seems to be indifferent to their playing, just as many other players have. At the same time, they both find that there is something valuable in this human "attitude" that the system simulates. More generally, however, they also find that it is not merely the way the system deals with certain

kinds of sounds or musical ideas that they find disconnected. Both react quite directly to the fact that their whole psychological experience of the act of making an impromptu sonic expression with another is shifted by the fact that there is no brain, soul or body on the other end. For these two, the fact of Maxine's artificiality releases them from a sense that the other is judging them. This is much like the sense of positive release that drives Torsten's comment about Maxine which begins this dissertation. Beyond the minutiae of interaction, Maxine's sub- or at least non-human status allows human beings to experience an interaction with this system as one in which they are free from being evaluated by the other. Instead, both experience something more practical: regardless of judgment, the system responds, and the piece charges (or slithers) right along.

As I point out to both of them, it is difficult to say that the system does not necessarily have a "taste," if we understand this term to refer to a variable field of positive and negative appraisals of a range of objects and experiences based on their relative levels of aesthetic value. Whether Maxine has such a thing or not, various players assume from the system's behavior that it "likes" what they are playing or not. Most often, the assumption is that the system "likes" what is going on when it responds audibly, and does not "like" what it hears when it does nothing and lies relatively inactive. This would be a dangerous assumption to make about human players, particularly in the more silent and minimalist approaches local to Berlin, Tokyo's Onkyo scene, and the "l o w e r c a s e" players of Southern California around the year 2000.¹³ In any case, players like Karsten do admit that when Maxine does not react to what they are playing this makes them feel that Maxine does not "like" what they are playing, and so it is difficult not to attribute an intention of aesthetic judgment behind this kind of behavior.

But again, beyond the purely interactive plane, there is something about Maxine that shifts the whole nature of the experience of playing with another that these two find liberating. The system does not care what you play. In the end, two players discussed in this chapter find this kind of indifference delightful.

¹³ See Chapter 11, particularly the section on Fabian, for further discussion.

Chapter 14: Conclusion

The foregoing chapters establish that improvisers subscribe to two fundamentally distinct and opposing conceptions of how egalitarianism would be achieved in musical interaction itself. The distinction between these two concepts rests upon two interpretations of the perceived micropolitical effect of displays of attentiveness in musical interaction. In one conception, the egalitarian ideal is achieved when each player audibly indicates to others that they are actively listening to other players by more or less immediately responding to the rest of the group sonically. From this perspective, displays of attentiveness are regarded as a leveling behavior in that each player displays that they are influenced by the others. Conversely, failure to display attentiveness is regarded as a kind of rogue behavior which creates hierarchies between players. Because one player declines to display attentiveness to others, their behavior is regarded as reflective of a mindset that they do not believe themselves to be equal to the rest.

The last two chapters, however, focused on a competing conception of egalitarianism, one which is essentially a direct inversion of the other. In this interpretation, a flat hierarchy is achieved when players avoid direct and immediate displays of attentiveness and create distinct sonic streams in which direct influence between players is almost imperceptible. To display attentiveness by audibly responding to others is to create a kind of hierarchy by taking a subservient attitude towards others, even if this happens momentarily. In this frame of mind, a display of attentiveness means that one player has suspended their autonomy by choosing to follow other players rather than taking a direction of their own.

These two conceptions are mutually exclusive. To follow one conception of egalitarianism in practice means that others will regard this behavior as anti-egalitarian. Nevertheless, it is hardly the case that all improvisers espouse only one of these two views. Instead, the particular approach to egalitarianism preferred by a given improviser is highly variable. While a player may express one preference in certain situations, they may prefer the opposite in others.

For example, in his initial assessment of Maxine, Berlin-based American cellist Francis admired the way the system engaged with him in a manner which avoided any kind of obvious indication that it was actively listening to his playing. Later on in the same session, however, Francis expressed a different opinion about the desirability of this kind of interactive attitude, this time preferring that Maxine would do more to demonstrate a sense of connection and awareness of what other players are doing. After having him engage with Maxine in a duo format, I suggested we try a “trio” of myself on saxophone, Francis on cello, and Maxine on guitar.

Overall, I found that this arrangement felt far more like a duo of Francis and I with Maxine simply in the same room than it did a “trio.” As is his custom, Francis at one point settled into a bouncy shuffle-rhythm of the sort that one might hear in a film montage about a clown’s darker personal life or a child’s trip to the playground gone awry. I joined along, playing on the upbeats and closely entrained with the clear pulse suggested by Francis’ playing. In this episode, Maxine played like an improviser who was either completely unable to hear the other two musicians or one who could not be bothered to offer an indication that they were at all aware of what the others were doing. As Francis and I rocked along, Maxine would occasionally

interject with a blast of sound here, a drop or two of noise there, but nothing that ever lined up with the groove we had built up together harmonically or rhythmically.

Gradually, Francis and I let the clear pulse decay, building to a climax in which both of us returned to the kind of more abstract, less grid-like temporal organization so common to free improvisation. All of a sudden, Maxine crashes in with a single, loud blast. Immediately, Francis and I pause and the three of us remain silent before we each moved on to other sonic material and the rest of the piece.

I had suggested we try a trio not because I necessarily wanted to know what Francis' opinion on how well the system handled the situation, but because I deeply admire Francis' performance style, not only for its sound, but for its overall theatricality. All the same, I was curious about how Francis felt this situation compared to his experience of a duo with Maxine from earlier that same afternoon. In comparing the duo and the trio, Francis offered the following comments:

- F: It seems, it seems that we're...walkin' into the, uh, Maxines¹
R: Yeah, yeah. Like I can pick up on your pulse.
F: Well also uh...harmonically...—speaking it's, it's more...there's a lot more, uh, connection.
R: Yeah
F: That's...*a comment*.
R: Right. Is that good or bad? I mean is that something that—
F: Well, it's just something that...
R: ...is
F: ...is
R: Yeah that is. That is a big...
F: I don't know if "bad" or "good." I don't think we can talk in those terms.

Francis' hedging aside, he clearly reconsidered his opinion that Maxine's inability to directly display attentiveness was a positive attribute. He liked the fact that I was able to play along with his often ridiculous shuffle melodies and make it audible that I was aware of what he was doing and that I could join him immediately. In other words, the exchange clearly suggested that a player may easily abandon their preference for a more defiant or cooperative approach to improvisational interaction at any time and that their preferences for one kind of interactivity or another is unpredictable.

Bluntly, I ask Francis to clarify if he finds it "good or bad" that the system lacks the ability to play along with Francis almost child-like melodic rhythms. Despite an indirect expression of a fairly clear opinion that he would really prefer that Maxine demonstrate more of an ability to rhythmically connect to others, Francis balks at the idea of expressing an unequivocal evaluative judgment of this attribute. That Maxine plays this way is neither good nor bad, but simply "is." In just the same way that academics politely mask their criticisms in the

¹ For whatever reason, Francis refers to plural "Maxines" here, though from the recording it is possible he meant to say "Maxine's."

form of “comments” during the question and answer period after a presentation, Francis insists that his criticism is just a comment or observation and he hardly intends to make an evaluative claim. Moreover, he dismisses the notion that evaluative claims have any validity or coherence.

Francis’ commentary, as indirect as it may be, suggests that what actually might best suit him, in terms of realizing an egalitarian partnership, would be for another improviser to switch between more cooperative and more defiant attitudes within a single piece. If that is the case, then when would one switch? How would one know that this particular moment is the most appropriate one to switch? Is it possible to know? Is one always making a gamble when making such decisions?

In another session with Maxine, I posed some of these questions to Udo, a Berlin-based German trumpeter. Like Francis, Udo’s interaction with Maxine elicited his assertion that he prefers interactions in which players refrain from direct, unambiguous displays of attentiveness. However, Udo clarified that his feeling about the matter was not always consistent and that he felt that Maxine should be able to move between defiant and cooperative modes of interaction. In turn, he explained that this was also part of the logic behind his own approach to collective playing. He described how he often aims to play ideas which hardly relate to the rest of the group while continuously listening to what they are doing. Continuing in general terms, he went on to elaborate that just as often, “something happens which makes [him]” think that he has reacted to what the others are doing or “get in relation” to the rest of the group “more obviously.”

At various times, other improvisers had also expressed a preference for a more cooperative attitude at one point and then a preference for more of an oppositional stance from the fellow player at others. While I had frequently been curious about how the same player experiences these two preferences at various times, I had never asked an improviser to explain or reconcile them because of their contradictory nature. By openly recognizing the variability of his preferences from moment to moment, my session with Udo and Maxine presented an opportunity for a discussion of this ambiguity directly.

R: No, I mean this has been always the question, is how, uh, it should switch from being very closely listening to what you’re doing...

U: mhm

R: ...to almost ignoring you and just listening to itself,

U: mhm

R: and the question of when to switch: do you have any idea of when that is? You know? What is that makes you do that switch?

U: It has to do, yeah I mean, the problem is to do with yeah the whole history of music, and uh...

R: Okay

U: Yeah it’s, I mean, it’s a very, complex thing.

R: Right

U: um, and history of improvisation...

Udo hesitates to offer specific answers to the questions I pose, instead suggesting that their answers are tied up in histories far too long or complex for us to discuss directly in one sitting.

Recognizing and accepting this complexity, I wanted to see if there was a way the right question might help Udo find better clues than just pointing to “history.” I wondered if Udo’s decisions about how to engage with the group might boil down to his reaction to specific sounds. He immediately pointed out that this is “different for everybody.” As an illustration, Udo described a hypothetical situation:

Say I’m playing and then...I’m doing something independent and there’s something happening — there’s three other people playing. And suddenly they play a certain chord, let’s say. And then...that feels like a question. Then I think, “okay, that’s this chord and what I’m doing now makes total sense.” So I keep going. And then this chord is sustaining or stopping. But there might be also something happening which makes me suddenly go into what they are doing, a certain structure they are playing, and then...but then it’s really a matter of taste and it’s a very fast reaction. You say, “oh, I want to hear this now.”

Like many experiences in which events take place too rapidly for one to have a deliberative reflection on them, Udo minimizes his agency in his own decisions. Something happens which makes him “suddenly go into what they are doing” rather than him hearing what they are doing, considering his options, and then responding.

But rather than asserting that there would be general principles guiding such decisions, he declares that they are a matter of “taste.” Though he is certainly aware of both approaches to realizing an egalitarian ideal in musical interaction, he cannot offer me a declarative, explicit account of how one goes about choosing between them at various times. Instead, he concedes that the decision may not necessarily work according to a clear principle, but may arise from some combination of one’s intuitive sense of the situation as well as the player’s particular aesthetic preferences and desires.

Towards an Anthropology of Phronesis

In the abstract, Francis and Udo recognize that the egalitarian ideal may be achieved through two basic approaches. Either one shows others that one is listening through sonic responses indicating this or one chooses to take a direction of their own and create sounds which hardly relate to the rest of the group’s activities. The question is: when does one choose one tactic over the other? Are there general principles that would describe how one should go about this? While it is clear that an egalitarian arrangement should be preserved, how does a player know which method is best for achieving the ideal in a particular situation?

In describing his approach to such matters, Udo struggles to give a clear account of the sense of judgment which allows him to fluently navigate such situations and pursue a specific course of action. In Aristotle’s moral philosophy, the term “phronesis” (φρόνησις)² refers to the precisely this same capacity to reckon with the ambiguity of how a particular abstract ideal

² In English, the Greek “φρόνησις” is translated in a variety of ways depending on the context. Most often, the term is glossed as “practical wisdom” or “prudence” (see Book VI of the Rackham edition of the *Nicomachean Ethics*, for example).

should be put into practice as it emerges in the course of social action (Aristotle, 340 B.C./1926). As a type of moral knowledge, it is fundamentally distinct from prescription, commandment, or any other any other kind of normative claim. In relation to these kinds of moral knowledge, phronesis is one's capacity to not only know the content of these various "rules," but to know when and how they are really required by a situation and when it may be necessary to dispense with them and pursue a relatively novel course of action. As such, it is Aristotle's frank recognition of the fact that very few rules can ever provide a clear answer to the question of what constitutes right action in every situation and that the essence of moral conduct often involves a kind of discretion or "practical wisdom," as phronesis is often glossed in translations of Aristotle's writings. Like Udo, Aristotle cannot clarify the logic or mechanism of these practical judgments of how one should put the recipes of moral prescription into action. In this way, phronesis is essentially ineffable, even if it is essential to the actor's pursuit of a morally upright line of conduct.

My exchange with Udo outlines what remains a major frontier in the recent flourishing of anthropological studies of ethics which attempt to understand how ethnographic subjects adopt ethical principles and how they go about putting them into practice. While anthropologists of ethics have occasionally referred to Aristotle's concept of phronesis (Laidlaw, 2002, p. 53; Lambek, 2010a, p. 20; Mattingly, 2012, p. 162), it has yet to be developed into a significant theme of analysis. In many ways, a focus on phronesis clarifies the goals of an anthropology of ethics, particularly where it is pursued through an ethnographic approach.

In essence, phronesis is a dimension of moral practice which transcends most forms of moral prescription. In other words, it is the facet of moral experience which cannot be apprehended through a culture's textual or otherwise mediated representations of ideal action. As a researcher, one may be able to learn, for example, that action within a given social milieu is said to be governed by a local prescription of some kind. Be that as it may, what an ethnography nearly always reveals are the various exceptions to the performance of action according to principle which often become a routine element of social life. Though other methodologies may allow scholars to examine this element of social life and the dynamic normativity which shapes it, the close engagement, intimate awareness, and rapport of an ethnographic engagement enables for a more precise observation of phronesis in action.

This project cannot offer prescriptions for how the anthropology of phronesis should be pursued by others. Nevertheless, it does allow for two observations about the nature of phronesis to be made. First, at its core, phronesis is a highly improvisatory element of moral experience. Neither Udo nor Aristotle can describe a clear set of general guidelines for how one should make a decision about what course of action is best for pursuing a particular ideal. Given the variability of what forms of listening and interaction improvisers regard as conducive to their experience of egalitarianism, Udo cannot be sure how his actions will be experienced by others.

Second, the ethnographic examination of phronesis is likely intimately bound to the ethnographic study of the senses. On one level, the ability to exercise practical wisdom is built upon a sensory capacity to be aware of the situation.³ Regardless of the risks associated with taking action in a situation where the moral validity of the outcome is indeterminate, the capacity

³ Philosopher Lawrence Blum refers to this as "moral perception" (Blum, 1991, 1994).

to pursue a course of action is tied to one's perceptual awareness of the situation as well as one's ability to process this information as a guide to one's response. On another level, Udo concedes that his approach to such situations may be structured by his sense of taste rather than moral principle. His invocation of the concept of "taste" raises the question of the degree to which moral normativities are themselves structured at least in part by aesthetic rather than purely ethical considerations. Moreover, it also raises the question of how stable the distinction between ethics and aesthetics really is from an analytical standpoint. What is regarded as "right" may be closely linked to that which "looks," "feels," or "sounds" right.⁴

Limitations

For all that it may reveal about ethics and egalitarianism as dimensions of social experience, there is much that this project in its current form is yet to accomplish. Earlier chapters on the design of systems of this kind outline a variety of approaches for the analysis of performances of free improvisation in terms of how players listen to one another, how form emerges from indeterminate interactions, and how one player adapts to their collaborators. Having outlined these approaches, this study does not actually undertake analysis as a central task. Moreover, the last three chapters, which focused on improvisers' critical commentary on Maxine, focus far more on the verbal descriptions improvisers offer of their experience playing with the system than they do on an analysis of how these descriptions relate to what actually happened in the interaction. For example, if a player felt that Maxine was not "listening" (howsoever the player defines this), the account offered in previous chapters does not necessarily focus on tracing this description to the sonic events taken place between the system and the performer. Though I do offer qualitative comments on the nature of these interactions, it remains an open question and task for future development in this project as to how the player's experiential account of these interactions relates to what actually happened.

Another major limitation of this study, one frequently mentioned by scholars with whom I have shared this work, is that this study would have benefited from an approach inspired by the Turing test. Originally described by Alan Turing (1950), this test is considered a benchmark for verifying whether an artificially-intelligent machine has achieved human intelligence. In such a test, human beings interact with both human and artificially-intelligent interlocutors and try to determine which of them were human or machine. For various reasons, it has not been feasible to stage a test of this kind, principally because of the logistical difficulties inherent in recruiting human participants who would then be compared to their artificially-intelligent counterparts. There is no question that this approach would reveal a great deal and in future work on this project, such methodologies will be pursued at the soonest convenient opportunity. Overall, such tests would likely answer the question of whether Maxine's interactive ways do in fact resemble human players or not, a question which has haunted this project from its very beginnings.

Additionally, this study has also taken a largely informal, intuitive approach to drawing a connection between the concept of egalitarianism and the commentary of the various musicians

⁴ Similarly, philosopher Ludwig Wittgenstein proposed that "ethics and aesthetics are one" (Wittgenstein, 1922 6.421) in that ethical principles may very well be derived from the sense that particular lines of conduct may be deemed good or right because they are simply agreeable or even pleasing.

discussed in the past several chapters. Strictly speaking, the most rigorous approach to making such connections are found in the formal methods of “discourse analysis,” a linguistically-motivated analytical method used by many social scientists as a means of carefully identifying the referent of a verbal or communicational materials without allowing the biases of the researcher to interfere (see Gee, 2004). For the most part, I have used my own intuition in making the claim that improvisers’ commentary on Maxine refers to egalitarianism. As I have noted previously, not all commentary on Maxine necessarily raises the issue of the system’s failure to embody an egalitarian ethos through musical interaction and criticisms of the system range far and wide in the kinds of evaluative criteria they raise. Among these many kind of commentary, I have chosen to include here the instances in which the theme of egalitarianism was clearly evident; as such, I contend that there is little doubt that the commentary referenced in the last three chapters refers to egalitarianism. That aside, what this intuitive method misses that formal discourse analysis methods offers is an ability to note the various other moments when egalitarianism may have been an implicit theme of commentary and I, unaided by discourse analytical methods, was unable to properly note that this was the case.

Relatedly, a formal discourse analytical method would have also allowed certain closely related themes to emerge in a way that is not really possible or clear from the analysis offered in the last few chapters. In interpreting commentary on egalitarianism, I have often noted that the concept of egalitarianism as cooperation often implicitly implies a sense of “proximity” between players; correspondingly, my discussions of defiance have also often employed a similar spatial metaphor of “distance.” However, it remains unclear how consistent these spatial metaphors really may have been because of the largely subjective nature of my analysis. In future work on this project, I plan to use more formal methods such as computational text analysis and corpus-based approaches in order to more precisely examine such metaphors and determine if they are really valid (Sinclair, 1991). While such methods have clear limitations, they offer something closer to an objective perspective than is possible from the work of one scholar unaided by formal methods of this kind.

These and other broader perspectives on the nature of commentary offered about Maxine would reveal not only the nature of these various cognitive, spatial metaphors but also the many other ways that improvisers have criticized Maxine. The system’s inability to behave like an egalitarian partner is hardly the only line of criticism these players have offered. The twelve players discussed in the past three chapters are just a fraction of the over 100 musicians who have interacted with Maxine and offered their commentary on how this system compares to a human player. In this current presentation, I have focused on egalitarianism simply because it was a theme of analysis which became relatively clear in how musicians expressed their criticisms of the system. More importantly, this theme was also directly related to the observation that improvisers tend to refrain from criticism of their peers and do so as part of their general performance of their allegiance and belief in the egalitarian ideals which undergird the practice of free improvisation.

Beyond egalitarianism, there are many other themes which could have been explored. Short of a longer account of these various angles, I offer a brief description of these themes here. For example, for many improvisers, the role of silence in musical improvisation and its overall desirability was a frequent topic of conversation as they discussed their experiences playing with

Maxine. This was both in the sense that they found a great deal of meaning in the system's ability to occasionally be quiet and allow the human player to be heard alone as well as the system's ability to "take a solo" when the human player was inactive. However, many players also found a great deal of meaning in the system's ability (or failure) to engage in a "mutual silence," in which both the human and machine player would pause for a period of collective sonic inaction.

For nearly all players, the particular timbral qualities of the system's response to their playing was an issue which could not escape their comment. Where I have previously clarified that improvisers pride themselves on the inclusion of idiosyncratic timbres in musical practice, this commentary further elaborates on just what the parameters of doing so really consist of. More importantly, this commentary also illustrates the various ways that improvisers conceptualize the principles by which timbres should be best combined in the course of musical performance.

Among the more important themes which arose in improvisers' critical commentary about Maxine was the question of what exactly "freedom" really means in the context of free improvisation. That is, can a machine ever really act "freely?" And if it were to do so, then what would this really mean about the concept of freedom? What would enable a machine to exhibit freedom? For many players, this debate centered upon the relationship between the system's current behavior and understanding of its environment and its past as well as the musical pasts of many related artistic practices. Several improvisers implied that Maxine could never be free if it never had a sense of its own history and a memory of its past interactions with other players. Others, however, found that it was precisely Maxine's radically amnesiac cognitive makeup that allowed it to be free from the baggage and orthodoxy of other musical practices.

In addition to the issue of freedom, many conversations about Maxine also raised the question of what it means for a musician to "improvise." Or rather, what is it that makes an individual feel that the actions of their interlocutor are actually improvisatory and not just a reproduction of some script, collocation, or "lick" that they have previously acquired? As was the case for egalitarianism, there is no singular truth to the answer to this question; rather, the sensation that the other is improvising is entirely precarious, ephemeral, and particular to the occasion. Nevertheless, this side of the commentary on Maxine suggested that there are many ways in which "improvisationality," or the qualities of a performer's actions which suggest that they are improvisatory, often amounts to a set of rather consistent, rather than indeterminate or "spontaneous," tropes of performance for a given musical practice. In other words, just as Erving Goffman has suggested (1959, p. 49), there are many ways in which the feeling that our interlocutors have "surprised" us are actually quite well-planned, even if that actor is wholly unaware of how hackneyed and routinized that "impromptu" behavior really is. In future work on this project, these and several other themes will surely prove to be fruitful foci in the analysis of improvisers' discourse on Maxine.

As mentioned in the introduction, one of the principal aims of this project was to illustrate how the encounter of human and machine social interactants can elicit commentary on the phenomenology of human sociality in a way which is not possible through other methodologies. This project has succeeded in illustrating how such approaches offer a richness and variety of commentary on the nature of human sociality as an experience which is not

possible through traditional fieldwork practices in ethnomusicology and related fields. However, it would be foolish to claim that the words that these improvisers offered in their meetings with Maxine are equivalent with their actual thoughts and mental states. Ultimately, the phenomenological approach offered here is still limited by the subject's framing and narration of their experience in language. In other words, while this approach brings out an element of experience which could not have been examined otherwise, it still does not allow us to observe the Other's experience directly. Opacity remains, despite the transparency of their forthright accounts of why Maxine lets them down (or occasionally does otherwise).

New Directions

Nevertheless, this project open up new lines of inquiry in a variety of directions.

A Broader Conception of Digital, Algorithmic Ethnography

In the time since this project began nearly a decade ago, scholarship under the broad heading of "digital humanities" (see Gold, 2012) has become increasingly present in several fields of sociocultural study. Generally speaking, this work has led to the development of an array of new methodologies which capitalize on the various ways that computational approaches allow humanists to do what they have always done but more efficiently, at a larger scale, or more precisely (see Moretti, 2013). For the most part, digital humanities work has focused on the use of computation as a means of analyzing large corpora of text, archiving and sharing work with the public, as well as analyzing geographical and social network data in diverse research contexts.

In roughly the same span of time, scholarship in "digital," "online," or "virtual" ethnography across various fields has also expanded significantly (Boellstorff, 2015; Kozinets, 2002; Murthy, 2008). This kind of work examines a wide array of ways that digital technologies, particularly the internet, have changed the ways that human beings relate to each other. In response, ethnographic observation of social life in online and in virtual space has become increasingly common and includes work focusing on online cultures for their own sake as well as the use of online methodologies as a means of answering other ongoing questions in the humanities and social sciences. Relatedly, the ethnographic study of algorithms, both in their production and how human interactants experience them, has also grown (Seaver, 2017; Wilf, 2013b).

Both of these trends are of obvious importance given the ways that digital technologies have altered both sociocultural life as well as scholarly means of examining it. Nevertheless, what remains underdeveloped is the use of algorithms as a means of ethnographic depiction by scholars who want some audience, whether academic or public, to experience the findings of their fieldwork. In other words, algorithms have yet to be exploited as a form of "writing" or scholarly expression in the same way that text, image, audio, and film all have.

Like any other tool of expression, algorithms will always have their flaws and limits. There will always be something in the real world that is never fully represented or re-performed by an algorithm. All the same, an algorithm allows for the depiction of human ways of thinking

and responding to other human beings and the world in a way which has never been possible through the traditional fixed media of text, image, audio, or film.⁵ Specifically, these media do not allow for the direct *experience* of the forms of social interaction which might be particular to a given cultural milieu. A film might allow one to see and hear an interaction between players, for instance, but obviously such media do not allow one to actually experience the interaction taking place between the players themselves.

An algorithm, on the other hand, creates the possibility for the audience to not only see and hear this kind of experience, but to actually experience it for themselves. I do not claim that Maxine is an accurate representation of such experiences. Playing with Maxine is just one experience playing free improvisation that one could have among many. Its particularity aside, Maxine, as a cluster of algorithms, allows one to experience the scholar's depiction of free improvisation directly and do so in a way that would not have been possible from just reading this work or field recordings.

With all their faults, they allow for an ethnographic representation of various forms of sociocultural life, particularly where these forms manifest themselves as specific ways of thinking, feeling, and being with others socially. To some extent, this is already what many scholars of critical algorithm studies already recognize (see Nissenbaum, 2001, for example). The crucial difference here is that whereas critical algorithm studies scholarship focuses on how extant computer systems embed values, worldviews, or discourses, what I propose here is the active use of the algorithm as a means for social scientists and humanists to ethnographically depict the cultural worlds they have previously tried to depict principally through text, and occasionally through film or sound. Likewise, for digital humanities, the difference is that instead of using computation as a means of analyzing information, I propose the use of computation as a means of representing and re-performing the culturally-specific ways that human beings process their environments and one another.

Thus Maxine is a digital, algorithmic ethnography. This does not mean that Maxine is an ethnography of an algorithm or of digital cultures. This does not mean that Maxine is an algorithm that enables me or others to quickly sift through piles of data in order to arrive at conclusions about sociocultural lives. This means that Maxine, like Malinowski's *Argonauts of the Western Pacific* (1922/2002), is *itself* a depiction of the nature of human sociality in a particular cultural world, in this case, the transnational networks of free improvisation in music.⁶ But unlike the *Argonauts* or any ethnography in fixed media since then, playing with this system offers an experience of the sonic interactional culture it depicts rather than just a written account, snapshot, sound recording, or moving image.

⁵ While each of these are now available in a digital form which often involves algorithms, the digital form remains more or less equivalent to the analog. Even if algorithms might be involved in reading an academic article online, the basic structure of the medium is the same as it was in the 16th century.

⁶ Without necessarily calling it an "ethnography," George Lewis draws a similar representational relationship between his system *Voyager* and the community of creative African-American music practitioners with whom he developed as an artist in Chicago (Lewis, 2000b).

Human-Computer Interaction as Critical Ethnography

As the last three chapters illustrate, improvisers routinely dispute the way that Maxine performs their ways of social interaction through music. The encounter between Maxine and improvisers constitutes a kind of “second” or “post” ethnographic practice, in which the critique of a cultural representation (in the form of Maxine) forms the basis of another ethnographic encounter between the researcher and subject. As social scientists have shown, it is only natural for those portrayed in an ethnographic text to do so (see Brettell, 1993). Moreover, the encounter between such texts and the subjects they represent has also shown itself to be a productive means of eliciting further commentary from those depicted about details of their social world which failed to make it into the ethnographic text (Abu-Lughod, 2016; Fassin, 2015).

These encounters are quite different than the encounter between Maxine and improvisers, however. For example, like Steven Feld (1987), I could have conceivably read passages of my writing on this practice to improvisers (or simply have them read them) and ask for their take on how well I have described what happens when they meet to make music. This would certainly give them an opportunity to critique how I have described what we as improvisers do when we create music together. As was the case for Feld, it would also create a conversation that facilitates the elaboration or complication of points made in the course of the text. Still, while repeating what Feld and others have done is certainly feasible, the methodology pursued here enables a more immediate reaction from the people who practice the forms of social interaction encoded into the design of Maxine. There is nothing for them to read. There is no academic register to decipher. There is no need for the player to understand how the system is designed. They simply play with the system like they would with another player and tell me to what degree playing with Maxine differs and how.

For the practice of ethnography, this project has been a relatively novel experiment in subjecting a virtual social interactant to the critique of human beings engaged in the practices the system was designed to perform.⁷ Beyond ethnographic fields, however, this project’s approach is utterly common for researchers in human-computer interaction and user experience. For the most part, designers now regard it absolutely essential that interactive technologies be subjected to the critique and evaluation of the human users they were intended for. This work is a vital part of the design process and often crucial in reaching the final goal of creating a greater coupling between the way a system is constructed and the tendencies and preferences of the human beings the system is intended to interact with.

Overall, however, subjecting systems to this kind of critique is largely regarded as entirely instrumental and limited to the goal of identifying “implications for design” (Dourish, 2006). Framing the results of such studies in this manner is not surprising given the obvious pragmatic goal of improving design and in industrial or commercial contexts, maximizing market reach. Nevertheless, much of the purpose behind this entire project has been to demonstrate that this way of thinking about how human beings critique these systems is enormously shortsighted. There is far more to learn from what Maxine’s critics have to say than

⁷ In ethnomusicology, the two best-known prior examples include James Kippen’s and Bernard Bel’s experiments with modeling Hindustani tabla improvisation (Kippen & Bel, 1989) and the Virtual Gamelan Project at the Kunst-Universität Graz (Grupe, 2008).

just improving the design of this system, even if this remains a key area of interest for me as an artist. On the contrary, such encounters reveal a great deal about the nature of freedom as a social and aesthetic experience, about egalitarianism as an ethical ideal, and how these abstract phenomena manifest themselves in how human beings listen to one another.

Implicitly, subjecting systems of this kind to the critique of the human beings they are intended to coexist with⁸ is a form of dialogic ethnography. This is in the sense that the system itself is already an ethnographic representation and performance of a particular social practice. Of course designers hardly consider the algorithms they build to be “ethnographic.” Nevertheless, these systems are implicitly ethnographic in that they are typically based on the designer (or some member of a design team) spending time with the intended human interactant and participating in and observing their practices. As Soyini Madison argues (2005), a representation does not need to be labeled by its creator as “ethnographic” in order for it to achieve the function of texts that are explicitly named as such by their producers. Therefore, if we understand technical systems to be ethnographic in their representation of real social practice, then it follows that subjecting them to the critique of human practitioners is a form of critical ethnography.

Thinking in this way allows us to reconceptualize what one learns from “user studies” in human-computer interaction research. It enables us to see that what one gains from these studies is far more than just a better sense of how a system needs to be rebuilt. This project has sought to illustrate that all this work, despite its typical framing as merely “technical,” is immanently a form of social scientific inquiry.

Rethinking Artistic Research

Still, Maxine is not just any kind of technical system. Broadly speaking, this system falls into the category of “artistic research” (Borgdorff, 2012; Hannula, Suoranta, & Vadén, 2005). In the canonical sense, Maxine constitutes artistic research in that a process of field inquiry about the nature of musical interaction in free improvisation was integral to my work in developing this system. Maxine is the product of the research I conducted as an artist in playing with and observing musicians, primarily in Chicago.

But beyond this primary sense of the term “artistic research,” this project also demonstrates how scholarly inquiry takes place not only in the creation of a work of art but how the work of art starts a process of intellectual discovery because of the way it disrupts and unsettles social experience. Maxine’s presence creates a disturbance. It perturbs the improvisers it engages with (and occasionally also makes them happy). These irritations allow for something to become explicit and apparent which previously remained dormant despite its centrality as a structure of sociality and intersubjectivity. Therefore it illustrates a sense of what “artistic research” might offer to ethnomusicology and the social sciences. Rather than limiting artistic research to its usual domain of the process of discovery required in the generation of new work,

⁸ Typically these are referred to as “users.” I have refrained from using this term since no improviser intends to “use” another. Likewise, improvisers playing with Maxine, Voyager, or any of the other systems mentioned in this project are “using” the system.

this project demonstrates how artistic provocation may be productively used as an ethnographic method.

Provocation is certainly the goal of a great deal of contemporary artwork. Much of it aims to cause some kind of disquiet, though methods vary. What I have tried to demonstrate in this project, however, is that there is more to say about this kind of goal and what it can achieve. If one aims to unsettle, so be it. If one succeeds in doing so, all the better. What remains missing in most work which attempts to do this is a systematic effort to document just how people were unsettled and what this unsettling might have revealed. As previous chapters demonstrate, the disruptions of an artwork — regardless of whether it is “good,” “bad,” or one refuses to speak in such terms, as Francis does — can offer a glimpse into an element of a social reality that was not otherwise available for analysis.

Consequences for Ethnography

The result of these encounters, especially when compared to the relatively traditional ethnographic fieldwork I also conducted as an improvising saxophonist, has broad implications for the practice of ethnography. As I have shown in discussing my own experiences as an improvising saxophonist, I am never subjected to the same level of explicit, forthright critique that Maxine is. I have done nothing to earn this impunity other than to be born human. While it is a pleasure to be free of the sometimes merciless critiques that improvisers have for Maxine, it means that there is much that this project would have failed to illustrate about the reality of social psychology among improvisers had I simply relied upon my own experiences as a saxophonist making music with these players.

Where traditional practices of ethnography in ethnomusicology or related fields would have largely confirmed the utopian vision of free improvisation as a deliverance from artistic normativity, the critique of Maxine should lead us to immediately question this utopian conception. The fact that Maxine is not a person releases them from much of their hesitation in speaking directly about what they really expect from other players when they meet to create music together. Hence the encounter with this virtual musician reveals much that has always been present but never explicitly discussed in how these musicians have dealt with one another.

This suggests that many canonical forms of participant observation, as practiced in ethnomusicology and related disciplines, have serious limits. Though prolonged presence with the ethnographic subject is often regarded as a methodology which enables a deeply intimate account of social realities, there is much that it cannot reveal. In addition to offering further clarification about the immediate objects of analysis in free improvisation and social interaction, this project also serves as a demonstration that one might consider that an ethnographic approach still leaves much mystery despite the proximity, involvement, and authenticity it is often assumed to offer. Conversely, it suggests that all the intimacy of an ethnographic engagement with a social reality may actually do more to conceal what other subjects experience rather than to render it more perceptible.

Anthropology and Ethnomusicology in the Uncanny Valley

It may seem that what improvisers seem to put up with and then suddenly begin to complain about when they are in the presence of Maxine is entirely particular to free improvisation. Their commitment to ideals of liberty and creativity rather easily lead them to refrain from being honest with one another but then feel far more comfortable expressing their grievances about a nonhuman musician like Maxine. However, the way that improvisers criticize Maxine may also have implications for the ethnomusicological study of communities of practice in which creativity may be a strong value or improvisation a key practice. In such communities, it may be common for individuals to simultaneously hold opinions of their fellow practitioners' work but feel hesitant to ever express a normative judgment about whether it has met a certain standard or not. In fact, this has already been suggested in one of sociologist Howard Becker's early essays on jazz musicians in Chicago, in which he found that musicians felt uncomfortable making evaluative claims about fellow players out of respect for their creative autonomy (Becker, 1951). Likewise, Richard Widdess' (1994) study of Hindustani classical improvisation illustrates how when musicians are asked to clarify whether a particular approach to spontaneous playing is right or wrong, improvisers are prone to deferring normative statements by insisting that the approach in question is just one of many options. Therefore, beyond "free" improvisation, this project suggests for communities of improvisational practice, it may be a frequent occurrence that participants hold various opinions of their peers' practices which they habitually refrain from ever directly expressing.

Outside of studies of musical practice, however, social scientists have continually indicated that habitual reticence about what one really thinks of one's daily interlocutors is surprisingly ubiquitous. Improvisers are hardly the only human beings who find themselves routinely frustrated with those they traffic with.⁹ Though it manifests itself in different ways across culture (Bargiela-Chiappini, 2003; Brown & Levinson, 1987), Erving Goffman's concept of "face-work" (Goffman, 1955), or the tendency to prevent oneself or others from experiencing embarrassment in social encounters, manifests itself in social behavior far and wide. This suggests that replication and expansion of projects like this one may also allow for more direct examinations of the experience of sociality in other contexts because commenting on the behavior of an artificial social interactant is far less awkward than directly confronting an interlocutor about one's frustrations with their behavior. For the anthropology of ethics in particular, Maxine's critics suggest that latent moral critiques of one's interlocutors are a frequent element of human social experience. Whereas moral critiques or prescription are often explicit, this project demonstrates how much of moral experience is silent; one wishes, as Torsten the bassist does, to say something to others, but refrains from doing so.

⁹ Around the time I first created Maxine, my work in community once brought me to attend a workshop with community workers from all around the city of Chicago. The first panel featured a rather impressive speaker. Before getting into his main points, he asked us all "please raise your hand if you work with difficult people every single day." Nearly all raised their hands, this despite the fact that many were seated with co-workers. Realizing that the timing of the event relatively early in the morning led them to let their guard down, almost all immediately balked and laughed.

Considering such interactions (and criticisms thereof) as relevant to the anthropology of ethics allows for some rethinking of the so-called “uncanny valley” (Mori, 1970), a widely discussed explanation of why human beings detest humanlike technologies. According to this typical account, human beings become more disgusted with a technology the more that designers build it to behave or resemble a human being’s presence. As roboticists Karl MacDorman and Hiroshi Ishiguro (MacDorman & Ishiguro, 2006) note, though this kind of revulsion at a humanlike machine has been widely documented, the reasons behind the phenomenon are still unclear. At least in the case of Maxine, it is fairly clear that the reasons for the human indignation this system elicits stems from the ways it violates the human interlocutor’s sense of the norms of the particular genre of interaction at the center of this project. Looking forward, this suggests that one of the major frontiers of the anthropology of ethics may lie in the study of how human beings react to the behavior of humanlike technologies.

For ethnomusicology in particular, however, the ethnographic study of humanlike virtual performers may also prove to be a fruitful endeavor which allows for a renewed approach to the study of traditional and popular musics. As strange as technologies like Maxine may seem, artificial performers are increasingly becoming a part of contemporary musical life. And though such work may have been previously limited to the rarefied, cosmopolitan, subcultural world of experimental, avant-garde musical practice, such technologies are slowly becoming a part of the experience of a variety of popular and traditional musics around the world.

For example, Shimon is a robotic vibraphonist proficient in modern jazz (Weinberg et al., 2009; see also Wilf, 2013a; Wilf, 2013b). Similarly, far from being a fringe practice of the avant-garde, Hatsune Miku is the first virtual artist to enjoy wide commercial success and “performs” for audiences of thousands across Asia (D. Black, 2012; Kenmochi, 2010). As ethnomusicologist Andrew McGraw (2016) has demonstrated in a recent essay on the “Gamelatron,” or a robotic gamelan orchestra created by American artist Aaron Kuffner, the artificiality of such technologies often allows for a re-acquaintance with their counterparts in the real world, such as the gamelan itself. Like Maxine, each of these musical technologies unsettles the typical experience of these various artistic practices by suggesting that which is “uniquely human” can be replicated in algorithmic form. The various debates and crises of identity these technologies each cause, in much the same way Maxine does, serve as highly productive arenas of ethnomusicological inquiry into many of the same issues that music scholars have long been concerned with in regard to these various practices.

Sociality and the Cultural Study of Listening

Finally, this project sets the stage for rethinking the cultural study of listening, as manifested in a growing body of work in sound studies (Novak & Sakakeeny, 2015; Pinch & Bijsterveld, 2012; Samuels, Meintjes, Ochoa, & Porcello, 2010; Sterne, 2012), in terms of the role that auditory sensation plays in face-to-face interaction as a distinct element of human sociality. Scholarship in the cultural study of listening has illustrated how practices of listening vary drastically across cultural context. This work has been fundamental in a broader project of developing an anthropology of senses which seeks to illustrate how sensory practices are far from universal and

that the human perceptual awareness of the world and other people is significantly shaped by a number of cultural attitudes, principles, beliefs, and histories.

Surprisingly, very little of this literature focuses on the rather obvious role that listening plays in human interaction. The cause of this lacuna is unclear. Notwithstanding, Jonathan Sterne's (2003) study of sound reproduction offers what may be a representative characterization of why interaction has been regarded as largely irrelevant for much of sound studies. According to Sterne, discussions of sound reproduction make the problematic assumption that "face-to-face communication and bodily presence are the yardsticks by which to measure all communicative activity" and that "the difference between sound reproduction and interpersonal interaction is important because the former lacks some of the qualities of the latter" (Sterne, 2003, p. 20). Later on, Sterne asserts further that "if interpersonal interaction is the presumptively primary or 'authentic' mode of communication, then sound reproduction is doomed to denigration as inauthentic, disorienting and possibly even dangerous" (ibid., p. 21).

Given that Sterne's study was concerned with illustrating how sound reproduction is an important part of how human beings develop various techniques of listening, it makes sense for Sterne to criticize an assumption that interaction is a primary site of sociality. All the same, who could possibly deny that listening is nearly always fundamental to human interaction? If most forms of human interaction are impossible without listening, then what validity does the cultural study of listening have if the role of listening in human interaction is regarded as a conceptual focus which obstructs the "real" subject of sound studies?

In many ways, sound studies has been a welcome intervention in its challenge to the hegemony of the dominant disciplinary locations and orientations (e.g., music, linguistics, acoustics) which have been traditionally assumed in the cultural study of sound as a feature of human sociality. In foregrounding sound, it has been only natural that scholars have also focused on the rich cultural and historical variability of practices of listening across geography and time. For the most part, however, studies of listening have focused on how practices of auditory attentiveness have developed in response to sound recording (Bull, 2005; Gopinath & Stanyek, 2014; Helmreich, 2007; Hirschkind, 2006; Kassabian, 2013; Kheshti, 2015; Steingo, 2016; Sterne, 2003; Stoeberl, 2016), live performance (Johnson, 1995; Novak, 2007; Pemberton, 1987; Sykes, 2015; Weber, 1997), or other nonhuman sources of sound (Bijsterveld, Cleophas, Krebs, & Mom, 2014; Feld, 1982; Helmreich, 2007).

As productive as this enterprise is, it largely overlooks the role of listening in human interaction. In interaction, the role of listening is often rather crucial because of the inherent "double-contingency" that is essential to human interaction as a distinct type of social experience. As theorized by Talcott Parsons (1962) and later elaborated by Niklas Luhmann (1995), double contingency refers to the mechanism by which almost any interaction has a tendency to become indeterminate over time. Specifically, a first actor cannot be sure what response their initial action will prompt in a second actor, their interlocutor. The second actor's response is contingent upon the initial action of the first. In turn, when the second actor reacts to the first, they cannot be entirely sure how the first will respond. Hence a second contingency takes place. Since interactions tend to feature this contingency going back and forth, Parsons referred to it as "double contingency."

In many cases, the first's awareness of the second is through the practice of listening. Canonically, this is in the form of a conversation, though numerous musical socialities also feature this kind of double contingency, particularly the kinds of improvisational interactions that have been discussed in this project. In any case, the way that a practice of listening is executed in this kind of interaction, whether conversational or through musical expression, is essential in the outcome of the interaction as a result of how participants responded to one another (or did not). Thus if sound studies is concerned with the study of culturally-specific practices of listening, then the study of listening in human interaction is paramount. For the typical contexts of sound studies research, double contingency is largely absent. Aside from the illusion of "interaction" with fixed media like an audio recording, one cannot interact with a tape player, vinyl record, or compact disc. Hence a major element of what listening is as an element of human sociality has yet to receive fuller attention in sound studies.

As these last three chapters demonstrated, the term "listening," as encountered in fieldwork contexts, is prone to an inherent ambiguity which rests upon whether the speaker assumes that a display of attentiveness is necessary when saying that "listening" is taking place in an interaction. For improvisers who preferred more cooperative approaches to musical interaction, it was fundamental that other players let them know that they were listening by audibly responding more or less immediately. In other words, they expected other players to "perform listening" by providing evidence that their active sonic reception of the world around them was taking place. These players were discontent with merely assuming that listening was taking place without this evidence being provided.

For improvisers preferring a more confrontational or autonomous mode of interaction, such displays of attentiveness were regarded as undesirable. This kind of interaction presents a fundamental conceptual problem for sound studies. One does not know that the other is listening. One can assume that they are given that they have ears and are within earshot, but no evidence of listening is being given. It is possible that they may be listening, but it is impossible to know for sure because the same kind of autonomous interaction could either result from a player listening closely or a player who simply could not be bothered to pay attention to others.

In other words, displays of attentiveness are quite important in the empirical task of understanding how and what form of listening is taking place. Ultimately, I concur with Sterne and others who assert that the study of face-to-face interaction is primary whereas listening to sound reproductions is secondary. For studies of how human beings listen to each other and their environments, these two topics are of equal importance. More importantly, analytical attention to the role of displays of attentiveness are not only relevant for human interaction, but for less obviously "interactive" contexts as well. For example, the way an audience is trained to respond to the performer often hinges on the social acceptability of displays of attentiveness as a listener. This is especially salient in the study of Hindustani classical music, where the cliched discursive token "*kyā bāt!*" is a marker of connoisseurship and appreciation (see Alaghband-Zadeh, 2017). Thus I submit that future work in the cultural study of listening practices will attend to how displays of attentiveness play a significant role in their meaning.

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Appendix

This appendix offers further explanation and clarification for several technical terms discussed in Chapter 7. Additionally, it provides illustrations of how several spectral features are inadvertently and indirectly reflected by pitch detection algorithms.

Tone-to-Noise Ratio

The tone to noise ratio refers to the proportion of a given sound signal that consists of sounds which are periodic in the frequency domain, or “tones,” and sounds which are not, or bands of noise.¹ In a nutshell, periodic sounds are “tones” while aperiodic sounds are “noises” (see Smalley, 1997). In reality, most sounds are actually a combination of tone and noise and thus feature both periodic and aperiodic elements. Periodic aspects of a given sound source are those which emanate from physical objects which produce compression and rarefaction of air, or sound waves, at highly regular rates. This includes sound sources such as a taut string of even density (as in a violin), a column of air (as with a trumpet),² and gongs. The regularity of these vibrations of the air causes the ear to sense such sounds, despite the uniqueness of each individual vibration, to result in the sensation of a periodic vibration of the air. Psychoacoustically, these sounds are perceived as tones for the fact that they have a quality associable with the human voice and other melodic instruments. Acoustically, because these sounds can nearly always be recomposed from sinusoidal waves, periodic sounds are synonymous with tones.

By contrast, aperiodic aspects of a sound emanate from physical sources which cause air vibrations at irregular rates, though these rates are often clustered around a particular frequency (e.g., clustered around 1500Hz, but with a range of 1000-2000Hz). Such sounds include the sound of wire brushes on a snare drum, most linguistic consonants, or the rustling of leaves in the wind over the Serengeti. Like periodic sounds, each individual source of vibration has a particular rate at which it causes the compression and rarefaction of air to occur. However, for each vibration of an aperiodic source, the exact timing between these individual impulses varies, thus resulting in the sensation of an aperiodic sound. Because these sounds cannot be reproduced

¹ In this discussion, the use of the terms “periodic” or “aperiodic” refers to their meaning in the frequency domain and not the time domain. The frequency domain refers to the analysis of a single slice of a digital sound sample, or frame, through the Fast Fourier Transform (see main text below.) Outside of this extremely short window of time, other forms of periodicity (such as rhythm, meter, or pulse) are very important for understanding musical structure. These forms of periodicity are indeed related to the kinds of periodicity discussed here in that they refer to the regular production of sound waves from the regular vibrations of a physical object. The difference here is mainly that the frequency domain refers to rates of sonic energy production which are high enough that most human beings no longer perceive them as individual events but as musical structures like rhythm. Rhythm, in turn, is also often highly periodic, but it remains the case that individual components of a rhythmic cycle are typically heard as being distinct and separable sonic events.

² It should be noted, however, that these first two listed sound sources and other pitched instruments can also produce aperiodic sounds. A violin string can easily be made to produce aperiodic sounds as can a trumpet. Nevertheless, these sound sources typically produce periodic sound. This is true provided the violin string is plucked or bowed with a standard violin bow using the basic arco technique and the string fingered with the requisite amount of pressure. For the trumpet, aperiodic sounds result only when using the standard embouchure of the common practice period and one successfully produces a sound which is heard as a single tone. In short, if one plays a melodic instrument as most people would expect it to be played, the sound will be periodic.

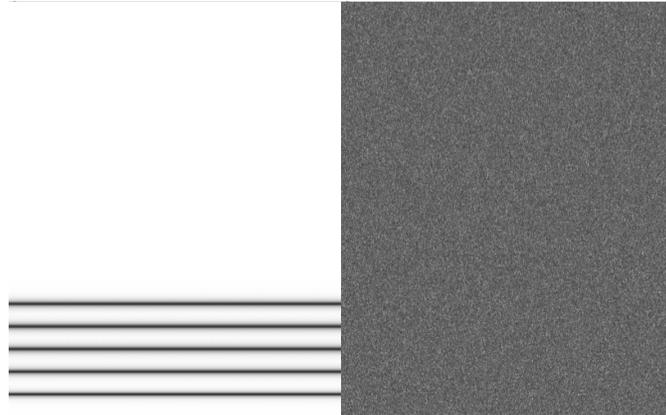


Figure 8. Tone vs. Noise.
 Left image shows spectrogram of tones.
 Right shows spectrogram of noise.
 Frequency axis (y) is linear, not logarithmic
 as is typically the case in linguistics.

using sine tones, aperiodic sounds are synonymous with the term “noise” within a purely technical discussion of acoustics.³

Using a process known as the Fast-Fourier Transform (FFT) (see Brigham, 1988, for reference) a frame of an audio signal can be decomposed into individual components in order to examine the relative distribution of amplitude (or audible physical energy) across the frequency band. When this information is visualized through a spectrogram (also referred to as a “sonogram”), this allows for the observation of which frequency bands are currently being produced with greater or lesser physical energy than others. This includes frequency energy from any periodic or aperiodic sound sources in the original sample. When visualized through the spectrogram, tones are visually identifiable by the fact that one can clearly see lines of concentrations of energy around specific frequencies. Conversely, noisy sounds are visually identifiable by their appearance as large blobs or swatches in which the spatial coherence of energy around particular frequency bands characteristic of tones is absent (see Figure 8).

Defining Pitch: Harmonicity and Inharmonicity

Beyond the distinction between noise and tone, further sub-classifications of sound types can be made in both categories. Within the category of tone, the basic distinction between the two sub-categories harmonicity and inharmonicity are of great musicological significance for between these two lies the difference between that which is a pitch and that which is not. In most cases, tones produced in the physical world do not consist of just one band of energy around a single frequency, but rather several bands for several frequencies. In the relative spacing of these

³ Naturally, there are numerous sounds which are referred to as “noise” despite not having the technical qualities that distinguish noise from tones. In many cases, “noise” refers to sounds which are simply displeasing to a given human subject. This use of the term is not relevant to the present discussion, which refers to acoustic rather than socio-cultural definitions of these terms.

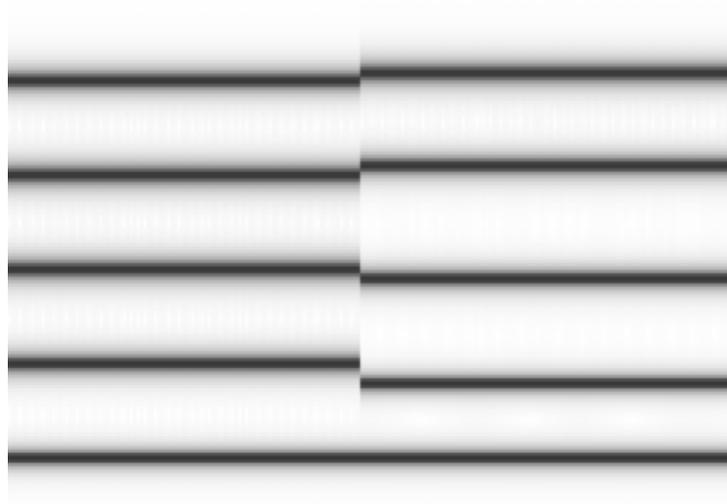


Figure 9. Harmonicity vs. Inharmonicity. Left side of image shows harmonic partial distribution. Right shows inharmonic partials. Frequency axis (y) is linear, not logarithmic as is typically the case in linguistics.

frequency bands for a given sound, the distinction between harmonic and inharmonic tones is made.

Groups of tones which are harmonic have the characteristic that the individual frequency components of these sounds are evenly spaced. For example, a hypothetical harmonic sound would be composed of individual frequency components, or partials, at 100, 200, 300, 400, etc. Hz.⁴ Harmonic tones have a unique psychoacoustical property due to the fact that the even spacing of the tones results in the sensation that these tones are a single sound. The consistent difference between adjacent partials means that each frequency band produces regular fluctuations of air pressure which cause them to line up with the rest of the set of partials. Consequently, these tones are heard as not separate but fused. Thus for harmonic sounds, the fundamental frequency of the sound is usually determined by finding the lowest of this evenly distributed sequence of frequency bands.⁵

By contrast, inharmonic tones are unevenly spaced (see Figure 9). Hence the human ear is less likely to perceive them as a single sound or single pitch. This is due to the fact that the uneven differences between the whole set of partials do not allow them to easily fuse in the way

⁴ In terms of actual psychoacoustic perception, the spacing of these partials does not to be as perfectly even as this example for the sound to be perceived as harmonic (see Moore, 1987; Moore & Ohgushi, 1993).

⁵ As it turns out, it is not necessary for the fundamental sound to be produced or even heard (Terhardt, 1979). Instead, it is simply the fact of even spacing of the partials that allows for tones to be perceived as having a definite pitch. Thus, it is the exact difference between frequency bands, rather than the fundamental frequency, which may be a more reliable means of estimating pitch as it would be perceived by a trained musical ear.

that is possible with harmonic combinations of partials. With very small discrepancies in the evenness of the partials, an auditory illusion that the amplitude of the entire sound is varying at a specific rate, or “beating,” results. For example, for a frequency pair of 100 and 204 Hz, the sensation of beating would occur at 4 Hz. Though inharmonicity is often perceived as a combination of two pitches, inharmonic combinations of partials that cause this sensation of beating are often perceived as being just one pitched sound.

For greater discrepancies between partials, combined tones are no longer heard as a single pitch but rather begin to be perceived as separate pitches. The threshold for perceiving such distinctions is theorized through the concept of “just noticeable difference” (JND) or the point at which such a difference is noticeable. For the percept that the tones are no longer part of the same pitch and are actually distinct pitches the JND varies according to several factors including the fundamental frequencies of the respective pitches and the number and frequency of harmonics (Houtsma & Smurzynski, 1990). Common examples of inharmonic sounds include those produced by metal gongs, bowed cymbals, and many extended techniques on musical instruments such as preparation of the piano or guitar and woodwind multiphonics. Psychoacoustically, these sounds are distinguishable from harmonic sounds because it is usually difficult (or at least a matter of debate) as to what pitch or pitches they produce.

Spectral Centroid and Flux

In addition to distinctions between tone and noise or harmonicity and inharmonicity, two other types of timbral features are of crucial importance for understanding the complications inherent in how pitch detection algorithms (PDAs) parse complex sounds and their temporal variance. In turn, these are two types of timbral features which a PDA inadvertently and obliquely responds to with changes in the reported “pitch” value. These features are the spectral centroid and spectral flux. Also referred to as the “brightness” (Schubert, Wolfe, & Tarnopolsky, 2004) of a sound, spectral centroid (Peeters, Giordano, Susini, Misdariis, & McAdams, 2011) is calculated by taking the weighted mean (see Upton and Cook 2014) of the entire frequency band. In a simple mean each datum has equal weight in the calculation of the average across the set. For a weighted mean each datum has an individual weight that determines the degree of its influence on the the final value. An FFT across the entire audible frequency band produces a calculation of the amplitude for each of these possible frequencies from 20 to 22,000Hz (this being the value considered the highest limit of human auditory sensation).

A simple arithmetic mean of these values yields little insight since it would simply be 11,000Hz for any and all sounds. As a weighted mean, the spectral centroid offers a value that roughly indexes where or whether frequencies are concentrated in higher or lower regions of the audible frequency band. To calculate a spectral centroid, the FFT is first necessary in order to determine the relative amplitudes of each frequency bin.⁶ Once frequency bin-amplitude pairs are produced, the amplitude of each frequency bin can be used to set the weight at which each

⁶ FFT’s do not always produce values for each frequency. For example, an FFT could be set to report values for frequency ranges, or “bins,” of 2Hz across the spectrum. This means that the amplitude for frequencies in a 2Hz range are given rather than the value for 1Hz. Bin size can be adjusted according to purpose.

	Frequency (Hz)	Amplitude	Product
	100	0.0009	0.09
	200	0.02	4
	300	0.3	90
	500	0.4	200
Simple Mean	275		0
Sum of Amplitudes		0.7209	
Sum of Frequency-Amplitude Products			294.09
Centroid			407.948397836038

Table 1. Calculation of Spectral Centroid from Hypothetical Frequency and Amplitude Pairs. Frequency is given in Hz, while amplitude is given in arbitrary units.

frequency contributes to the weighted mean. For example, consider the hypothetical set of frequency-amplitude pairs given in Table 1.⁷

The spectral centroid is calculated as follows:

- 1) Take the product of frequency components and their respective amplitudes.
- 2) Find the respective sums of
- 3) amplitude values and
- 4) the product of frequency-amplitude pairs
- 5) Calculate spectral centroid by the quotient of sums of frequency-amplitude products divided by the sum of amplitudes

For this hypothetical frequency distribution, the spectral centroid comes to roughly 408Hz. Whereas a simple mean of these four frequencies would be their sum divided by four (or 275Hz), the centroid of this frequency-amplitude distribution is much higher than this simple mean. This reflects the fact that there is greater amplitude for the higher frequencies of this set of tones (see Figure 10). Or to use the metaphor of “center of gravity,” this set of tones is more weighted towards the higher end of the range of frequencies.

The spectral centroid is a useful statistical calculation for numerically representing the sense of “brightness” of a particular sound. For pitched instruments, the centroid of a sound varies as the player puts more or less energy into higher or lower partials. Generally speaking, musicians do this intuitively and are hardly aware of or concerned with the centroid as a specific

⁷ For the sake of simplicity, only 4 values are given in this example. With an actual FFT, an amplitude would be calculated for each frequency bin. In this case, one can assume simply that the amplitude of all other frequency bins is 0.

value. Likewise, composers do not typically specify the centroid they wish to be produced. For example, for a given pitch, the centroid likely varies across the duration of the note itself as most players naturally produce temporal variation in the relative strength of the partials of a note. That

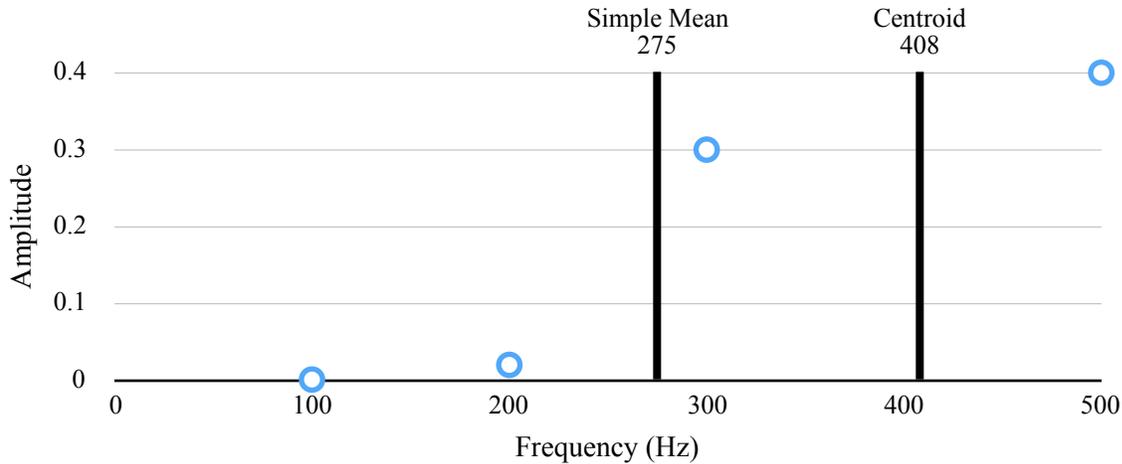


Figure 10. Spectral Centroid vs. Simple Mean of Frequencies.

is to say, for the same G#4 played twice, the spectral centroid will differ between these two notes and likely vary across their durations. In human speech, vowels produced at the same pitch have significant differences in their spectral centroids because of the variable amplitudes of different partials or formants across the spectrum (e.g., “oo” is typically heard as “darker” than the “brighter” sounding “ee”).

The spectral centroid is a useful descriptor not only for combinations of tones, but noises as well. For example, numerous consonants vary by their relative centroid. For the English language “sh” has a lower centroid than “s,” “f,” or “th” (see Figure 11). Similarly, percussionists, whose instruments are the most iconically noisy of almost any type of instrument group, are usually skilled in controlling the relative frequency ranges in which their instruments produce audible acoustic energy. Consequently, the spectral centroid is a strong indicator of the timbral differences between wire brushes on a snare drum versus a styrofoam ball rubbed on the same surface.

Finally, though it also reflects the distribution of energy across the audible spectrum, spectral flux (Peeters et al., 2011) is far more indicative of how timbres change than how they are at a given moment. Specifically, spectral flux is a calculation which compares audio spectra from one frame to the next. For sine tones which are not set to vary in frequency or amplitude, there is no spectral flux that can be detected. For noise, there is always at least minimal spectral flux due to the inherently chaotic nature of such sounds. For pitched sounds, the onset and release of the note are the two times when spectral flux is highest while the middle of the note features relatively low flux. This is perceptually relevant since it is also the beginning and end of the notes that are meaningful for understanding timing and duration (hence rhythm) in addition to the fact that these two times are when the timbre of the note is most audibly shaped by an attack

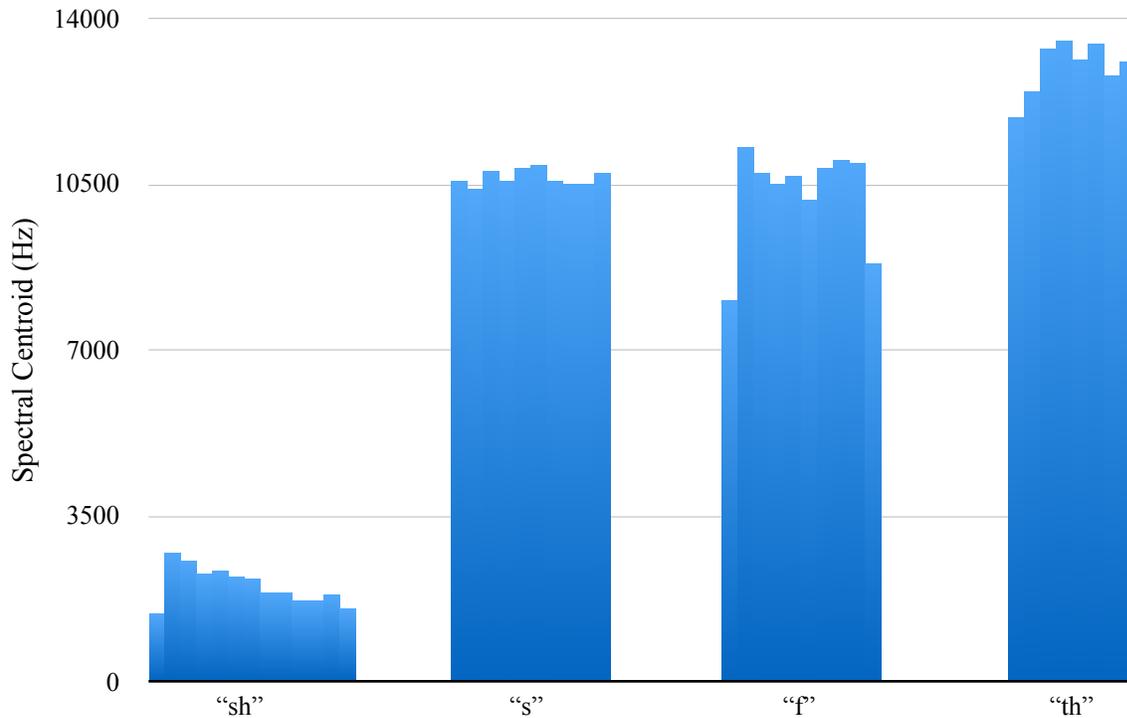


Figure 11. Spectral Centroid of Various English Consonants. Audio sampled from the voice of the author.

or decay. But regardless of the sound, spectral flux is a remarkably useful tool for understanding any and all evolutions in a given example. This could be the slow change from a single-pitched sound to a more complex multiphonic (Riera, Proscia, & Eguia, 2014) or the shift in which area of the frequency band is most emphasized by a noisy sound.

Timbral Features Reflected by PDA Output

PDA's are by no means designed for the analysis of these various timbral differences. Nevertheless, they are still affected by them in numerous ways. On one level these are simply factors that interfere with the PDA's intended task of estimating pitch. On another, these aberrations illustrate the fact that the PDA is affected by such timbral variations. For an engineer's mind, these sources of error are the enemy and must be rooted out or otherwise planned for. But for those seeking to endow a machine with the capacities of creativity that human beings readily exhibit, they offer a path to reproducing the idiosyncratic ways of listening that many improvisers wish to engage with.

As suggested by the previous discussion of pitch itself,⁸ PDAs estimate the maximum likelihood of pitch for a given sound by computing the fundamental frequency. For example, in the case of the widely used [fiddle~] object (Puckette, Apel, & Zicarelli, 1998) designed for the Max/MSP programming environment, pitch is estimated by calculating the fundamental frequency. This is done by first extracting the most audible frequency-amplitude pairs from the entire spectrum. These pairs are then assumed to represent the partials of a pitch. Based on the ratios between these extracted partials, a fundamental frequency of “maximum likelihood” is then estimated. As Miller Puckette notes, the algorithm is built to estimate a maximum likelihood “even when no pitch is present” (ibid., p. 2). In other words, the PDA does not determine whether what it detects is a pitch or not; it simply assumes that every sound in the world is a pitch.⁹

Given this general strategy for estimating pitch encoded into PDAs, there are numerous ways that they register differences in timbre. While these effects are most pronounced for noisy, inharmonic, or time-varying sounds, they are not entirely trivial for pitched or harmonic sounds. Overall, the timbral characteristics of a pitched sound (aside from the fact that it is a pitch and not a noise or inharmonic sound) affect the output of a PDA at the beginning and end of the note, though modulations of timbre within the note can also have an effect as well. As outlined previously, the shift of the spectral centroid of a sound reflects any shift in how and where energy is distributed across the frequency band. Not all changes in the spectral centroid will be registered by a PDA and prompt a change in its output value, this being especially true for tones that are clearly pitched. But while the natural tendency of a performer to change the tone color of a single held pitch for expressive purposes does not always lead to a change in the PDA’s reported value, in many cases it does. For example, there are numerous ways that a musician may manipulate their sound, whether in an improvised or composed context, that will cause both the spectral centroid and the PDA’s estimate to shift. Such techniques may include a string player bowing closer or farther from the bridge of their instrument, a wind or brass player modulating their embouchure over time, or any other kind of expressive timbral manipulation of an acoustic melodic instrument’s sound.

Aside from timbral modulations within a given note, the onset and release of a note also cause changes in spectral characteristics in terms of the tone to noise ratio as well as inharmonicity. For most melodic acoustic instrumental sounds, the attack creates a very short burst of noise at the head of the note which quickly subsides as the more toneful portion of the sound is then produced. As discussed previously, noise often causes PDAs to return similarly chaotic values. Though the noise that is produced at the beginning or end of a note is not the same as the full band white noise (see Figure 12), these brief moments of noisy sound do cause error in many PDAs. To compensate for this basic problem, many PDAs also work in tandem with other algorithms, such as the Max/MSP [bonk~] object (Puckette et al., 1998), which detect

⁸ This discussion of PDAs refers mainly to PDAs used in a live performance context. In offline contexts for the analysis of speech or music, greater computational resources are typically available for more accurate results through more sophisticated methods than what is presented here.

⁹ However, by no means does this mean that the designers of this or other frequently used PDAs (Jehan & Schoner, 2001) make the same assumption.

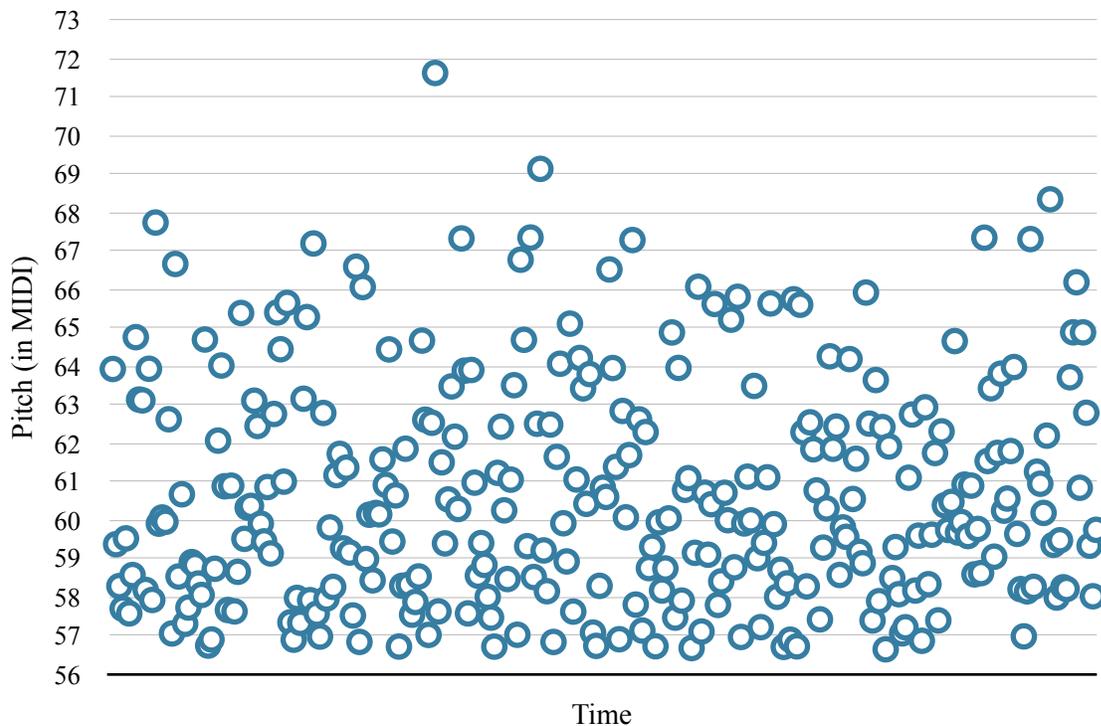


Figure 12. Output of a PDA with White Noise Across a 22,000Hz Spectrum.

note onsets. For certain musical contexts, this feature can be used to create a temporal filter for the PDA's input, with the short burst of noise being tuned out for a moment before the PDA determines pitch once the sound becomes more toneful. However, this has natural limitations given that the temporal characteristics of attacks or offsets may vary, this being especially true for improvisational contexts.

But far beyond these common elements of how many musicians tend to produce pitched sounds on their instruments, the output of the PDA is significantly affected by nearly any use of inharmonic or noisy sounds, particularly when these sounds vary over time. Returning to the tone to noise ratio outlined above, there is a strong likelihood that nearly any PDA would report that a sound sample that changes from a cluster of periodic tones to a band of noise and back again is just a steady stream of changing pitches. More importantly, given their chaotic nature, aperiodic sounds, even when they are produced with the computationally-ensured consistency of digitally-produced white noise, cause a PDA to constantly report a flurry of pitches. For example, Figure 12 illustrates the analytical output of Tristan Jehan's [pitch~] object, a commonly used PDA for the Max/MSP programming environment, when full band (i.e., 22,000Hz) of white noise is used as input. Though the range of a PDA's output for noise source which does not vary with time is limited to roughly an octave, this is a significant amount of variation and constitutes one means by which the PDA registers phenomena other than pitch.

With regard to the continuum between harmonicity and inharmonicity, the PDA will, just as it is designed, report a single pitch value for a harmonic sound held for a period of time. For an inharmonic cluster of tones, however, the PDA will report a fluctuating set of estimated values depending upon the degree of inharmonicity or auditory roughness of the tones (Vassilakis,

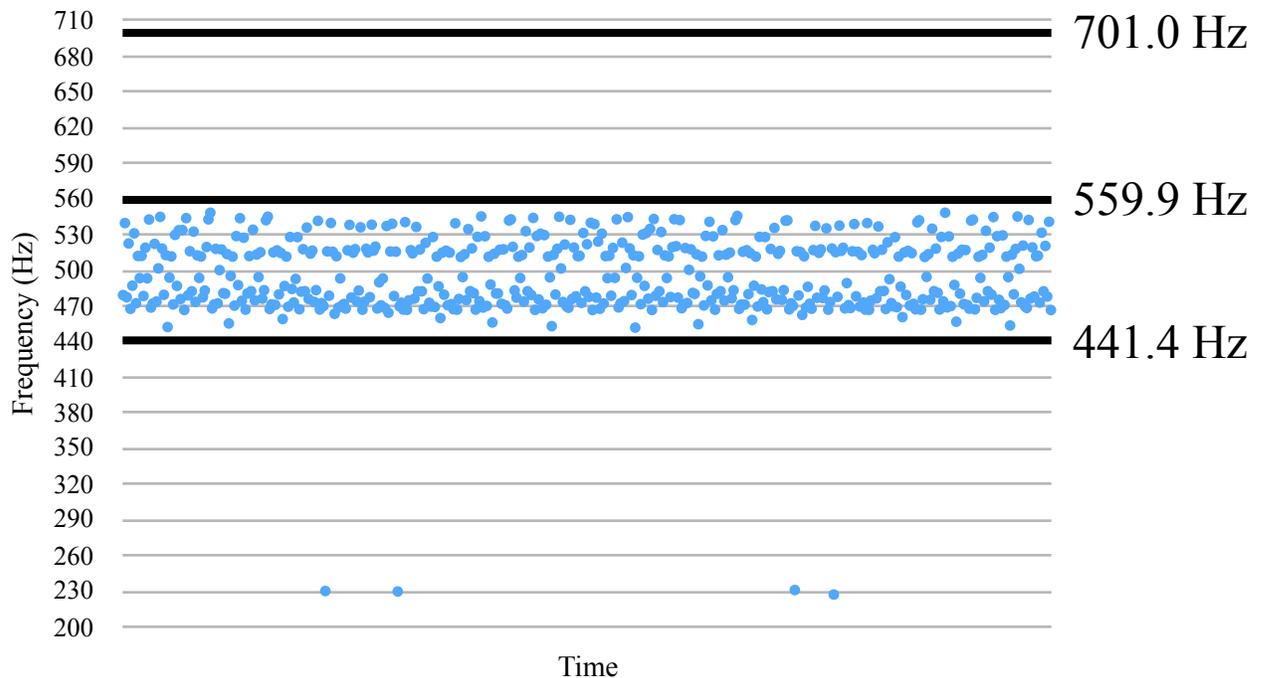
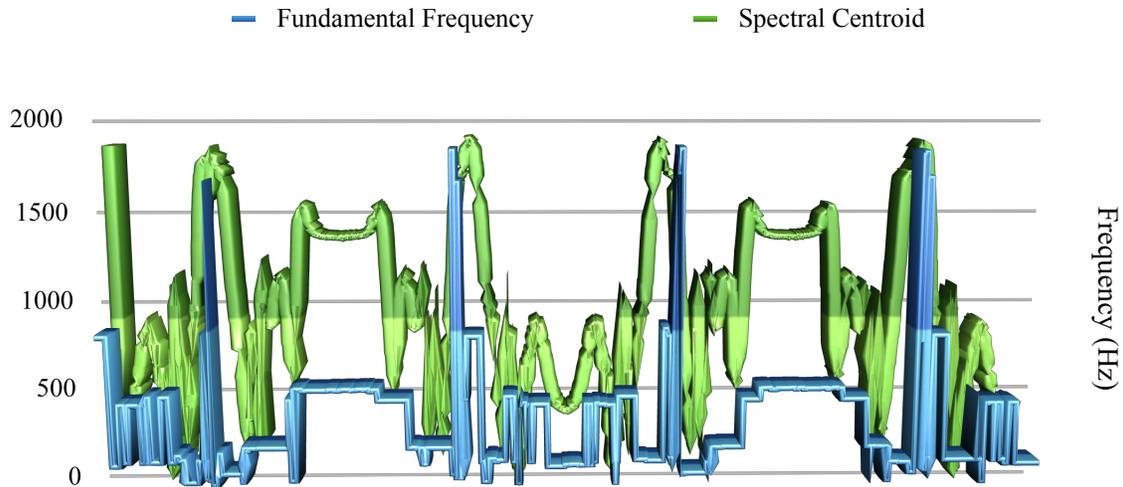


Figure 13. PDA Output for an Inharmonic Combination of Three Sine Tones.

2001). Even if neither amplitude nor frequency vary over time for an inharmonic combination of tones, PDAs often report fluctuating estimates of “pitch.” For example, Figure 13 shows the output of [pitch~] for a combination of three sine tones with no harmonic relationship between one another played at equal volume into the PDA. Despite the fact that the spectral energy distribution of this combination of tones does not vary over time, the PDA reports a similar flurry of tones. Compared to the PDA’s interpretation of a white noise signal, the range of values reported is much smaller. Specifically, for this particular inharmonic sound, the PDA reports a range of just four “semitones” compared to more than “octave” for noise input). Nevertheless, given that a PDA is built to produce just *one* value for a given sound, particularly a sound which a human ear would identify as a static sound which does not vary over time, this range is both meaningful and surprising.¹⁰

Naturally, for time-varying spectra, the PDA reports any and all changes in the distribution of spectral energy as changes in “pitch” unless by coincidence the spectra that change lead the PDA to estimate the same or a similar value for the fundamental frequency. This is true for both inharmonic and noisy sounds. Again, both such sounds have either an indefinite or a simple lack of pitch when pitch is understood as a sound featuring partials whose frequency differential is equal. Despite the fact that inharmonic and noisy sounds lack this basic defining

¹⁰ As mentioned above, the time varying characteristics of a sound can be analyzed through spectral flux. Though the example given in Figure 13 results in zero spectral flux, and hence reflects the fact that the spectrum of this sound does not change over time, other inharmonic combinations of tones can produce non-zero values for spectral flux. This occurs mainly when the combination of tones produces the audible “beating” effect mentioned earlier. Because of beating, the perceptible amplitude of the overall sound varies with time, this change also being correlated with spectral flux as an index of spectral change.



“Pitch” Values and Spectral Centroid
for Time-Varying Inharmonic Sound



Spectrogram of Time-Varying Inharmonic Sound

Figure 14. “Fundamental Frequency,” Spectral Centroid, and Spectrogram for a Time-Varying Inharmonic Sound. Produced in Max/MSP using the [sinusoids~] object created at CNMAT, this sound sample features a bank of 25 sinusoids at random but consistent frequencies under 2000 Hz with amplitudes varying cyclically in time.

feature of pitch, PDAs commonly used for real-time feature extraction such as [fiddle~], [pitch~], or even the slightly more refined [zsa.fund] (Malt & Jourdan, 2008) report changes in the spectral energy distribution of such sounds as if they were just changes in “pitch.”

For example, Figure 14 shows the output of [pitch~] and [zsa.centroid~], a spectral centroid tool for Max/MSP (Malt & Jourdan, 2008), for a cluster of sine tones which are not

harmonically related. Unlike the illustration in Figure 13, the tones analyzed in Figure 14 each have amplitudes that vary cyclically in time (see the lower image of Figure 14 for a spectrogram representation of this change in the amplitude of each tone). For [pitch~], however, the changes in this amplitude distribution across these tones is reflected as changes in “pitch,” or really, the reported estimate of pitch for a given moment in this evolving sound. However, as is shown in the upper image of Figure 14, there are moments when the change in the relative amplitude of these individual frequency components is not actually registered by the PDA as a change in pitch. Instead, these moments are interpreted by the PDA as a static pitch.

For time-varying noise sounds, the manner in which the temporal evolution of such sounds is reflected by the PDA is more striking. Whereas for inharmonic sounds there remains the possibility that a pitch may still be heard psychoacoustically or captured by a PDA for a length of time (see Figures 13 and 14), noisy sounds tend to cause a PDA to yield a constantly shifting range of values, with few values remaining constant for longer than a fleeting moment. This is especially true for noisy sounds with a wide spectral spread (Peeters et al. 2011), or the range of frequencies across the audible band for which a statistically significant (i.e., likely audible) amount of acoustic energy is detected. This is generally less likely for sounds with a narrower spectral spread.

For example, Figure 15 shows the output of [pitch~] for various levels of spectral spread for white noise. Specifically, spectral spread for each noise input varies from wide to narrow and was controlled through the use of a Q filter (see Harlow, 2004; Tooley, 2014) which controls the width of the band of noise with $Q=1$ being the widest band of noise and $Q=100$ being the narrowest. For each Q , the central frequency of the noise signal was set to vary sinusoidally at a rate of .25Hz between 100 and 16,100Hz. This condition was chosen in order to illustrate the relationship between the spectral centroid of a noise signal and pitch output.

Similar to the output of a PDA for noise input shown in Figure 12, at $Q=1$ the output of the PDA fluctuates chaotically between a relatively small range of “pitch” values (16 “semitones” or roughly an octave and a third). As can be seen in the progression from lower to higher Q values, the narrower the spectral spread, the more the PDA output reflects the general height of the center of the noise band. Whereas the PDA output hardly seems affected by the dramatic change in the center of the noise band for $Q=1$, the relationship between the contour of the PDA output and the central frequency of the noise input becomes more obvious with greater levels Q or smaller spectral spread. For $Q=100$, this is quite apparent and almost suggests that the PDA is capable of registering the relative height (in frequency) of a narrow noise band.

All of the illustrations presented here (with the exception of Figure 11) were created using synthetic sounds in a digital audio environment. That means that sound output was generated using digital synthesis tools and then directly fed into digital analysis tools without being produced in a real physical environment. Consequently, none of the normal noise and distortion due to relative frequency resonance and damping of a real physical space or a physical microphone or loudspeaker were in effect. Likewise, the sound sources used are of a very different character than real physical sounds. Sine tones are an idealized representation and lack a basic level of noisiness that can be readily observed in instruments which normally have an extremely high level of clarity and absence of noise in their spectra. Similarly, white noise as well is an idealized representation of real, physical instruments which have noisy characteristics.

Specifically, it is likely physically impossible for noisy instruments, such as almost any kind of percussion, to produce the kind of full spectrum white noise used in the illustrations above (see Figure 12). In the physical world, most noisy sounds are similar to the filtered noises represented in Figure 15.

Still, even in this completely sterile environment, PDAs can be shown to reflect changes in timbre, and not merely changes in pitch as they were designed to. Notably, though the changes in timbre reflected by a PDA are related to spectral centroid, flux, and spread, the way the PDA responds to such changes is distinct from what these indicators actually report in response to the same sounds. This not only means that a PDA reflects changes in timbre, but that it additionally provides a kind of data that is unique in the kind of interpretation of sound it offers when compared to these other kinds of real-time metrics. Thus, even though the examples given above

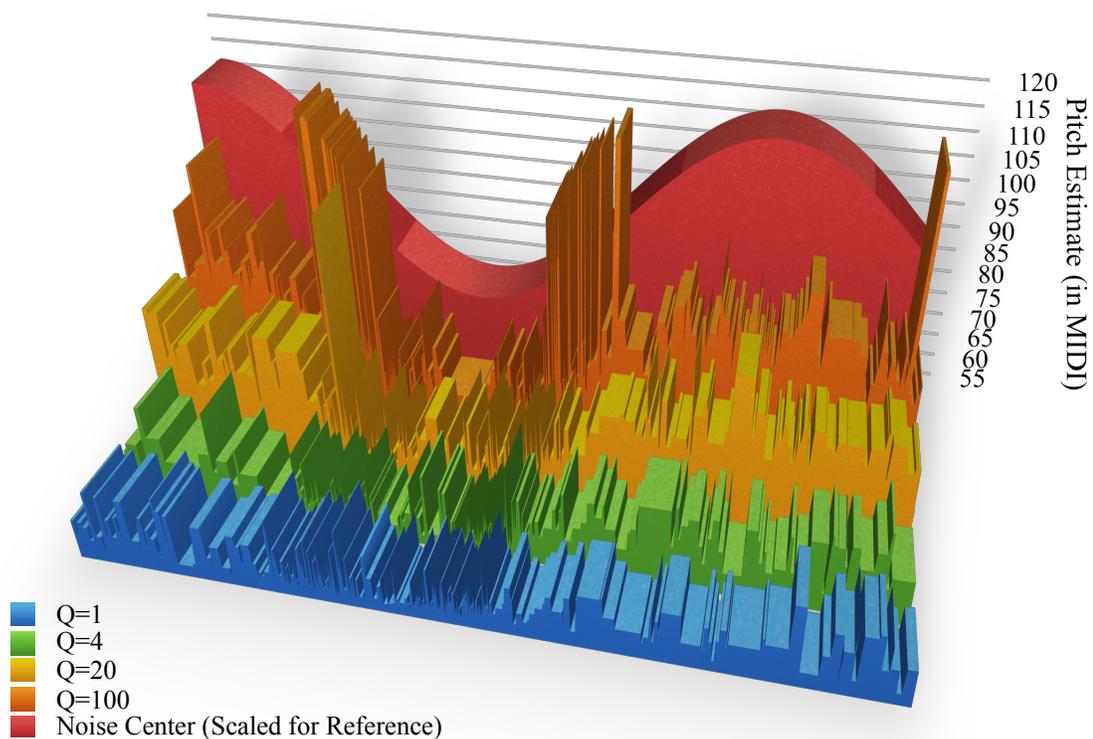


Figure 15. Pitch Estimates of Noise with Varying Q-filtering and Central Frequency. PDA output for noise output with various values of Q-filtering with the central value of the band of noise varying sinusoidally across the audible at .25Hz from a center of 100 to 16,100Hz. Red volume shows noise center variation over time but is scaled from original values and included as a visual reference.

are drawn from the virtual world of digital synthesis and analysis, it is likely that timbral variation in the physical world of free improvisers has the same effects on how a PDA interprets and numerically represents these sounds.

Though several designers of these improvising systems assume that the strange representation of events provided by the PDA is useless and therefore move on from this form of feature extraction in favor of more timbrally-focused features, they overlook the PDA's potential for providing the foundation for what is likely a desirable attribute in a free improviser. Namely, they provide a computationally lightweight pathway to what Michael Young calls "opacity" or "unimagined music" (Young, 2008). As shown in the examples above, the PDA provides a representation of sonic events that is nonsensical or irrelevant, especially for sounds which lack a definite pitch. On one level, PDAs are inaccurate representations of such sounds. On another level, however, what the PDA provides is a means of simulating the idiosyncratic and unpredictable ways of interpreting and responding to improvisatory suggestions that many improvisers value. As much as improvisers may value a partner who is a keen listener and can react to precise details of sound, they also want a player who demonstrates a sense of creativity. While the PDA can certainly be said to offer a distorted picture of timbral states as they occur in real time, George Lewis wittily acknowledges this hidden artistry in the PDA's interpretation of sonic events by characterizing it as "a device known to exercise its own creative options from time to time" (Lewis, 1999, p. 103).