

Toward an Anthropology of Computer-Mediated, Algorithmic Forms of Sociality

by Eitan Wilf

This article argues that contemporary, computer-mediated, algorithmic forms of sociality problematize a long and major tradition in cultural anthropology, which has appropriated the notion of artistic style to theorize culture as a relatively distinct, coherent, and durable configuration of behavioral dispositions. The article's ethnographic site is a lab in a major institute of technology in the United States, in which computer scientists develop computerized algorithms that are able to simulate the improvisation styles of past jazz masters and mix them with one another to create new styles of improvisation. The article argues that the technology that allows the scientists to simulate and mix styles is playing an increasingly important role in mediating contemporary forms of sociality over the Internet and that the anthropological tradition that has theorized culture as artistic style has to be reconfigured to account for the dynamic nature of these contemporary forms of sociality not as styles but as styles of styling styles.

“How Much ‘Miles’ Will You Have in Your Cocktail?”

It was a warm, late August day, but inside the lab in a major institute of technology in the United States, powerful air conditioners maintained a cool atmosphere. I was still fiddling with the video camera when James,¹ one of the lab directors, entered the room. He nodded to me quickly and then sat down in front of the electric keyboard. Syrus, a humanoid robot, was already situated behind the marimba, ready to play, its four arms—each equipped with two mallets—placed in different positions along the marimba. David, a member of the research team, sat behind two computer monitors and waited for James's instructions. James turned to David and said: “OK, let's do ‘Yardbird Suite.’ Syrus is going to play the head, right?”² David looked at James from behind the monitors and said: “Yes. And at the end of the head you want Syrus to trade fours with you?”³ James, playing some quick phrases on the keyboard, said: “Yes, then trade fours. Does Syrus have a certain amount of Monk, Coltrane, and—I think Syrus has Monk, Coltrane, and You as third, third, third, right?”⁴ “Yes,” David answered, looking at one of the monitors. “But this looks like—because for this project it has a ‘You Slider,’ a ‘Charlie Parker Slider,’ and a—” “Parker, not Coltrane?” James interrupted him with surprise. He looked at Syrus for a few seconds and then said with a smile: “OK.

Let it be a third Parker—there can be nothing wrong with having Parker in our mix, right?” Observing this conversation, I agreed wholeheartedly, as did the three students who sat next to me and who, like me, seemed to be curious to know what a robot improvising in a statistical mix of the styles of Miles Davis, Charlie Parker, John Coltrane, and the player who happens to play with Syrus on the electric keyboard sounds like. Just before Syrus and James began playing, the student sitting next to me turned to his two friends and asked with laughter, simulating a British accent: “How much ‘Miles’ will you have in your cocktail, sir?”

Syrus is a humanoid robot marimba player, which, thanks to computerized algorithms, can be trained to imitate the styles of different past jazz masters.⁵ As part of its training, computerized algorithms perform statistical analysis on databases that consist of files of different masters' solos. In actual playing sessions, these algorithms instruct Syrus what to play based on this analysis (Wilf 2013a, 2013b). During this specific session in the lab, Syrus was programmed to improvise in a style that is “a mix” of 33.3% the style of Miles Davis, 33.3% the style of Charlie Parker, and 33.3% the style of the player improvising with Syrus on the electric keyboard—in this case, James—whose style Syrus can learn in real time because the

1. All names and locations have been changed to maintain anonymity of research subjects.

2. “Yardbird Suite” is a jazz tune written by saxophonist Charlie Parker. The “head” of a jazz tune is its melody. Typically, improvisations on a tune begin after playing the head.

3. “Trading fours” is a practice in which different players improvise on a tune a few measures each, one after the other, and in response to one another.

4. Monk is pianist Thelonious Monk (1917–1982); Coltrane is saxophonist John Coltrane (1926–1967).

5. Specifically, the style imitation focuses on pitch and rhythm values.

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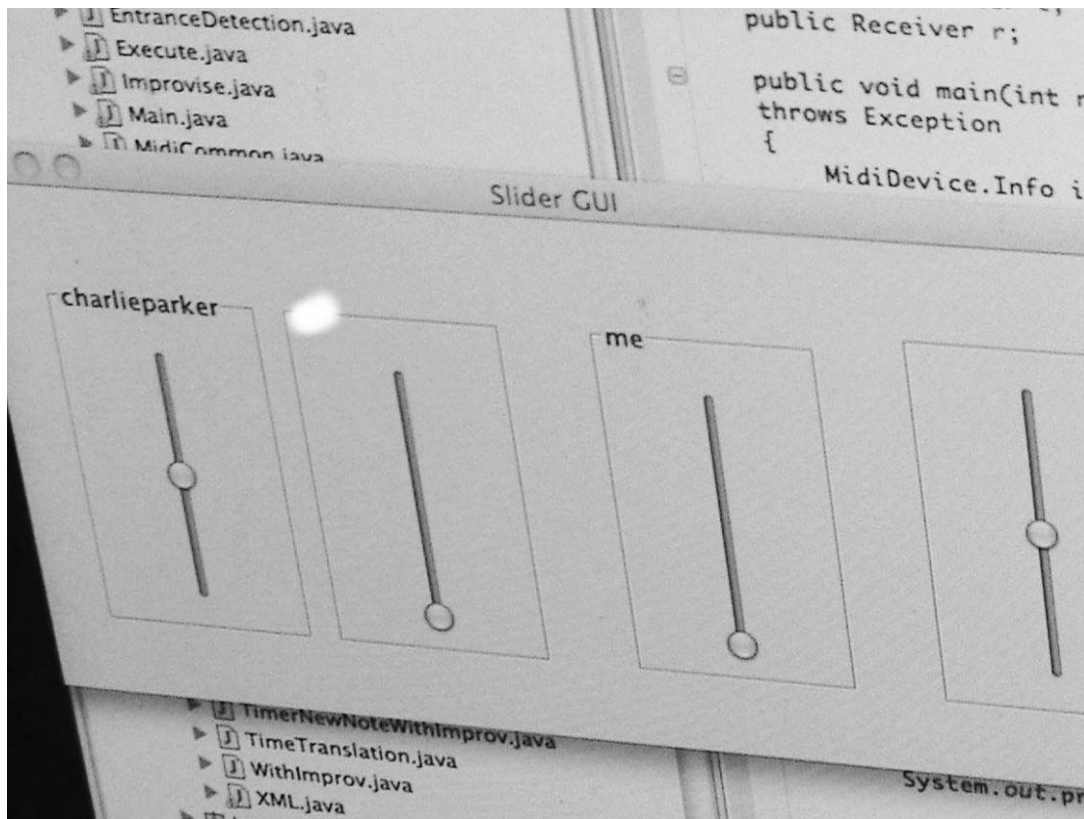


Figure 1. Sliders for controlling proportions of different styles. A color version of this photo appears in the online edition of *Current Anthropology*.

electric keyboard is connected via a digital interface to the computer that controls Syrus. As David's comments make it clear, it is possible to change the proportions of these different styles in Syrus's playing via sliders on the software interface ("a You Slider, a Charlie Parker Slider"; see fig. 1). Thus, if one wants "more Miles Davis" in Syrus's improvisation, one can manipulate the slider and achieve, for example, a mix of 70% the style of Miles Davis, 20% the style of Charlie Parker, and 10% the style of the keyboard player improvising with Syrus. As I will argue, the fantasies that motivate the research in the lab in which I conducted fieldwork concern the prospect of mixing the already too familiar styles of specific musicians with one another and thus creating new styles that will reinspire listeners and players.⁶

6. My ethnographic fieldwork in this lab was part of a broader, multisited research project on computer-mediated, algorithmic forms of creative agency and sociality, which began in March 2011. I conducted preliminary fieldwork in this specific lab in early May 2011, and then full-time fieldwork from August through October 2011. During my fieldwork in the lab, I was given a workstation next to the workstations of the other team members. The fact that I am a semiprofessional jazz musician has eased my access into the lab. It has also allowed me to conduct and video-record long playing sessions with Syrus, in which I improvised with it on an electric keyboard in a call-and-response fashion, and thus to gain a deeper understanding of its different capabilities and of the overall research project.

Far from being limited to pockets of research in music technology, parts of the technology that animates Syrus—in particular, the computerized algorithms that simulate and mix styles—have been a key mediator of sociality in late Western modernity for quite some time, especially over the Internet. Along with other computerized algorithms, they have enabled search engines such as Google and social media companies such as Facebook to statistically predict online users' individual preferences, tastes, and distastes—in short, their individual styles of various kinds—based on their online behavior, and then provide and produce online content that mirrors and anticipates these styles. This enables companies to produce more effective advertising strategies that bring to users' attention products they are more likely to buy (Cheney-Lippold 2011; Seaver 2012). Computerized algorithms in consumer-centered production derive their profitability from their ability to tap into each consumer's distinct patterns or styles of consumer behavior, especially when this behavior takes place online, because the online platform enables companies to easily create large databases of consumers' patterns of online behavior. In both contexts—that of the jazz styles Syrus learns and that of online advertisement strategies—computerized algorithms identify behavior as a statistical pattern that they can then anticipate and reproduce to achieve

specific aesthetic effects and generate significant financial profits.

The prospect of mixing styles has recently begun to play a key role in this broader sphere of computer-mediated, algorithmic forms of sociality too and for similar reasons. A growing number of critics have argued that as a result of how media companies use computerized algorithms, individuals no longer receive the same online content as one another, but rather content that is customized to mirror each consumer's style, and that this situation results in stifling self-referentiality, narcissism, atomism, and the fragmentation of the public sphere (Pariser 2011:112–113, 160). Their discontent, then, much like the discontent of the scientists I worked with, is about styles that have become ossified. As a solution, these critics have called for realizing these algorithms' liberating potential to disrupt, challenge, and reconfigure individuals' habituated styles. If computerized algorithms can simulate each person's style, then, in principle, they can also provide each person with content that will not be aligned with this style and thus enable individuals to change their personal styles if they wish to do so by "mixing" it with, that is, exposing themselves to, styles different from their own. This would require "crafting an algorithm that prioritizes 'falsifiability,' that is, an algorithm that aims to disprove its idea of who you are" (Pariser 2011:233). Indeed, some of the suggestions for such falsifiability uncannily resemble the "cock-tailing of styles" I witnessed in the lab: "Google or Facebook could place a slider bar running from 'only stuff I like' to 'stuff other people like that I'll probably hate' at the top of search results and the News Feed, allowing users to set their own balance between tight personalization and a more diverse information flow" (Pariser 2011:235).

How might we conceptualize this contemporary historical moment of facile "simulation and mixing of styles" with sliders on a software interface that control for proportions—technological developments that often concern individuals' most ingrained patterns of behavior? What might be the implications of the increased ubiquity of computerized algorithms with respect to the notion of identity and the very possibility of sociality? Most importantly, what might the implications of this presumed liquidity of styles be for long-held anthropological theories of culture?

In this article, I contribute to the growing anthropological literature that has been concerned with theorizing the role played by computerized algorithms in various ethnographic sites (Downey 1998; Helmreich 1998; Kockelman 2011; Suchman 2007; Zaloom 2006). I discuss the role played by computerized algorithms in the simulation and mixing of styles as a way to engage with, problematize, and reconfigure a long and major tradition in cultural anthropology, which has appropriated the notion of artistic style as part of its theorization of the notion of culture. This tradition has conceptualized culture as a relatively coherent and durable set or configuration of dispositions, acquired through prolonged periods of socialization by individuals who are forced, as it were, to enact

these dispositions in a quasi-automatic and consistent manner in different situations, whether because these dispositions are anchored in the unconscious, in the body, or in all-encompassing symbols (Bateson 1967; Benedict 2005 [1934]; Boas 1955 [1927]; Bourdieu 1977; Geertz 1973; Gell 1998; Kroeber 1957; Sapir 1985*a*). The notion of artistic style has provided this tradition with a model for a number of core ideas about culture, such as the totality of cultural integration, the perdurability of culture, and culture as habituated and deeply ingrained behavior over which individuals have little control and over which they are mostly unaware but which can be accounted for by the more cultivated and trained anthropologist. I will argue that this tradition was informed by a Romantic heritage of modeling the notion of culture on the presumed purity of Western high art. Unpacking this heritage is one of this essay's goals.⁷

Another goal is to problematize this tradition in light of the technological developments that are the focus of research in the lab in which I conducted fieldwork. I argue that this theoretical tradition is only partially useful for theorizing the contemporary historical moment of facile simulation and mixing of styles with computerized algorithms because it limits each individual to enacting only one style or to shifting between fixed styles and because it anchors styles in a stratum over which individuals have little control. Consequently, this tradition cannot account for the contemporary historical moment in which style, as a pattern of behavior, can be statistically anticipated, reconfigured, and mixed with other styles with relative ease by means of available technologies and in which individuals can have increased control over such technologies and hence over their own styles.

In problematizing the anthropological tradition of theorizing culture as artistic style, my purpose is not to "write against culture" (Abu-Lughod 1991). To begin, my analysis focuses on only one—albeit key (as is apparent from the anthropologists I am concerned with)—tradition of theorizing culture in anthropology that has appropriated the notion of style for this purpose. By focusing on anthropologists who have theorized culture in the model of style in music and art—a choice justified by the nature of the ethnographic data I am concerned with—I am leaving out other key anthropological traditions that have appropriated the notion of style to theorize culture. For example, I will not be concerned with the tradition that has looked at culture-as-language, which has offered sophisticated accounts of the multiple functionality of culture in addition to its poetic function or text-internal coherence (key figures in this tradition include, e.g.,

7. Thus, this article offers an account of the culture concept in anthropology that is meant to complement rather than replace other accounts of similar dimensions of this concept, such as Charles Briggs's, who attributes the "problematic aspects of anthropological conceptions of culture" to "the particular imaginings of language and linguistics used in articulating them" in Boasian anthropology (Briggs 2002:482).

Roman Jakobson [1960], Edward Sapir [1985*b*], and Michael Silverstein [1995]).⁸

Furthermore, against the backdrop of specific technological developments, my purpose is to critically engage with, rather than to completely invalidate, the anthropological tradition that has appropriated artistic style in its theorization of culture and to figure out how this tradition might be reconfigured to make sense of these developments. I suggest that the fact that some of the founding figures in cultural anthropology conceptualized culture as style and focused on the restraints that underlie it means that their theory of culture can be tweaked and made useful for elucidating the contemporary historical moment of increased mediation of sociality by computerized algorithms that routinely analyze people's styles of behavior as statistical probabilities and then allow individuals to anticipate and reconfigure these styles. My argument is that this historical moment should not be analyzed in terms of one or a number of fixed styles, but rather through the prism of *styles of styling styles*. In other words, the age of computer-mediated, algorithmic forms of sociality might be better analyzed through the restraints that govern the practices of styling styles with the aid of these algorithms and similar technologies. While artistic style has been a model for the integration, distinctiveness, and perdurability of culture in anthropological theory, shifting the analytical lens to computer-mediated, algorithmic forms of producing and mixing styles reveals both the radically dynamic and agentic nature of contemporary forms of sociality, as well as the restraints that govern this dynamism. These restraints emanate both from the nature of technology or means, that is, what can and cannot be done with available technologies, and from normative ideals that stipulate ends, that is, what should be done with these available technologies. This article, then, is both a critique and a reconfiguration of a specific anthropological tradition of theorizing culture, aiming to make it analytically relevant to an increasingly prevalent form of sociality in the present historical moment.

Cultural Anthropology and the Notion of Culture as Artistic Style

During the twentieth century, a number of key anthropologists appropriated the notion of artistic style to theorize culture. When their theories are examined in detail, a number of shared foci become visible. First, style is used as a model of cultural integration and coherence. Second, one of the key manifestations of this integration is individuals' consistent behavior in different situations. Third, the restraints that are responsible for making culture a consistent style and pattern of behavior are anchored in strata that individuals cannot easily access and over which they have little control, such as the body, the unconscious, and overarching symbols—a fact

8. But see note 20. Sapir, to be sure, is someone who played a key role in both traditions, as I will argue later.

that ensures the perdurability and integration of culture. Finally, cultures are defined by one or a few distinct styles.

For example, Franz Boas (1955 [1927]) analyzed style in primitive art as part of his contribution to a theory of cultural integration, which became one of the core theoretical foci of Boasian anthropology (Stocking 1989:7–8). In his book *Primitive Art*, Boas argued that “without stability of form of objects, manufactured or in common use, there is no style; and stability of form depends upon the development of a high technique” (1955 [1927]:11), defined as the “automatic regularity of movement” (20). Thus Boas explained style in primitive art as the result of embodied habituation, among other factors, which sinks below the level of consciousness, in the same way that he explained other forms of cultural integration in terms of unconscious categories (Stocking 1989:7). It is important to note that Boas's emphasis on embodied habituation as the basis of style was not limited to artists' “technical virtuosity” (Boas 1955 [1927]:17). In a chapter specifically dedicated to style, Boas discussed the embodied styles shared by members of a culture as another explanation for the perdurability of style in primitive art. Taking the throwing sticks of the Eskimos as his example, he argued that “even if a variation of form should appeal to the eye, it will not be adopted if it should require a new adjustment of the hands” (146). Thus, deeply ingrained embodied habits become a key mechanism, which provides the restraints that account for pattern or style and which ensures the perdurability of style as a form of cultural integration.

A number of Boas's immediate students modeled their theories of cultural integration on the notion of artistic style. Alfred Kroeber, perhaps more so than any other anthropologist, used the notion of artistic style to model cultural integration, or “the degree of coherence and congruity existing between the many parts, organs, pieces, or items of which every culture consists,” in a book significantly titled *Style and Civilizations* (Kroeber 1957:85). Edward Sapir, too, wrote about “the grooves of the cultural mold” and its inescapable power over the individual (Sapir 1985*a*:313), adding that “the highest manifestations of culture, the very quintessence of the genius of a civilization, necessarily rest in art” (327), where culture is reflected as a “unified and consistent attitude toward life” (315). I will elaborate on Kroeber and Sapir in greater detail below because their work reveals the intellectual heritage of this emphasis much more so than the work of other anthropologists.

Another of Boas's students, Ruth Benedict, suggested that cultural integration is the result of the same process that is responsible for the integration of “style in art” (Benedict 2005 [1934]:47) or “the great art-styles” (48). In her book, whose title *Patterns of Culture* epitomizes the notion of culture as style, Benedict famously argued that without a mechanism of selection from the vast number of equally probable possibilities of patterning or styling cultures, culture would be meaningless—indeed, there would be no culture at all. Similarly to Boas, she located the selection mechanism responsible for

cultural integration outside of individuals' conscious subjectivity. She argued that the restraints or mechanisms of selection can be explained in terms of the culturally unconscious: "A culture, like an individual, is a more or less consistent pattern of thought and action" (46) "in accordance with unconscious canons of choice that develop within the culture" (48).

These concerns also found expression in the work of anthropologists indirectly associated with the Boasian school. For example, Gregory Bateson, writing about style in primitive art, argued that an art object is "both itself internally patterned and itself a part of a larger patterned universe—the culture or some part of it" (1967:132). Bateson drew a clear analogy between the patterned art object—its style—and the patterned culture, conceptualized as style. In addition to the early influence that Benedict's book *Patterns of Culture* exerted on him, he did so as part of his appropriation of cybernetics and the mathematical theory of information, which provided him with the analytical tools needed to view culture and all its instantiations as forms of information and patterns.⁹ Like Boas, he anchored the selection mechanism that accounts for style in the artist's embodied habits: "The skill and the patterning . . . depend upon muscular rote and muscular accuracy" (Bateson 1967:148). Similarly, in a chapter on style in primitive art, Alfred Gell argued that "style is to artworks what group-identification is to social agents" (1998:163) in that the nature of the relations between different artworks in a specific style is structured by the key values and norms of the culture to which that style belongs (I elaborate on Gell's ideas about style and innovation in greater detail below).

The notion of culture as style found expression in the work of two of the most recently influential anthropologists, Clifford Geertz and Pierre Bourdieu. Although they are typically understood to have had very different ideas about what culture is—Bourdieu emphasizing the body as the infrastructure of culture and its reproduction and Geertz highlighting symbols as the stuff culture is made of—these real differences masked significant similarities with respect to the role played by the notion of style in their theories of culture. At one point in *Outline of a Theory of Practice*, Bourdieu discussed the notion of habitus thusly:

"Personal" style, the particular stamp marking all the products of the same habitus, whether practices or works, is never more than a deviation in relation to *the style of a period or class* so that it relates back to the common style not only by its conformity . . . but also by the difference which makes the whole "manner." The principle of these individual differences lies in the fact that . . . the habitus . . . brings about a unique *integration*, dominated by the earliest experiences, of the experiences *statistically common* to the members of the same class. (Bourdieu 1977:86–87; emphasis added)

9. According to Margaret Mead, Bateson read and was influenced by Ruth Benedict's *Patterns of Culture* already in 1933, i.e., when it was circulated only in a draft form. See Stocking (1988:3).

On the other side of the fence, as it were, stands Clifford Geertz, who, at one point in *The Interpretation of Cultures*, argued that "sacred symbols function to synthesize a people's ethos" (1973:89), creating what at another point in the book he characterized as "a unity of style" (145). As for the actual behavior of the individuals who share a culture, Geertz had this to say:

[Religious symbols] both express the world's climate and shape it. They shape it by inducing in the worshipper a certain *distinctive set of dispositions* (tendencies, capacities, propensities, skills, habits, liabilities, pronenesses) which lend a *chronic character* to the flow of his activity and the quality of his experience. A disposition describes not an activity or an occurrence but a *probability* of an activity being performed or an occurrence occurring in certain circumstances. (Geertz 1973:95; emphasis added)

Note how, like the previous anthropologists I have discussed, Bourdieu and Geertz appropriate the notion of style to talk about cultural integration. This allows them to theorize culture as a perdurable form of integration over which individuals have little control and which manifests in individuals' propensity or a disposition to act in a consistent manner in different situations. Here, too, there is a sense of the inevitability and distinctiveness of style. It finds expression in Geertz's notion of the "chronic character" of individuals' behavior as a result of cultural integration and even more so in Bourdieu's portrayal of the habitus as embodied style/culture—a quasi inescapable matrix of personhood even when, or especially when, one tries to subvert it.

In arguing that "fixity of style" is a prominent feature in all of these theories, I am not suggesting that they neglected to consider innovation. Rather, they conceptualized innovation as the product of the exploration of the space of possibilities within the constraints of a specific style. Gell and Bourdieu are particularly instructive in this regard and useful for highlighting the challenges posed by the ethnographic data I present below. In his attempt to provide "'generative' . . . style descriptions for 'ethnological' art," Gell (1998:158) argued that stylistic coherence is the result of a limited number of "rules of transformation" that stipulate the ways in which motifs can be combined with and transformed into one another (in the case of Marquesan art—Gell's specific case study—such rules include, e.g., reflection, rotation, and duplication [Gell enumerates 12 rules]): "The constraints governing the production (*innovation within culturally prescribed parameters of style*) of Marquesan artworks were constraints governing the possibility of transforming a motif or form into related forms. . . . It is a *field of possible or legitimate motivic transformations*" (Gell 1998:215; emphasis added). Gell's notions of style and innovation are highly similar to Bourdieu's. Gell's idea of rules of transformation (which he took from Levi Strauss's analysis of myths [see Gell 1998:175 n. 3]) are reminiscent of Bourdieu's notion of the habitus as a set of dispositions, that is, embodied generative "schemes of per-

ception and thought, extremely general in their application,” which account for the stylistic coherence behind individuals’ behavior in new situations and circumstances (Bourdieu 1977: 15). In both cases, virtuosity and innovation are not about changing the rules of transformation but rather mastering them to such a degree that one can seamlessly and fluidly behave in a “stylistically” sanctioned way even in new and unexpected situations (Bourdieu 1977:79; Gell 1998:158). Within a typology of kinds of creativity recently offered by one scholar, this form of innovation consists in “exploring conceptual spaces” or “structured styles of thought” (Boden 2003:4). Conceptual spaces are spaces of possibilities that derive from a given set of restraints. Within this form of innovation, then, any novelty or “a new trick” is “something that ‘fits’ . . . [an] established style: the potential was always there” (Boden 2003:5).

As I show in the next section, the research conducted by the scientists I worked with is motivated by fantasies about the reversal of long-held assumptions about the perdurability, inevitability, and fixity of style and the nature of innovation that they stipulate. These fantasies motivate the development of computerized algorithms that abstract style as information, as a probability function that can be easily manipulated, and that consequently enable the mixing and reconfiguration of well-known styles in art. They are techniques of innovation not within existing rules of transformation but rather through the reconfiguration and transformation of such rules—that is, at a higher level of the reality of style “so that thoughts are now possible which previously (within the untransformed space) were literally inconceivable” (Boden 2003:6). At stake is a different form of innovation motivated by discontent with styles that have become too familiar, as I now turn to discuss.

“They All Sound the Same”: Fixity of Style and Its Discontents

I first met James, one of the lab directors, on the eve of a concert in which Syrus and other projects developed in the lab were to be featured (Wilf 2013*b*). I had written him an e-mail message a few days earlier in which I had explained my interest in conducting fieldwork in the lab. Specifically, I had been intrigued by James’s ongoing research on the development of robots that improvise rather than play precomposed pieces. In my message I had described my previous study of contemporary modes of socialization into jazz in US academic jazz programs as a way of framing my interest in Syrus (Wilf 2010, 2012, 2014). I had explained that my previous research was about the rationalization of jazz socialization in higher education and that James’s attempt to “train” Syrus to play jazz via computerized algorithms might be conceptualized as an extension of this rationalization. However, it soon became clear that James had a totally different interpretation of what he was trying to do in relation to US academic jazz education.

I arrived at the concert hall a few hours before the begin-

ning of the concert, during what seemed to be a break in a rehearsal. I saw Syrus on the stage, positioned in front of the marimba. James and his students were sitting amid open pizza trays and talking to one another. After introducing myself to James, I explained again my previous research on US academic jazz education. I was in the middle of a sentence when James interrupted me: “They all sound the same.” At first I was confused. “Who?” I asked. “The students! They all sound the same. Like machines!” He laughed. “And all the musicians who come out of the schools, and like 99% of the jazz musicians today—they all sound the same. You know what they say: jazz may not be dead but it sure smells funny.” As I was thinking of what to say, James continued:

This is why I built Syrus. Because I wanted to be inspired. I wasn’t inspired anymore by—everything that can be written had already been written. Everything that can be played had already been played. I felt that I understood all the genres I was familiar with like jazz—there was nothing that really caught my interest, a new sound, new ideas. I wanted to develop a device or a tool that would generate new musical ideas that I could not come up with by myself, nor could other people.

James’s comments seem to be contradictory because he appears to argue that he wanted to build a machine that would inspire people because people have become quasi-machines. However, there is no real contradiction here because the machine in each case is of an entirely different kind. Critics of standardization in US academic jazz education often rely on tropes of machines associated with the industrial revolution, which are based on repetitious and preprogrammed action and that produce standardized objects (think of an early twentieth-century car factory; see Wilf 2010:567–568). Syrus, however, is a machine of a very different kind: it is based on algorithms known as Markov Models, which integrate stochastic processes into their logic and whose output is thus seldom repetitious and predictable. For example, for each jazz master in whose style they want Syrus to play, the members of the research team create a large database of this master’s solos. These solos are in a MIDI (Musical Instrument Digital Interface) format, which means that the files can be fed into a computer program that can break the musical information into chains of pitch and rhythm data that are represented numerically (see figs. 2–4). These data are then analyzed against chord changes score files (i.e., the harmonic sequences on which the player improvised; see fig. 5, which represents files of chord sequences of different standard jazz tunes).¹⁰ The system statistically analyzes this corpus to generate transition probabilities, that is, the probability that a certain future state will follow a given present state. During performance, and for each note played by Syrus, the system constantly

10. In straight-ahead jazz, players improvise on the sequence of chords that structures a given tune while also taking into account other elements, such as the tune’s melody and the contributions made by the other band members.

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Figure 2. A chain of pitch data from a Charlie Parker solo. A color version of this photo appears in the online edition of *Current Anthropology*.

searches for a match between the last sequence of notes performed by the player who plays with Syrus (if Syrus takes turns with a player) or by Syrus itself (if Syrus improvises by itself) and the chains of pitch and rhythm values derived from the jazz master's corpus, which are stored in the system's memory. The length of the sequence is determined in advance (e.g., two or three notes each time). Any such search yields a number of candidates. The system chooses stochastically—that is, based on chance decisions weighted by a function of likelihood, itself determined by the statistical analysis. When a matched sequence is selected from the system's database of the master's solos, the system instructs Syrus to play the note that continues this sequence as it appears in the memory—that is, to play the note that the master had played after he or she played that specific sequence. The system's decisions (i.e., the notes Syrus plays) feed back in real time as new input, and thus the decision process begins again. All this computation takes place in real time and in a split second prior to every note Syrus plays. Syrus, then, is a machine that is supposed to simulate the contingency of human action and thus to assist players who have become more like the machines of yesteryear (Wilf 2013b).

However, as became clear on the following day when I met

James again, his criticism of the sterility of contemporary music was not taking its inspiration solely from the model of the repetitious machines that are emblematic of industrial modernity. It was also directed against the way in which the same computerized algorithms, which are at the center of his research, are typically used in the broader field of algorithmic music composition. Indeed, Markov processes have been used in algorithmic music composition ever since the 1950s (Nierhaus 2010). They are especially suitable for style imitation based on the analysis of large corpora of music. James took issue with scientists and composers who use the same computerized algorithms he uses but for simulating well-known and already familiar musical styles. Thus, at one point during our conversation, James mentioned *The Continuator*, a software written by the music technology scientist, Francois Pachet (Pachet 2003; Wilf 2013a). This program is able to learn and simulate the style of a player in real time and “con-

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  - <pitch>
    <item>72</item>
    <item>69</item>
    <item>65</item>
    <item>62</item>
    <item>71</item>
    <item>72</item>
    <item>74</item>
    <item>71</item>
    <item>72</item>
    <item>71</item>
    <item>69</item>
    <item>68</item>
    <item>67</item>
    <item>65</item>
    <item>62</item>
    <item>63</item>
    <item>0</item>
  </pitch>
  - <pitch>

```

Figure 3. A chain of pitch data from a John Coltrane solo. A color version of this photo appears in the online edition of *Current Anthropology*.

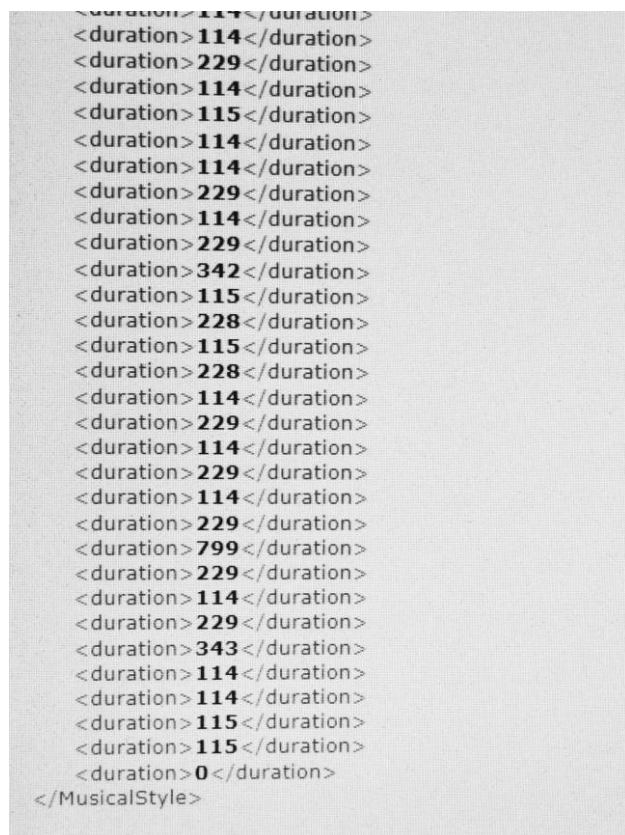


Figure 4. A chain of rhythm data. A color version of this photo appears in the online edition of *Current Anthropology*.

tinue” it in a kind of turn-taking interaction. James had this much to say about this program, which also uses Markov Models:

I think that The Continuator is more successful than us [i.e., his research team] in capturing a given style. It does more complex things than we do. But on the other hand, I personally think that it was less successful than Syrus in inspiring because all it does—which is an achievement, don’t get me wrong—is to capture—“wow, it sounds like Chick Corea playing,”¹¹ or “wow, it sounds like me.” When I played with The Continuator I said: “yes, this is my style,” but it did not inspire me because I already knew how my style sounds, you know? What we did [in the lab] was perhaps less sophisticated statistically. But combining and morphing different styles—people have not done this before. This is our novelty. In this way we can generate responses that Chick Corea would have never thought of because suddenly it’s 60% Chick Corea and 20% Miles Davis and 20% you. This is where I expected the inspiration to come from, which you cannot get from humans.

Thus, James’s malaise concerns not only repetitious ma-

11. James refers to the well-known jazz pianist Chick Corea.

chines or musicians but also machines that integrate stochastic processes into their logic to simulate specific, fixed, and already familiar styles. For James, simulating already familiar styles is not enough, even if this simulation relies on stochastic processes. He feels that he is not inspired by it. It is for this reason that he decided to mix different well-known styles with one another. This facile mixing of styles, then, is the radical development that requires us to rethink the anthropological tradition of theorizing culture as artistic style. Returning to this tradition, then, how might we approach its emphasis on the integration, perdurability, and distinctiveness of style in light of these contemporary technological developments that seem to radically problematize it?

The Romantic Roots of the Anthropological Notion of Culture as Artistic Style

A first step in salvaging inadequate analytical paradigms—inadequate, at least, with respect to specific problems—is to unpack their intellectual and historical roots and clarify the context that engendered their problematic elements and then see if they can be reconfigured and made analytically useful again. I suggest that with respect to the anthropological tra-

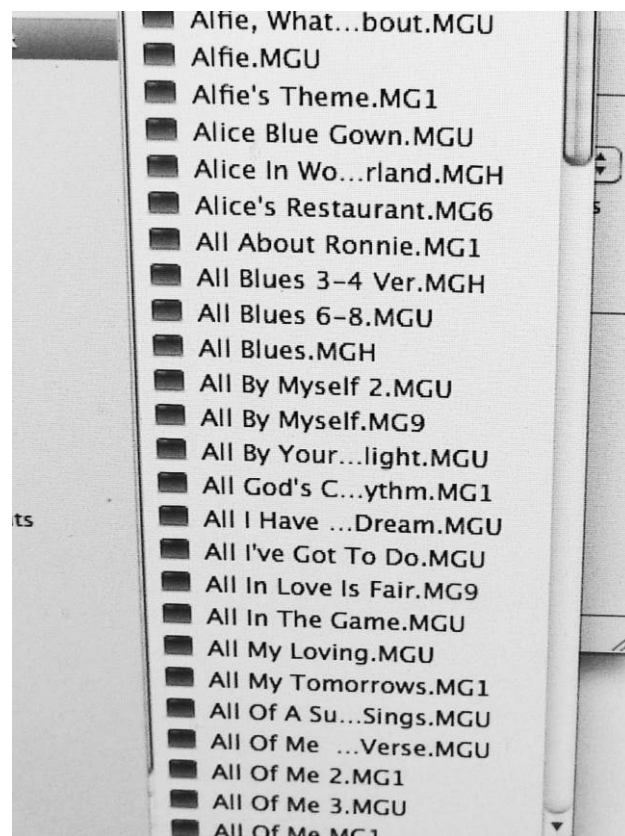


Figure 5. Chord changes score files of different jazz standard tunes. A color version of this photo appears in the online edition of *Current Anthropology*.

dition that has theorized culture as artistic style, this context is anthropology's Romantic heritage.

Conventional accounts have acknowledged the impact of German Romanticism on the making of modern cultural anthropology, especially in its American context (Stocking 1989), and have pointed to a number of Romantic ideas that found their way into the fabric of the discipline and resulted in a distinct notion of culture (Bunzl 1998; Stocking 1988). Most well known, perhaps, is the argument that the Herderian idea that each group is an organic whole that embodies a unique genius and that can only be understood in terms of its unique history and context informed Boas's emphasis on cultural pluralism and determinism as opposed to racial determinism or the notion of history as the evolutionary unfolding of a universal current. This "German romantic tradition" allowed Boas to develop "a thoroughgoing critique of the fundamental assumptions of evolutionist ethnology" (Stocking 1966:871) and thus leave behind a notion of culture "in the humanist or the evolutionist sense . . . associated with the progressive accumulation of the characteristic manifestations of human creativity" such as "art" and develop an alternative concept of culture as habituated tradition within a framework of cultural determinism (Stocking 1966:870).

However, what such accounts have underestimated is the degree to which the emblematic "manifestation[s] of human creativity" that is art—and especially the notion of artistic style—has continued to inform the culture concept in major currents of Boasian anthropology, as the frequent allusions to artistic style made by some of the founding figures I discussed above and will discuss below make it clear. Indeed, it would be hard to imagine it any other way for if there was one human activity around which Romanticism in its different guises coalesced, it was art. For most of the Romantic thinkers, art was considered to be "the most important human activity" (Taylor 1989:376; Wilf 2011), and it was through its theorization and practice that these thinkers arrived at, demonstrated, and solidified their notions of humanity. I thus suggest that the culture concept in modern anthropology has been significantly informed by Romantic notions of artistic style and that to understand the former we need to unpack the contours of the latter.

One of the distinctive features of the modern notion of artistic style is that it has instituted a concern not merely with the unity that underlies the oeuvre of one artist but the oeuvres of different artists (e.g., the unity of style in Expressionism), thus connoting integration on a scale that is higher than that of the individual artist. This notion of style is typically dated to Johann Winckelmann's mid-eighteenth-century writings on art (Winckelmann 1972), in which he focused on artistic style as the crystallized expression of a broader way of life of the social group within which a specific artwork emerged. Winckelmann anchored his analysis of "period styles" in different groups' social conditions, religion, customs, and climate. Significantly, Winckelmann's "treatment of Greek style as an expression of the Greek way of life en-

couraged Herder and others to do the same for the medieval Gothic" (Gombrich 1968:354). In other words, we can see here a connecting line between early formulations of the modern notion of artistic style and early anthropological formulations of the notion of culture as an organic whole whose different instantiations are unified by a common idea or *geist*.

This notion of style, which was first highlighted in the context of artworks and then in the context of general cultural phenomena, informed the thought of a number of key thinkers in the genre of the philosophy of history who theorized the unifying basis of cultures or civilizations in terms of artistic style and who, in turn, influenced a number of the key anthropologists I have discussed above. For example, it underlined Oswald Spengler's momentous oeuvre *The Decline of the West*, in which he suggested a typology of different kinds of "Cultures," such as the "Western," "Egyptian," "Chinese," or "Arabian," according to their distinctive styles. He argued that "The style, like the Culture, is a prime phenomenon in the strictest Goethian sense, be it the style of art or religion or thought, or the style of life itself. . . . In the general historical picture of a Culture there can be but one style, the style of the Culture" (Spengler 1991 [1918]:110). Spengler's phraseology explains why the notion of artistic style has lent itself to anthropological theorizations of culture: style denotes the same kind of integration of seemingly distinct parts suggested by the culture concept; most importantly, it is integration at the level of the presumably emblematic human phenomenon.

The interchangeability of the notion of artistic style and a specific character of a culture or a civilization found expression in the writing of another author in this genre, Arnold Toynbee, who argued that "if, then, it is accepted that every civilization has a style of its own in the domain of art, we have to inquire whether the qualitative uniqueness which is the essence of style can appear in this one domain without pervading all the parts and organs and institutions and activities of each separate civilization" (Toynbee 1987:242). Toynbee's answer is that style cannot appear in art without pervading the rest of culture, and he consequently offered a typology of cultures according to the "bent or bias" unique to each of them.

It is with this kind of integration that another key figure in this intellectual genealogy was concerned: the sociologist Pitirim Sorokin. Sorokin opens his magnum opus *Social and Cultural Dynamics* (1957 [1937]) with an introductory chapter entitled "Forms and Problems of Culture Integration and Methods of Their Study." He differentiates between four possible types of cultural integration, ordered hierarchically in terms of how much they are unique to human culture as opposed to other entities. The form of integration most specific to human culture is "Logico-meaningful Integration of Culture." Sorokin characterizes this last form of integration as "'consistent style,' 'consistent and harmonious whole,' in contradistinction to 'inconsistent mingling of styles,' 'hodgepodge,' 'clashing' patterns or forms," and he suggests that

these are terms which “apply especially to the examination of artistic creation” (Sorokin 1957 [1937]:8). Sorokin adds that

many such superlative unities [which display this kind of integration] cannot be described in analytical verbal terms; they are just felt as such, but this in no way makes their unity questionable. One cannot prove by mere words—no matter what they are—the inner consistency and supreme integration of the Cathedral of Chartres, or the Gregorian chant, or the musical compositions of Bach or Mozart or Beethoven, or the tragedies of Shakespeare, or the sculpture of Phidias, or the pictures of Dürer or Raphael or Rembrandt, or many other logico-meaningful unities. But . . . their supreme unity is felt by competent persons as certainly as if they could be analyzed with mathematical or logical exactness. (Sorokin 1957 [1937]:8)

I quote from Sorokin in detail because of his influence on a number of anthropologists. Although Ruth Benedict did not credit Sorokin as an influence, another member of the culture and personality school did. In a 1945 *American Anthropologist* article, Laura Thompson argued that “a close study of the covert aspects of the Hopi culture reveals that it is characterized by a high degree of still another, more subtle and distinctly human type of integration; namely, an abstract, logical unity which reinforces its organic wholeness at both the conceptual and aesthetic levels. The purpose of this paper is to describe this logico-aesthetic integration” (Thompson 1945:540),¹² which she describes elsewhere as “configuration’ or style” (Thompson 1945:552). More significant is the fact that a decade later, Clifford Geertz, who was Sorokin’s student at Harvard, explained social change as a clash “between what Sorokin has called ‘logico-meaningful integration’ and what he has called ‘causal-functional integration.’ By logico-meaningful integration, characteristic of culture, is meant the sort of integration one finds in a Bach fugue; . . . it is a unity of style” (Geertz 1973:145 [the essay was originally published in 1956]).

Five points stand out in these arguments, which bring to mind the arguments of the different anthropologists I have previously discussed: cultures have but one artistic style (note Sorokin’s rejection of “mingling of styles”); the style of a specific culture’s art is the most iconic of this culture’s broader style and of the form of integration that underlies it; the art that is the most emblematic of this type of integration is Western high art; apprehending this form of integration requires “feeling”; only a “competent” observer can appreciate this form of integration to the fullest. I argue that these points found their way into the culture concept in modern anthropology, the last two points corresponding to the method of *Verstehen* and the assumption that the anthropologist has a privileged access to understanding the true nature of cultural phenomena of which *less refined* people—often called *na-*

tives—remain ignorant.¹³ Thus, although the phenomena that modern anthropology studied under the term “culture” did not concern solely “the progressive accumulation of the characteristic manifestations of human creativity” such as “art” (Stocking 1966:870), they did continue to be encompassed under and understood through the kind of stylistic unity attributed to Western high art within a specific intellectual tradition. This genealogy explains the inadequacy of this tradition to account not only for the kind of “mingling of styles” that is fast becoming a key logic of sociality in the present historical moment but also for anthropology’s long-held difficulty to theorize the dynamism and fluidity that characterize social life in general.

This intellectual genealogy is most evident in the oeuvre of one of Boas’s most important students, Alfred Kroeber. In his book *Style and Civilizations* (1957), Kroeber explicitly acknowledges Spengler, Toynbee, and Sorokin as key influences on his thought, although he does not hesitate to critically engage with their theories of culture as style. Kroeber argues that Spengler took “his point of view from Nietzsche, who had said: ‘Culture is unity of artistic style in all the life manifestations of a people’” (Kroeber 1957:88). Although Kroeber rejects Spengler’s more ostentatious claims about the teleological growth and death of cultures, he credits him for highlighting “a large problem of great interest,” namely, “how far a culture may legitimately and profitably be viewed as a sort of style, perhaps something like what I have already called a superstyle, or a style of styles: a total style of life” (Kroeber 1957:88). Kroeber’s answer is in the affirmative: “Something of a coherent characterization of our civilization seems to be achieved” (Kroeber 1957:102).¹⁴ He suggests that precisely because style in culture is not as integrated as artistic style that artistic style should serve as a kind of an ideal type of what cultural integration in its various dimensions looks like. Similarly to Sorokin, he frames a hierarchy of epistemological skills with respect to different people’s abilities to apprehend the stylistic unity of a culture. Arguing that style is about form rather than subject matter, he adds that “the layman,” “children and the completely untutored” may be “little aware of the form” because they are taken by the subject matter (Kroeber 1957:26–27).¹⁵ Additionally, although Kroeber is forced to acknowledge that modern society consists of a number of

13. It is typically acknowledged that Romanticism contributed to anthropology not only ideas about the ontology of cultures but also about the methodology of studying them. The notion, advanced by Humboldt and later Dilthey, that understanding a culture requires scholars to use intuition, empathy, and feeling as a way of grasping the cultural unity that underlies what on the surface appear to be disparate elements had a tremendous impact on how anthropologists have come to understand their craft (Bunzl 1998:25).

14. For the persistence of these ideas in contemporary anthropological theory, see these two recent examples (El Or 2012:441–442; Henshilwood and Dubreuil 2012:133).

15. This argument owes to the Kantian tradition of privileging form over subject matter as the essence of high art, a distinction that has traditionally been used by the cultivated Bourgeoisie to distinguish themselves from the lower classes (Bourdieu 1980).

12. At this point, Thompson references Sorokin in a footnote.

styles, his way of formulating this plurality suggests that purity of style underlies his, much like Sorokin's, notion of plurality. Taking his cue from artistic styles, Kroeber argues thusly:

No one can accuse Picasso of being indecisive in execution, of weakness; he is highly original, and he is supremely skilled, even if his art is split stylistically. If his single personality can contain several styles *without mishmashing them*—as Goethe already successfully expressed ultraromanticism and Hellenic classicism side by side—surely a world art should be able to contain them. *The weaker practitioners will blend and fudge and eclecticize; but they will have less influence and be soon forgotten.* (Kroeber 1957:51; emphasis added)

Many of the same emphases structure Sapir's notion of "the genuine culture," which he defines as "inherently harmonious, balanced, self-satisfactory," "not a spiritual hybrid of contradictory patches, of water-tight compartments of consciousness that avoid participation in a harmonious synthesis" (Sapir 1985a:314–315). Sapir's Romantic heritage finds its clearest expression when he discusses "genuine cultures" in terms of "genius" and "healthy spiritual organisms, such as the Athenian culture of the Age of Pericles," whose health we immediately and "instinctively feel" (315).

That we find artistic style playing an important role in the theories of a number of key anthropologists, such as Boas, Kroeber, Sapir, Benedict, Bateson, Geertz, Bourdieu, and Gell, is noteworthy. It suggests that anthropology's emphasis on the "one culture for one society" principle stems in part from the view of Western high art as an emblematic form of cultural integration, a pure form that inevitably loses its purity and "logical necessity" when it is mixed with other styles.

Interestingly, jazz filled the slot of the potentially polluting style with respect to Western high art, and specifically Western classical music, in at least two places that are worth mentioning.¹⁶ At one point in his book, Sorokin argues that, "A competent person could listen as many times as you like to a musical composition where jazz and crooning are interspersed with bars from Tchaikovsky [*sic*], Stravinsky, or Wagner. Any number of repetitions of these bars would not oblige him in any way to declare that such musical compositions are logical and consistent unities" (Sorokin 1957 [1937]:12). Compare this statement with the following one, made by another pair of gatekeepers, Max Horkheimer and Theodor Adorno: "A jazz musician who has to play a piece of *serious music*, Beethoven's simplest minuet, involuntarily syncopates, and condescends to start on the beat only with a superior smile. Such 'naturalness' . . . constitutes the new style, 'a system of *nonculture* to which one might even concede a certain "unity of style" if it made any sense to speak of a stylized barbarism'" (Horkheimer and Adorno 2002:101; em-

16. For an analysis of contemporary institutional sites within which jazz is framed as a potentially polluting agent vis-à-vis Western classical music, see Bruno Nettl's ethnography of music conservatories in the United States (Nettl 1995:82–111).

phasis added).¹⁷ Note how this last statement, which—like Kroeber's paraphrase of Spengler—incorporates a quote from Nietzsche,¹⁸ denies any possibility for the reconciliation of Western classical music with jazz. Such mingling of styles can only result in a "unity of style" in the sense of "stylized barbarism," that is, "nonculture"—a clear example (this time from outside of anthropology) of the kind of debt owed by the culture concept as a unified and coherent whole to the idea of the purity of artistic style, more specifically in Western high art.

Within the confines of this intellectual tradition, there is very little hope of making sense of the phenomena I am concerned with, of which the following vignette is a typical example. One day, as I approached the lab, I heard from within the closed doors a strange mix of sounds. What I heard was both familiar and strange. I opened the door with my access card and entered the room. Kim, a member of the lab's research team, was playing the electric keyboard that is plugged to the computer that controls Syrus. He looked intently at Syrus while playing. David, another member of the research team, was looking at one of the computer monitors. I recognized the first movement of Beethoven's *Moonlight Sonata*, which Kim played with ease. Suddenly Syrus started to play on the marimba while Kim continued to play the sonata. I listened carefully. I could identify in Syrus's playing rhythmic and melodic motifs taken from what Kim had just played, but these were only hints. Syrus did not copy Kim's playing but rather loosely weaved bits and pieces from it into its own playing. At one point, Kim turned to David and said: "The Jazz style produces much more interesting results than the Rock style, right?" David answered, "Yes, definitely!" I approached David, looked at the monitor, and saw that he was shifting a slider called Jazz with the cursor. Two other minimized windows had two different sliders titled Rock and Classical (see fig. 6).

As I realized after this session was over, Kim and David were trying to figure out which preprogrammed "style" would lead Syrus to produce more interesting responses to Beethoven's *Moonlight Sonata*. These preprogrammed styles were based on a statistical analysis of a few selected music pieces that belong to specific genres. In the weeks that followed this session, I observed other sessions in which Syrus was instructed to respond in a "classical style" to a jazz piece or to respond in a "jazz style" to a classical piece that were played or improvised by Kim or another student on the electric piano. In an interview with John, a doctoral student who originally compiled these styles, he told me the following about this aspect of the research:

That was something I was just playing around with. What I was interested in was what if I take, for example, Mozart and Chopin and mix them and then introduce it to a jazz

17. I thank Michael Silverstein for directing my attention to Horkheimer and Adorno's argument.

18. For the exact reference, see Horkheimer and Adorno (2002:269).

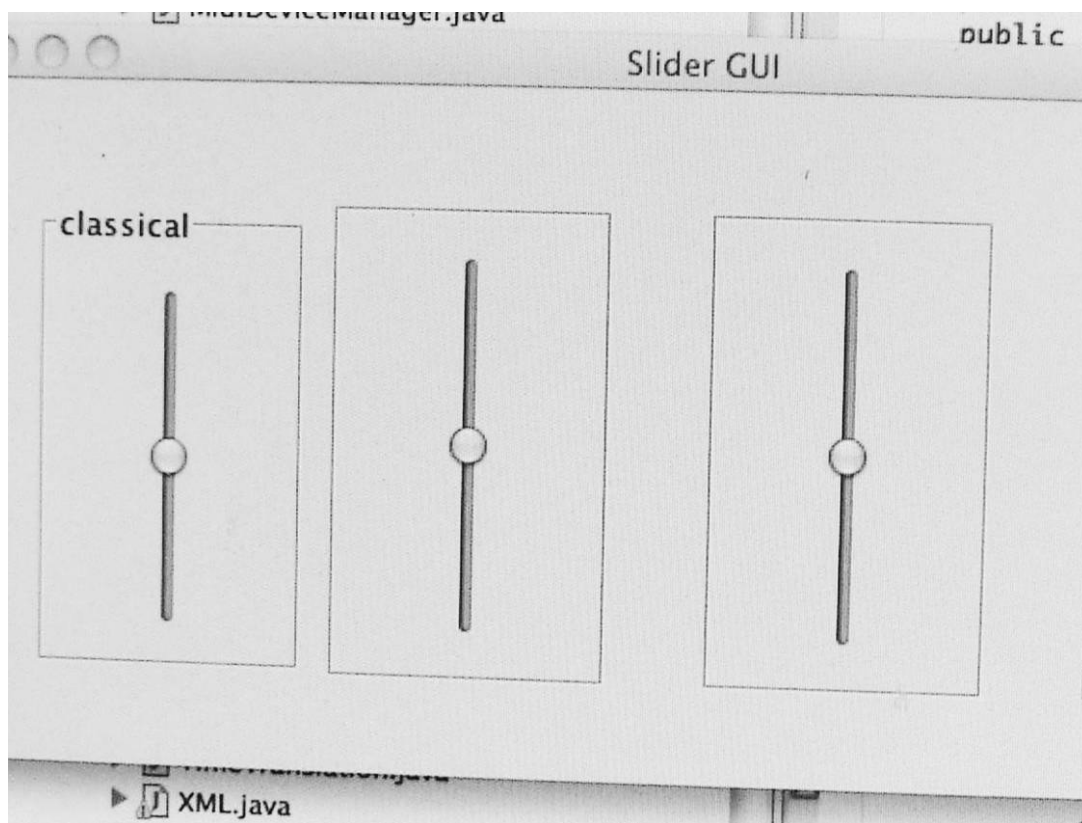


Figure 6. A slider for controlling proportions of “classical” style. A color version of this photo appears in the online edition of *Current Anthropology*.

standard and see what comes out. Or another time I was going to throw a couple of Romantic composers together and then I was going to throw modern harmonic language at it and see how it responds. With all those styles, I was just curious what would come out because we had this engine there and it can treat all the music the same way so I was just curious what would come out. . . . It definitely created interesting results that were a lot of fun to play with. *And it felt new. It wasn't something you heard before.* That was the part that I found the most interesting in the research.¹⁹

How might we conceptualize these practices other than “stylized barbarism” or “a system of nonculture”? How can we account for these practices’ playful, creative elements, made possible by the availability of such “engines,” that is, computerized algorithms specifically programmed to handle such tasks? How might we reconfigure the anthropological tradition that theorizes culture as artistic style to make sense of these phenomena?

19. See other examples of style mixing that involves jazz in Boden (2003: 312) and Cope (2005).

From Style to Styles of Styling Styles

I suggest that the answer might lie, ironically, with the insight of the key anthropologists I have discussed above, according to which a theory of style must be a theory of specific restraints that create patterned phenomena. These anthropologists understood that style represents a relatively consistent choice, governed by specific restraints, from among equally probable possibilities. Their efforts to provide detailed ethnographic accounts of the various selection mechanisms or restraints that result in styles or patterned behavior—whether these are anchored in the unconscious, the body, or symbols—are commendable, although their theories of culture as artistic style were informed by the misguided notion of the purity of culture as one or a limited number of well-defined styles and by the notion that restraints must be inaccessible to individuals or that innovation can mostly take place within these restraints. Indeed, they were not ready to deal with nonhuman agents such as computerized algorithms, which provide users with the dynamic control of restraints and of probabilities of selection and hence the option to reconfigure existing styles of behavior by reconfiguring these restraints with relative ease.

Computerized algorithms change the rules of the game

because they are highly reliable mechanisms that enable users to easily reconfigure the restraints or rules of transformation themselves and thus to generate new styles understood as consistent forms of behavior in some modality. When James and his research team program Syrus to mix the styles of a number of masters, they are engaging in a specific form of creativity of a higher order than the one featured in the anthropological theories of style I discussed above. This form of innovation consists in “transforming the space”: they change preexisting styles, tweaking them, or even radically transforming them, “so that thoughts are now possible which previously (within the untransformed space) were literally inconceivable” (Boden 2003:6). On one level, style now becomes a matter of agency that is much less restrained than before. While people have always engaged in some form of styling styles (Hebdige 2005), the possibilities and the ease to do so have now increased in such a way that we need to develop a new conceptual framework, albeit one that draws on old frameworks. When John explained to me matter-of-factly his and the other students’ mode of experimenting with mixing different styles by saying “we had this engine,” he conveyed the ease and the new possibilities opened up by these relatively new, and increasingly ubiquitous, nonhuman agents, which bring intentional agency and styles under one roof as never before.²⁰

However, while on one level style becomes much less restrained than before, on another level it remains equally restrained. Restraints continue to have an impact but on the level of the practices of styling styles with these new computerized technologies. I argue, then, that in analyzing computer-mediated, algorithmic forms of sociality, we should do so not through the prism of a fixed style, a limited number

20. At this point it would be apt to note in passing why some of the most nuanced approaches to the analysis of style as a dynamic feature in real-time communicative events, which were developed within linguistic anthropology and in the context of which agentive individuals are conceptualized not only as sets of distinct styles but also as techniques of generating styles in real time (see Bakhtin 1981; Eckert and Rickford 2002; Goffman 1981), are also limited in their capacity to account for these new technological developments. Specifically, these approaches do not capture the facility, enhanced control, and heightened conscious agency that are entailed in style mixing via computerized algorithms. Linguistic anthropological approaches to style manipulation have tended to treat the question of agency as in the following example, which takes style and stance as its objects of study. After arguing that “all linguistic patterns of use arise from decisions people make in interaction when they are talking to a real person and thinking about ‘who they are’ in relation to that person or people” (Kiesling 2009:172), Kiesling adds the following endnote: “These decisions are not necessarily ‘conscious’ in the sense of being open to reflection, in the same way that we do not calculate all of the actions necessary and do calculus in order to catch a ball” (Kiesling 2009:192). Subtler approaches to calculation have revealed that calculation rarely takes place exclusively inside individuals’ “heads” but rather depends on material arrangements and external systems of measurement that often remain unaccounted for (Callon and Law 2005). The style manipulation I am concerned with is subject to heightened conscious control and reflection precisely because “the calculation” is performed by nonhuman agents, i.e., computerized algorithms, on behalf of human agents. This frees the latter to be much more consciously agentive with their manipulation of styles.

of styles, or the shifting between styles, but rather through the prism of *styles of styling styles*, and I suggest that rather than discard altogether the anthropological tradition that has conceptualized culture as artistic style, we should retain its ethnographic sensitivity to the various forms of restraints that govern style. Not only is this emphasis necessary for theorizing the computerized algorithms as technologies that enable individuals to control, shift, and create restraints and thus to reconfigure with ease existing styles and shape new ones, but it is indispensable for theorizing these practices of styling styles as styles governed by their own specific restraints.

What might such restraints be? There are a number of obvious candidates. To begin, the technology that is involved in these practices poses some of its own specific restraints. Although critics have correctly cautioned against technological determinism (Coleman 2010), they have also demonstrated that the interaction with technologies is not a one-directional relationship where human capabilities are delegated to technologies. Rather, technologies prescribe back to humans, who must learn to operate them, and to social practices that must be organized around these prescriptions (Latour 2005). Similarly, the technology used in the simulation and mixing of styles in the lab in which I conducted fieldwork is productive of specific restraints that stylize the practice of styling styles enabled by this technology.

To illustrate this point, consider the following vignette. One day, as I was checking my e-mail in my workstation, David entered the lab. He greeted me and the other students present and then sat in front of the electric piano. I saw that Syrus was turned off, so I assumed that David was planning to just fool around on the keyboard, a practice that many students engaged in from time to time as diversion from work. David started to play what seemed to be rather conventional musical phrases but in a highly unconventional way. He played one note with his left hand and the successive note with his right hand and so forth in a rapid fashion, each note on a different section of the keyboard. The music he produced had a zigzag-like contour. Suddenly, Kim’s head, which up until that point was hidden behind the computer monitor in his workstation, appeared with a smile: “Syrus Music!” he exclaimed. I looked at David and saw that he was smiling to himself while continuing to play these highly convoluted phrases.

In a conversation a few hours later, I asked David what Kim had meant by “Syrus Music.” David laughed and told me the following:

You see, Syrus has its own style because of the arm movements and the limitations. You’d hear the beginning of a natural run [i.e., a phrase that consists of notes adjacent to one another] and then suddenly a note would go up in the octave—you’d hear some note being played by a different arm in a different octave because the first arm is not fast enough to play it so the other arm would compensate for it. And I think that’s unique to Syrus. So Kim would sometimes refer to this as “Syrus Music” and he’d play this way,

and he'd say, "This is Syrus Music!" [laughter]. So today I just decided to do the same.

David's comments highlight the fact that practices of styling styles are constrained and hence styled by the material infrastructure of the available technologies that enable such styling to begin with. There will always be some material stratum imposing its own restraints, limitations, and embodied realities, which will eventually result in a certain style of styling styles in a particular domain. The limits of computing power, the need to dissipate heat from processors, and so forth—there are myriad of restraints at the material level of technologies, which are bound to result in a style of styling styles (Hayles 1999). The restraints that result from Syrus's particular features—the speed at which one arm can play successive notes, for example—is productive of a residual style that pervades its playing regardless of which jazz style or mix of styles it happens to play at any given moment. Everything Syrus plays will have the edgy style the students associate with its playing because when one arm cannot play a note, another arm will play it in a different octave on a different part of the marimba.

If one crucial source of restraints that result in a style of styling styles is found on the level of technology or means, another source is found on the level of the normative ideals that stipulate the ends to which people choose to use specific technologies of styling styles. Thus, the members of the research team in the lab are motivated by a set of normative ideals that stipulate that creativity can be quantified, divided into building blocks, and recombined with the building blocks of the creative agency of another person to profit from the strengths of each. For example, in one of the tentative research plans that John, one of the PhD students, wrote in the lab, we find the following: "In an improvisation scenario the user may want to have Syrus implement Miles Davis's voiceleading with harmonic progressions in the style of John Coltrane's 'Giant Steps,' and Bach's voiceleading; this would be done by only recalling data files specific to these categories." John's suggestions draw from a specific paradigm of creativity with a long history in the West, that is, creativity as the product of combinatorics (Selfridge-Field 2001). Combined with specific machineries of knowledge production that enable users to take this paradigm to its logical extreme,²¹ the result is a specific style of styling styles.

Coda

It is apt to conclude this essay with the May 2012 news about Facebook's public offering of its stocks, which ripped \$16 bil-

21. Compare this mash-up of styles and its conditions of possibility and implications with new developments in the field of bioinformatics, which allow "lateral translations" of genetic material between, and "horizontal leaps across," different branches of these trees (Mackenzie 2003:321). These developments, which are enabled to a large extent by the algorithmic processing of genetic material as digital information, are creating new kinship and biopolitical imaginaries, which have hitherto been dominated by the model of the tree structure naturalized and given a scientific status by Darwin in the nineteenth century (see also Helmreich 2003).

lion, making it the third-largest sale in U.S. history at that time. With hundreds of millions of users, the company is a testimony to the increasing role played by computerized algorithms in mediating contemporary forms of sociality and in generating huge profits based on their ability to anticipate people's styles and patterns of behavior in various modalities. That artistic style has been a key trope in anthropological theories of culture from the outset means that anthropology is well positioned to make sense of these technological developments provided that its theories of culture as artistic style are reconfigured in light of these developments. This reconfiguration requires that we uncover the ideological baggage that informed these theories in the context of which the enormous success of companies such as Facebook and Google, as well as the strategies devised to mitigate their power and effects, have little sense. The technology that allows us to simulate and anticipate styles with great accuracy and facility is also the one that enables individuals to mix styles with one another and thus to reconfigure each of them. Neither the former nor the latter are instances of "nonculture." Rather, they are the stuff culture is increasingly made of in the contemporary historical moment in many contexts, whether we choose to click the "like button" or not. Anthropologists have much to gain from studying the role played by computerized algorithms in mediating these increasingly ubiquitous forms of sociality.

Acknowledgments

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Comments

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I frame my teaching through the lens of power, focusing on how people and ideas become marginalized not only by violence and overt discrimination but often because they are forced, suggested, or assumed to speak on another's terms. This is what algorithmic processing structurally does: it moves

us and our cultural practices to speak according to a distinct set of terms. These terms can be found in even the most unalgorithmic of places. Movie scripts can be green-lit by algorithms (Eliashberg, Hui, and Zhang 2007). A single professor's algorithm has been used to produce over 200,000 different books (Cohen 2008). And in the case of Eitan Wilf's engaging ethnography, algorithms are currently defining styles of jazz music.

Wilf's understanding of algorithm as "styles of styling styles" is an effective way to detail how algorithmic terms are determining the future of culture and style. Musical innovation here becomes indebted to characteristics of algorithmic logics: of sliders, of quantification, of being able to, with the most serious of faces, add a variable like "Monk" to the variable "Coltrane." Here, algorithm not only forces culture to speak on its terms, but it reconstitutes what culture is and can be.

This is formative work done by Wilf, of assigning algorithmic procedures as more than just participants in culture. Algorithms are increasingly founding the ontology for cultural production. Jazz as performed by Syrus, the marimba-playing robot musician, is not jazz + computation. It is jazz reconstituted through algorithm, replete with the limitations and regulation implicit in computation. Jazz by Syrus is a different type of jazz, one that listens to tones as Hertz-defined notes, not as sounds. A saxophonist who "grows" into her mouthpiece, for example, would likely remain unintelligible to the algorithms that make up Syrus's software. The notes she does play, or the sounds that are interpreted as notes by Syrus, are what count. What is not available, what is unable to be measured, is discarded as data debris.

Indeed, even the pseudo-pathos implicit in Adorno's critique of jazz, of a bandmaster shouting "swing it boys" to permit, but more importantly declare the beginning of, improvisation, finds itself at odds with the robotic heart of Syrus (Adorno 1990). To repurpose a quotation by Franz Boas, algorithms actually do become "a new adjustment of the hand" precisely because they operate within a separate ontology (Boas 1955 [1927] as cited in by Wilf). What constitutes algorithmic processing is different than what makes jazz as we have historically known it. Music mixed by sliders is an increasingly useful diagrammatic to see algorithms' function in cultural production. Quantifiable knobs and dials enable a user to amp up or decrease a discrete musical style. But this algorithmic practice also reconfigures culture itself to fit within the rubric of a slider.

On that point, I would be interested in hearing Wilf think through algorithms as more than mechanisms operating within restraints. We are not just dealing with technological/material limitations that produce the "embodied realities" of a machine. We are also experiencing a foundational shift transforming the complexities of style into definable (discrete), quantifiable (processed), and modulatory (dynamic and in "real time") elements.

Algorithms like those that undergird Syrus function according to strict, readable patterns, not perceived essences.

The feeling that emanates from a piece performed by John Coltrane hits us each on an individual level. But when Coltrane is not only played but interpreted by algorithm, we are dealing with something that is not necessarily Coltrane. We are dealing with an algorithmic assessment of Coltrane, a paraphrasing or a representation. But, much like representation itself, algorithms represent in a literal form by presenting anew according to their own unique, quantifiable terms.

By understanding style as formed, and not just mediated through algorithm, we must attend to the all sorts of qualities that make algorithm "algorithmic." Algorithm does not just provide new elements from which innovation can come. Rather, style as an algorithmically defined category determines unity, which then determines cultural validity and use. Wilf is entirely correct to emphasize the creative practices that come from music "engines," but we should go further to think of style in a fundamentally algorithmic way. Algorithmic stylistic unity is not about socially construed, accepted forms of artistic and cultural practice. It is about commonality models, about taking what can be known (tones as Hertz) and considering that knowledge vis-à-vis rhythm, harmony, and rests.

We could play alongside an algorithmically represented John Coltrane, but its response to our playing, and our interpretation of its own musicality, is made according to its algorithmic terms. This is where Wilf's idea of limitation can be encountered, but also where research must proceed. Wilf asks us to think of innovation alongside algorithm. I ask us to think of how algorithm frames innovation.

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I see traces of two projects in this article: an empirical project—with theoretical implications—on contemporary pedagogy for improvisation and a theoretical project—with methodological implications—on the relevance of established analytical distinctions within anthropology. Eitan Wilf is committed to both projects. He has published insightful accounts of the ways in which colleges, universities, and conservatories try to create new contexts and activities for transmitting or renewing an established art form, for example, jazz (Wilf 2010, 2011, 2012), and he has used his insider-outsider observations of music production and performance to theorize about paradoxes hidden in our very notions of tradition and innovation. In the latest installment of this double project, Wilf engages his readers to reexamine the notion of culture as style while hinting at the challenge that anthropologists face when studying computer-mediated sociability. In addition to providing a critical appraisal of the debt that anthropologists owe to the study of art, this study also speaks to a growing interest in creativity and in-

novation (e.g., Hallam and Ingold 2007; Lavin, Narayan, and Rosaldo 1993; Liep 2001), which includes improvisation not only as a recurrent musical practice—something that (ethno)-musicologists (e.g., Nettle and Russell 1998) have studied for some time—but also as a ubiquitous property of everyday life and thus a key ingredient of any kind of socialization (Bourdieu 1977; Duranti and Black 2012; Sawyer 2001).

Wilf criticizes anthropologists in the past who equated culture with artistic style and thus “were not able to deal with nonhuman agents such as computerized algorithms.” I actually think that the problem in dealing with the type of complex human-machine interactions described by Wilf is bigger than the restrictions imposed on theorizing when the old notion of “style” is adapted to the study of human creativity and new technologies. Handed-down practices of inquiry have profound implications for arriving at generalizations that can satisfy the current appetite for “new knowledge.” The problem is a well-known and still unresolved one: anthropologists have felt the need to expand their inquiries to contexts that do not easily fit the mold of analytical concepts and methods originally designed to study small-scale societies. Calling for an “anthropology of the contemporary,” as some of our colleagues have done (e.g., Rabinow 2008; Rabinow and Marcus 2008), opens a space for self-reflection but does not solve the problem of keeping up with our times, which are defined by technologies more complex than ever before and an unprecedented abundance of material culture (including all kinds of “gadgets”) in our everyday life that overwhelm individuals and families (e.g., Arnold et al. 2012). The main problem in anthropology—with exception made for archaeologists who usually work in teams—is the assumption that an individual researcher can capture the complexity of contemporary life, whether at home, in the workplace, in the classroom, at large public events (e.g., sports matches), or on the Internet. I see the limitations of old theoretical notions, including the notion of “style” discussed by Wilf, as a minor problem compared with the problem of a scientific practice that is an impediment to deeper understanding of social change in the contemporary world. We have known for a long time that naked-eye observational techniques are not adept at documenting fast and complex multiparty interaction among human and nonhuman agents whose practical and algorithmic logic are much harder to capture than the type of human interaction that Boas, his students, and his students’ students abstracted from to write ethnographies and grammars or theorize about culture and social systems. We need methods that allow us to synchronize and compare the recording of what humans are doing with what the computer (or any other tool-machine) is processing and executing (e.g., Goodwin and Goodwin 1996; Hutchins 1995), including the actions of a robot like *Syrus* described by Wilf. We need to integrate the best recording technologies with the constantly expanding treasure of digital data available to libraries and private citizens. Technology, of course, cannot replace thinking and theorizing—for one thing, we need to remind ourselves that computers

and the robots that they control are always only part of the interactions going on and there is no perfect reproduction of what “really” happened—so we need to avoid the fallacy of being a “virtual-realist” or a “hypercontextualist” (Duranti 2006). But an understanding of new technologies can motivate collaborations that go beyond the traditional interpretation of interdisciplinarity. Anthropologists are, by definition, interdisciplinary, but we are not yet collaborative enough across our own subfields and across divisions within the same university. There are of course exceptions, such as the collaboration among archaeologists, linguists, medical anthropologists, and clinical psychologists in the study of the everyday life of middle-class families supported by the Alfred P. Sloan Foundation (e.g., Ochs and Kremer-Sadlik 2013), or the study of trends in burglaries done by an archaeologist, a mathematician, a statistician, and a criminologist (Mohler et al. 2011). The laboratory studied by Wilf is a perfect example of an interactional domain between humans and machines where collaboration is needed if our goal is an anthropologically-informed study of human creativity.

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In this stimulating paper Eitan Wilf invites us to rethink deeply held assumptions on culture and creativity against the background of the increasing prevalence of uses of digital technology that enable new forms of combining cultural styles. Wilf stresses how the deployment of such new media technologies introduces important differences in scale and range as far as the production and combination of cultural styles is concerned. His argument in favor of a cultural analysis of “styles of styling styles” thus pushes up older discussions of cultural change and reproduction one meta level. As the speed and mutability of cultural transformation significantly increases, Wilf acknowledges that nonhuman agents, such as algorithms, also impose new constraints on styles. While the skilled use of computerized algorithms can enable a spectrum of cultural innovation and recombination that in its speed and range typically far exceeds the capabilities of human actors, the problem of style as coherent, consistent choice remains. The role that computerized algorithms seem to play in constituting “styles of styling styles” in Wilf’s account is therefore an extension of a faculty that Wilf acknowledges has always been there (the styling of styles). This appears to bring in McLuhan’s well-known perspective on media as extensions of human actors (McLuhan 1964), and it seems to be directed against any of the utopian or dystopian visions of nonhuman media as overriding and dominating human agency that have repeatedly appeared in media theory (e.g., de Kerckhove 1995; Kittler 1997; Virilio 1998). In my view,

these implications of Wilf's analysis could be further elaborated, and in this spirit my comments will focus on two issues the insightful essay raises, the problem of style and typification and the issue of sound reproduction and the auditory field.

At first computerized algorithms might resemble an automated Heideggerianism, as they seem to embody technology as poetic *technē*, creating the factual, prehermeneutic presence of things in the world (Heidegger 1977:13). But Wilf's ethnography shows us that, even though the automated styling of styles might result in singular, new cultural phenomena, its outcome is still subject to cultural typification. When one of his interlocutors remarked "Syrus Music!" while listening to his colleague trying to approximate the humanoid robot's ways of producing music, it is clear that we are witnessing a moment when singular tokens resulting from the new combination of existing musical styles are subsumed under a new semiotic type, here identified as a new style particular to Syrus, the robot. In other words, also for the computer-generated automated styling of styles described in the paper, the dialectics of token and type seem to be inescapable, because human actors continue to synthesize sameness out of pure difference. Styles of styling styles are not just constrained by the material infrastructure of the technology employed, but human acts of typification also constantly impose limits on them. In this respect there appears to be little difference between automated and nonautomated modes of styling styles.

Further, as far as uses of sound reproduction technology are concerned, it is also important to note that robot-generated musical styles are still mediated by the constantly shifting and unique auditory fields that listeners inhabit (Ihde 2007). This includes not just the apparatus of sound reproduction with its reassembling of acoustic signals and the variable co-presence of other sounds. Very importantly, it also involves the bodily positioning and emplacement of listeners (Feld 1996), their physical surroundings, and their listening habits, that is, embodied auditory dispositions that may result in listeners being especially receptive to particular aspects of acoustic phenomena over others, all informed by "hearing cultures" (Erlmann 2004). This of course also includes the relating of a singular acoustic event, or aspects thereof to learned semiotic types such as the "same" song, musical piece, or overall musical style. In other words, the automated generation of musical styles unfolds in singular auditory fields, where human listeners engage in acts of recombination and creativity that do not primarily depend on whether the styling of musical styles is performed by computerized algorithms or not. This key dimension of sonic cultural creativity and reproduction seems to be largely untouched by the question of computer-mediated algorithmic forms of sociality. Auditory fields are in general extremely context-bound, resisting perfect repetition, and constantly generate difference in open-ended ways, regardless of the modes of styling styles and the technical infrastructures of sound reproduction employed.

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Eitan Wilf's article focuses on how new technologies alter familiar creative practices, in this case performing jazz music. Computerized algorithms provide computer scientists in a lab in Austin, Texas, with the opportunity to imagine anew what constitutes improvisation and style in jazz and other musical genres. Wilf argues that this reimagination is itself part pastiche, but upon long-standing Romanticist assumptions about creativity and culture that can be profitably put into dialogue with American anthropological conceptions of "culture as style" found in the writings of Boas, Benedict, and later in Geertz. By bringing together jazz-playing computer scientists and culture-uncovering anthropologists, Wilf hints at a potentially productive approach to the social theorists who are anthropologists' ancestors: asking how their theoretical approaches were shaped by tacit semiotic ideologies based on contemporaneous technologies.

This is a question that our contemporary media ecologies encourage. All these technologies can alter the ways in which we circulate knowledge, aesthetic forms, and value. These are not always large changes, but even the small transformations to practices of circulation can reveal tacit assumptions of earlier theorists. For example, what can digital money reveal about Marx's assumptions about money's materiality (see Maurer 2011)? In Wilf's case, when computer scientists are able to turn jazz musicians' styles into measurable units that can then be combined proportionally (that is, 20% of Miles Davis, 20% of Charlie Parker), this changes how one can mobilize style. In the process, it sheds light on Boas's and others' assumptions about creative choices and cultural restraints. Wilf shows scholars a line of inquiry to classic social theory that promises to be very productive, revealing what has been taken for granted by asking, for example, how Benedict Anderson's or Gabriel Tarde's theories might have to change when the ur-media for circulating public information is no longer newspapers and pamphlets but the Internet. Yet Wilf is a bit hesitant about which direction the contrast cuts: Is it Boas and Benedict that can be understood in the new light shed by computerized algorithms or can Boas and Benedict be transformed with a bit of imaginative care to explain these computer scientists' semiotic ideologies about creativity and music? I am suggesting it might be time to reexamine anthropological ancestors by comparing their own media ecologies with our own. In his article Wilf seems more ambivalent, or perhaps more versatile, about the direction this reexamination could take.

This analytical move, however, requires careful attention to a range of semiotic ideologies that should be historically situated. What are the computer scientists' semiotic ideologies of music and computers? Is there a difference for the computer scientists between adding 20% of Charlie Parker to the

“Yardbird Suite” or 20% of a jazz style to Beethoven’s “Moonlight Sonata”? How does thinking about music through this particular algorithmic lens change people’s relationships to music—what happens in practice when music is a “product of combinatorics”? And how do the computer scientists’ ideologies about style, genre, and music in general compare to the social theorists’ semiotic ideologies that Wilf puts the scientists into dialogue with?

This is a comparative project, yet I want to suggest it is a comparison of more than culturally and historically specific media ecologies and ideologies. Style in music, after all, is different than style in pottery in many cultural contexts. In Wilf’s examples, how people understand authorship in different media contributes to this difference. But music’s and pottery’s material forms are also part of this difference—some forms are more amenable to being computerized, or might seem to be more worthwhile in remastered form from some computer scientists’ perspective. How much does the emphasis on the “styles of styling styles” depend on music’s specificity as an aesthetic form and its amenability to computerize algorithms? How much can one generalize? As computerized algorithms increasingly shape how knowledge circulates and art is produced, will forms less amenable to this manipulation develop different statuses—either more easily overlooked or more privileged? Here questions of materiality and semiotic ideologies intersect to allow scholars to reflect on the complex dialectic relationship between technological innovation and social change.

Wilf is asking whether what counts as spontaneous and reactive changes when computer-mediated algorithms are the techniques people use to express creativity. That is, he asks whether familiar anthropological questions about agency and structure or individuality and cultural restraint are restated with a “difference which makes a difference” (Bateson 1972: 272) when improvisation is a result of proportioning styles. In doing so, he points to the possibility that familiar older anthropological theories have assumptions about channels and circulation embedded within them that cannot be applied seamlessly and without repair to contemporary mediated practices. Everyday uses of computerized algorithms might be making it necessary to uncover the implicit assumptions about media and technology in social theories that Bauman and Briggs uncovered about language in *Voices of Modernity* (2003).

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In the social science and humanities literature on algorithms, style has not been the focus of interest. Algorithms exemplify intangible processes in various domains of business, government, media, entertainment, and infrastructure. While ques-

tions of power, agency, materiality, and relationality have been widely discussed in relation to algorithms, algorithmic aesthetics have been less prominent.

While Eitan Wilf aims to explore what algorithms mean for the underpinning notions of culture in anthropology (and other disciplines), my commentary mainly concerns the handling of algorithms as objects of analysis. Wilf connects algorithms and style through an ethnographic study of a jazz-playing robot. Studying algorithms through music, even improvised music such as jazz, immediately connects algorithms to aesthetic experience and hence style. The history of music, perhaps more so than other arts, is replete with instances of algorithms and quasi-algorithmic processes. Whether in the rhythms of Afro-Cuban music, the structure of Baroque counterpoint, or twentieth-century Serialism, algorithms, mathematics, and music have been entangled. In this respect, the case that Wilf describes—Syrus, a marimba-playing robot, controlled by a statistical machine learning or artificial intelligence model—is hardly unusual. Even Syrus’s capacity to combine styles of improvisation, or “styling styles,” is not necessarily very unexpected. Recursive combination is a familiar move in algorithmic processes.

And yet to present, as Wilf does, Syrus as symptomatic of wider transformations in contemporary sociality associated with algorithms is perhaps more provocative and problematic. Whereas music is felt very immediately, experiences of algorithms in other settings are highly mediated. When we think, insofar as we can, of the algorithms at work in contemporary digital media (Facebook, Youtube, ebay, Twitter, etc.), aesthetic experience is not the category that comes first to mind. What does come to mind? Very little in fact. This is not to say we cannot know how the algorithms work. While the exact algorithmic processes are not public knowledge, the general algorithmic treatment of these data can be imputed. The algorithms are nothing particularly new. At a general level, they have been described in high-profile publications such as formed **Wired** magazine editor Kevin Anderson’s “The End of Theory” (Anderson 2008). They are taught in any number of online courses (see, e.g., Stanford University’s Andrew Ng’s cs229 course on [machine learning] (http://www.youtube.com/playlist?list=PLJ_CMBwA6bT-n1W0mgOIYwccZ-j6gBXqE)).

Two observations arise from this patent yet unfelt character of algorithms. First, algorithms could be read by cultural analysts in terms of style. The algorithms comprise a patchwork of different techniques and approaches to data. Algorithms are not stylistically consistent, and they exhibit diverse provenances, even if they are increasingly “standardized” in the form of software libraries and platforms. The fact that these algorithms are applied to personal and group behaviors in order to classify or predict actions and to leverage advertising or sales on the basis of machine learning should not lead us to flatten the many differences between them. Like the robot arms, which, as Wilf describes, impose certain stylistic constraints on Syrus’s playing, every algorithm brings with it

certain material-technical constraints that effectively style it. Similarly, every algorithm, and particularly the quite convoluted machine-learning algorithms used in social media, carries inherited latent conceptions of relation, number, movement, order, and event. In short, there is no purely algorithmic style, since algorithms themselves are styled. This means that the styling of style still has style, and the questions of coherence or integration that ran through anthropological and social science invocations of style more broadly might be reinvoked.

Wilf's comparison between Syrus and the increasingly encompassing worlds of machine-learning algorithms raises questions of scales (as in size). Syrus's data include numerous previous jazz performances and the data generated by its human players. The musical data base may be large, but compared to the accumulations of data wielded by finance, social media, many contemporary sciences, or businesses like Walmart or Amazon, it is likely to be small. The problem with the massive success of machine-learning algorithms is that their integrative scope threatens to subsume all others. This point would take some developing, but say we revisit, as Wilf does, Pierre Bourdieu's integrative concept of habitus. For Bourdieu, habitus integrates experiences "statistically common" to members of the same class. What happens when algorithms, making no assumptions about membership, class, or personhood, work out what is "statistically common" and remake the world in that style? What happens to habitus under such regimes of integration? On a large scale, algorithms performatively redistribute what is statistically common and thereby undercut the differences on which habitus or forms of life thrive. The irony of Syrus, in this context, is that its engineers and computer scientists pursue precisely the opposite: from the algorithms they hope to hear something uncommon. It would be interesting to know whether they can hear that in Syrus's playing, and if they can, to think what that would mean for our understandings of how cultural invention and change happens.

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Eitan Wilf's article presents the potent example of Syrus, an interactive robotic musician with whom fellow musicians can have an open-ended, and ideally inspirational, relationship. In contrast to the Boolean, determinate relationship that characterized our engagement with digital technology over much of its history (think ATMs or TurboTax, where the only source of contingency is user choice), Syrus behaves more like a computer-controlled agent (opponent or collaborator) in a digital game. Similarly, the lab in which we find Syrus is a contrived, yet open-ended, game-like space, where the meet-

ing of technology and human action have both a speedy, phenomenologically rich, and open-ended dimension (in the playing of music) and a reflective, symbolically mediated, and more determinate dimension (in the setting up of Syrus and his parameters between such playing).

For Wilf, this constitutes a demonstration of the limits of one strand of our thinking about culture. We must confront, he argues, how we have conceived of our embodied, culturally shaped dispositions as (a) inaccessible (because implicit, embodied, and the like) and (b) constrained by the broader parameters characteristic of a particular cultural style, both of which get in the way of understanding experiences such as those possible with Syrus. Wilf further shows how this view of culture as "style" is a mutual construction between art (and creative expression more broadly) and culture undergirding much of our disciplinary thought, ultimately traceable back to German Romanticism.

There is no doubt that in several respects anthropology must continue diligently at least to recognize and adjust, if not transform, our concepts, which bear the deep imprint of years spent under the weight of a notion of culture as bounded. One wonders, however, whether the case is perhaps overdrawn through its exclusion of other threads, especially those leading back to Gluckman and the study of conflict within cultural contexts. Could the links to him by many anthropologists who pursued another metaphor of artistic expression, theater, be part of the reason they are not presented herein? Importantly, though in a footnote, Wilf briefly suggests that dramaturgically-inspired (Goffman) and other approaches (largely in the area of linguistic performance) do not suffice to change the story: "Specifically, these approaches do not capture the facility, enhanced control, and heightened conscious agency that are entailed in style mixing via computerized algorithms." I would completely agree, but of course at this point we are quite a distance away from Wilf's broader claim that anthropology's approach to culture as style has inhibited our ability to recognize how actors can innovate beyond the constraints of a particular cultural system at all.

And so one fears that Wilf's subtler and, to me, more interesting point might get lost amid the extensive discussion of the shortcomings of our disciplinary heritage. As Wilf puts it (again in that footnote), "The style-manipulation I am concerned with is subject to heightened conscious control and reflection precisely because 'the calculation' is performed by nonhuman agents, i.e., computerized algorithms, on behalf of human agents. This frees the latter to be much more consciously agentive with their manipulation of styles." The claim here is that digital technology—in its near instantaneity, its networkable structure, and the symbolic manipulability of its code—transforms the speed, scale, and scope of social action, but just as importantly opens up new opportunities for moving back and forth along the spectrum between social action that is urgent and that which is reflective. Or, one might add, it opens up new opportunities for divvying up access to those forms of engagement between those who can tinker "under the hood,"

as computer programmers often say, and those invited only to act within this complex, open-ended, and interactive system. Such would seem to characterize an increasingly apparent social division between platform engineers (often outside of avenues of appeal) and users (despite their elevation as agents—the “crowd”—in much technoliberal rhetoric).

Human action has always taken place within domains that have run the gamut from more to less contrived, from more routinized to more open-ended, but for the most part it has been in somewhat limited ways that architects and other reflective and intentional designers of our experience could tinker with the transformations in style prompted by new designed spaces or other experiences. Furthermore, much of those projects of contrivance have been about control in the high modernist sense—about the elimination, or at least minimization, of contingency in the service of bureaucratic institutions. Now, however, the rapprochement between digital technology’s Boolean, determinate materiality and the contrived contingencies of game design (including, but beyond, the stochastic) and similar techniques has enabled new kinds of styles of styling styles, as Wilf makes clear, and he is correct that our anthropology must tackle the new avenues to manipulation, even of our dispositions, that present technology affords.

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We thank Eitan Wilf for a provocative essay integrating strong data with careful attention to the history of explanatory paradigms in anthropology. We like his style and are fascinated by the harmonies he has composed from a diverse range of ethnographic and theoretical materials. In this spirit, our comment takes the form of a conceptual improvisation, 50% Boellstorff and 50% Seaver, playing in the key of Wilf.

A central theme of Wilf’s argument is style, and as he proceeds from marimba-playing robots to Facebook to the Romantic roots of anthropology’s long obsession with style, he traces out variations on this theme. “Style” is dauntingly polysemous; as Wilf notes, it has been mobilized in many ways throughout the history of anthropology. Wilf productively links these notions of style from anthropology, music, and algorithms. To build on Wilf’s analysis, we might further address disjunctures between these conceptions of “style” and to how styles themselves are produced as objects of inquiry. Although we may call them “styles,” the statistical patterns of user behavior identified by Facebook, the cultural congruences identified by Boas, Kroeber, and Mead, and the Markov-chain probabilities of Syrus invoke different, even possibly incommensurate, notions of “style.” The fact that two or more things are identified with the same English lexeme suggests

lines of analysis, but to say that a particular large cat and a particular automobile are both “Jaguars” certainly obscures more than it reveals, and the same issue can crop up with differing notions of “style.” If we cast the analysis in terms not so reliant on the multiple meanings of English “style,” how might the analytic shift as well?

Wilf’s argument for analyzing sociality “through the prism of styles of styling styles” suggests a potentially infinite hierarchy of “styling styles” alongside the more familiar notion of personal “style.” How might further attention to nonhierarchical or lateral relationships among styles provide another perspective on emergent forms of algorithmic living? In addition to thinking of algorithmic styles as successively nested explanatory frames or mixtures of individual distinctions, we might investigate other computational figurations of style. Such an investigation could draw on alternative analyses of style, for instance, ones that foreground temporality and change (e.g., White 1978). This might serve as a counterpoint to the tendency that Wilf notes in the history of anthropology to see styles as “patterns” of holistic cultures, given that many theories of culture (e.g., structuralism and functionalism) have had difficulty accounting for change over time.

Wilf’s attention to the history of anthropology can be complemented by an attention to the history of technology and style. Drawing on this history can help us understand what precisely is new and at stake in these developments. For instance, although human expressive style and machinery have often been opposed, Wilf’s article provides a rich example of the entanglement of expression and technology. During an earlier generation of musical robots—specifically, the player piano—debates also focused on the possibilities of capturing style in a machine. High-end “reproducing pianos” could recreate subtle variations in tempo and loudness in recordings made by famous pianists. As a result, discourse around the player piano construed tempo and dynamic variation as the essence of style (Seaver 2011). Users of these pianos could take control themselves, layering their own expression over that recorded on the piano roll by manipulating levers and pedals. This represents a kind of stylistic mixing quite different from what we see in Syrus’s improvisations. This history leads us to ask, are algorithmic forms of sociality limited to those predicated on computer mediation? What might we gain from thinking through the algorithmic manipulation of style as a variation on an old theme: the intimate and evolving connection between what we think of as human and what we think of as technical?

Which brings us to algorithms. An important issue for further consideration is in what ways an “algorithmic turn” is shaping new ways of being human, and in what ways it is revealing and concretizing aspects of sociality that were there all along. The kind of slider sociality Wilf identifies in his ethnographic data raises important issues about intentionality and emergence, of ossification but also customization—affordances as well as constraints. Further exploration of variation and debate in the broader community of Wilf’s researcher interlocutors might provide interesting perspectives

on articulations of performance, technology, and style. What might other algorithmic configurations afford? How would other forms of “computer mediation” (e.g., ones not based on Markov Models) alter what “style” and “mixing” might entail?

We hope our riff on these promising lines of inquiry demonstrates how Wilf’s article provides a timely and valuable consideration of notions of style from anthropology, music, and contemporary digital culture. Given the growing pervasiveness of algorithms in everyday life, this is a valuable contribution indeed.

Reply

My article is about computer-mediated, algorithmic technologies that are able to abstract a type (e.g., style) from a corpus of tokens (e.g., specific solos of the same improviser) and thus produce new tokens of this type (e.g., new solos in “the same style”) and also enable users to manipulate the constraints that structure such types so as to produce tokens of new types. Style thus becomes much more amenable to conscious manipulation, at the same time that this manipulation is itself constrained and hence styled due to the nature of different algorithms, hardware, and cultural frameworks. To account for such technologies we must return to a key tradition of anthropological theory of theorizing culture as style, but not before we reconfigure this tradition in light of such technologies.

The theoretical added value of the distinction between tokens and types is exemplified in Eisenlohr’s comments. He correctly points out that the dialectics of token and type seem to be inescapable, that is, that at the end of the day, even the new styles created by Syrus must undergo typification by its human listeners. Elsewhere (Wilf 2013a) I have discussed in detail the ways in which humans, when interacting with such technologies, actively fill in the blank spaces in the output generated by such technologies, thus synthesizing a type from what sometimes appears to be pure difference. This persistent typification by humans notwithstanding, we should not remain blind to the fact that my focus has been technologies capable of automated typification. This makes them radically different from the technologies Eisenlohr has studied, such as CDs, MP3 files, and cassettes. To frame it in a Peircean terminology closer to Eisenlohr’s theoretical predilections, whereas he studied technologies that reproduce Seconds, Syrus is a technology that reproduces Thirds. Eisenlohr’s position might result in the argument that because humans typify any kind of data they encounter then the nature of the data becomes irrelevant. While such a position makes us sensitive to the continuities of past and present (typification by humans is inevitable), it leaves us myopic to the particularities

of the present with respect to the past (some technologies are able to typify).

Understanding these technologies as technologies that can synthesize types from a corpus of tokens and hence produce new tokens in the same style or type is crucial if we want to account for their potential impact in the sphere of online consumption. Here Bourdieu’s notion of habitus—itsself a type (“disposition”) responsible for the production of tokens (behavior) in the same style—becomes important. Mackenzie is correct to suggest that if we take algorithmic technologies that make “no assumptions about membership, class, or personhood,” then they “performatively redistribute what is statistically common” such as habitus. Yet this is not the only kind of algorithmic technologies in which a lot of R&D funds are currently being invested. For example, as some of the same “high-profile publications” mentioned by Mackenzie make it clear, companies, aided by such technologies, now increasingly experiment with assigning different prices to the same product according to assumptions they make about the socioeconomic class of specific online customers as algorithmically inferred from customers’ online behavior (Valentino-Devries, Singer-Vine, and Soltani 2012). Much of the contemporary commercial interest in algorithmic technologies is related to their hypothesized, albeit not yet fully realized, potential to classify consumers precisely according to the habitus-determining factors Bourdieu theorized. Although algorithmic processes in general are indeed nothing new—a cake recipe is an algorithm and, as I have noted in my article, Markov models have been used in algorithmic music composition since the 1950s—their contemporary computerized iterations certainly are new, especially the expanding commercialization of automatic synthesizing of types (styles) from tokens.

Such iterations, in turn, explain why certain threads in anthropological theory are more suitable than others as frames of analysis of such technologies. Hence the answer to the question posited by Malaby, namely, why I did not discuss the analytical thread leading back to Max Gluckman and the study of conflict within cultural contexts, as well as the many anthropologists who pursued another metaphor of artistic expression, theater, is quite simple: this thread frames change as unanticipated “social dramas,” and it frames agentive control in terms of individuals’ recourse to highly conventionalized rituals, behaviors, and roles as their strategy of resolving such dramas (Gluckman 1958). Such an approach is the precise negative image of the ethnographic context I studied, where change is the product of agentive control enabled via the manipulation of constraints and where the purpose of such agentive control is to stylize new behaviors, not to perpetuate highly conventionalized ones. Finally, if we take one of Gluckman’s most celebrated students who used the metaphor of theater, Victor Turner, we indeed find a theory about the existence of a social space in which society members have the capacity to step outside of, reflect on, and sometimes reconfigure taken-for-granted social norms (and hence style new styles), yet we

also find Turner famously theorizing this aspect of social life in terms of the “liminal” and “betwixt and between,” that is, as a transitory phase leading to, rather than a phase that is part of, routinized reality and behavior (see Wilf 2012:32). In contrast, the manipulation of constraints and the stylizing of styles I analyze are intended to take the form of a mundane and quite routinized aspect of the social, available to anyone with access to the appropriate technologies.

With Malaby’s second point, however, I must agree, namely, that these technologies entail a social division between people who have the skills to design such technologies or to “tinker under the hood” and people who will have to use these technologies as is, accepting the constraints designed and manipulated by others and thus the styles of styling styles as stylized by such experts. This social division is effectively discussed by Cheney-Lippold, too, who urges us to analyze these algorithmic technologies as technologies that force their users to “speak on another’s terms.” That being said, I would caution against assuming a dichotomy between a state of “immediation” in which we encounter Coltrane “on an individual level” and a state of mediation that presents us with Coltrane’s standardized shadow, as Cheney-Lippold seems to do.

At stake, as Gershon aptly puts it, are also our semiotic and media ideologies that intervene whether we listen to Coltrane in a “live” setting (itself a highly mediated state) or as simulated by style-reproducing algorithms. I could not have formulated the future research avenues opened up by my article any better than Gershon, who also correctly points out that we need to understand the ways in which practices of styling styles aided by computerized algorithms are structured by the nature of the artistic medium at stake—music, the plastic arts, poetry, and so forth—and the specific materiality of its semiotic forms (see Wilf [2012:38] for this difference with respect to technologies that reproduce tokens rather than types).

As Gershon accurately adds, my article is about a new kind of infrastructure and the possibilities and limitations of which it is productive. Hence the relevance of the very interesting point made by Duranti with which I could not have agreed more: anthropologists have tended to pursue their research individually, embodying the romantic image described so well by Susan Sontag as “the anthropologist as hero” (Sontag 1961); an anthropology of the contemporary moment, however, requires a more collaborative approach. Surprisingly, however, Duranti stops short at this description of our contemporary style of doing anthropology instead of digging deeper at the source and nature of the constraints responsible for this style: the very academic infrastructure of the humanistic social sciences. For, as any academic knows too well, resistance to “mixing styles”—that is, to academic collaboration—has been largely motivated by the concern of tenure and promotion committees to maintain “purity of individual style” so they could presumably better assess the scholarly worth of individual academics (O’Hara and Kaag 2013). As the current dean of social sciences at University of California, Los Angeles, then, it is up to people at Duranti’s administrative position to change the constraints

responsible for our current academic style. In the absence of such change, an increase in the number of major collaborative projects is unlikely to happen.

And so, at last, we arrive at the collaboratively generous response provided by Seaver and Boellstorff. They raise a host of smart questions and articulate promising avenues of research. First and foremost, they suggest that I have encompassed too much variety under the notion of style. To begin, I want to emphasize that I have focused on only one kind of algorithms, Markov processes, and that these algorithms are one of the key building blocks of the algorithmic customization architecture of companies such as Google and Facebook. Consider one of Google’s numerous patents, entitled “user-based advertisement positioning using markov models,” which is concerned with “methods and systems to modify the number and/or positioning of advertisements presented to a user based on that user’s activity patterns (e.g., previous queries, query result selections, ad selections, etc.)” [US patent 8,271,328 B1]). There is a direct line between the technologies that animate Syrus and such commercial applications, and we need to figure out which anthropological theories might be relevant to their analysis. Anthropological theories of culture as style are such theories.

Second, willingness to take seriously different iterations of the notion of style, however remote from one another they might seem to be at first glance, aligns with one of anthropology’s most valuable methodological principles. Hence it was surprising to note that Seaver and Boellstorff dismiss as uninformative a claim such as “a particular large cat and a particular automobile are both ‘Jaguars,’” for precisely such claims have been at the core of a specific social institution of some importance in the history of anthropology: totemism. Ironically, some anthropologists have taken such claims seriously and thereby been able to suggest that “‘the totemic operator,’ *articulating differences in the cultural series to differences in natural species . . . has . . . been replaced [today] by species and varieties of manufactured objects, which like totemic categories*” support social classification in the sphere of *consumer lifestyle* (Sahlins 1976:176, emphasis added; see also Roland Barthes’s *Mythologies* [1957:74], especially his wonderful “La Nouvelle Citroën” [1957:150–152]—not quite the mighty Jaguar, to be sure, but a fine car nonetheless!—for an analysis of the totemic classificatory logic of style that consists of precisely such claims, also brilliantly elucidated in Bourdieu’s *Distinction* [1984]).

Seaver and Boellstorff correctly argue that any approach to the study of computer-mediated, algorithmic forms of sociality must take into account the history of technology and style. Turning to this history, then, I want to reiterate not only what is novel about the computerized algorithms I have studied but also the ways in which anthropologists might miss this novelty by not carefully attending to what style actually is. Consider the reenacting piano, discussed by Seaver and Boellstorff, to which, incidentally, I have referred elsewhere (Wilf 2013a). Contrary to what their comments suggest, such pianos did not reproduce style. They were based in the prin-

ple of “mechanical fidelity” (otherwise effectively analyzed by Seaver), not “stylistic fidelity.” What does this difference entail? I will reiterate a point I have already made above. Such pianos reenacted specific performances recorded by great performers on a special recording piano (Seaver 2011:64–65). The reenacting piano reenacted these performances by reproducing their qualia (e.g., the intensity of each note played by the performer during the recording). They thus reproduced tokens rather than types. It is the human listener who abstracted types (styles) by listening to these reenacted tokens and perceiving relations between relations between one token’s parts or between a number of tokens of the same type (Wilf 2013a). Syrus, on the other hand, as well as the various computerized-algorithms designed to reproduce style, operates according to the principle of “stylistic fidelity”: it does not purport to reproduce past performances of a jazz master but rather to abstract a master’s style responsible for the generation of his stylistically consistent improvisations. The abstraction of a master’s style from a corpus of his past recorded improvisations allows Syrus to produce new tokens (i.e., new improvisations) of this type (i.e., in this style). The difference between tokens and types has been at the foundation of the theories of style formulated by the anthropologists I have discussed in my article, and it is highly relevant to the technologies at stake. The risk of confusing tokens with types is precisely why we need to take style seriously—indeed, “beyond the level of lexemes”—not irrespective of our desire to map out the varieties of contemporary forms of computer-mediated, algorithmic forms of sociality and their difference from forms of sociality mediated by previous media technologies, but as the very condition of possibility for our ability to do so, to begin with.

—Eitan Wilf

References Cited

- Abu-Lughod, L. 1991. Writing against culture. In *Recapturing anthropology: working in the present*. Richard G. Fox, ed. Pp. 137–162. Santa Fe, NM: School of American Research Press.
- Adorno, Theodor W. 1990. On popular music. In *On record: rock, pop and the written word*. Simon Frith and Andrew Goodwin, eds. Pp. 301–314. New York: Pantheon. [JC-L]
- Anderson, C. 2008. The end of theory: the data deluge makes the scientific method obsolete. *Wired* 16. http://www.wired.com/science/discoveries/magazine/16-07/pb_theory. [AM]
- Arnold, Jeanne E., Anthony P. Graesch, Enzo Ragazzini, and Elinor Ochs. 2012. *Life at home in the twenty-first century: 32 families open their doors*. Los Angeles: Cotsen Institute of Archaeology Press. [AD]
- Bakhtin, M. 1981. Discourse in the novel. In *The dialogic imagination*. C. Emerson and M. Holquist, trans. Pp. 259–422. Austin: University of Texas Press.
- Barthes, Roland. 1957. *Mythologies*. Paris: Seuil.
- Bateson, Gregory. 1967. *Steps to an ecology of mind*. New York: Ballantine.
- . 1972. *Steps towards an ecology of mind: collected essays in anthropology, psychiatry, evolution, and epistemology*. Chicago: University of Chicago Press. [IG]
- Bauman, Richard, and Charles Briggs. 2003. *Voices of modernity: language ideologies and the politics of inequality*. Cambridge: Cambridge University. [IG]
- Benedict, R. 2005 (1934). *Patterns of culture*. New York: Mariner.
- Boas, F. 1955 (1927). *Primitive art*. London: Dover.
- Boden, M. A. 2003. *The creative mind: myths and mechanisms*. London: Routledge.
- Bourdieu, P. 1977. *Outline of a theory of practice*. Cambridge: Cambridge University Press.
- . 1980. The aristocracy of culture. *Media, Culture and Society* 2:225–254.
- . 1984. *Distinction: a social critique of the judgment of taste*. Cambridge, MA: Harvard University Press.
- Briggs, C. L. 2002. Linguistic magic bullets in the making of a modernist anthropology. *American Anthropologist* 104(2):481–498.
- Bunzl, M. 1998. Franz Boas and the Humboldtian tradition: from Volksgeist and Nationalcharacter to an anthropological concept of culture. In *Volksgeist as method and ethic: essays on Boasian ethnography and the German anthropological tradition*. George W. Stocking, ed. Pp. 17–78. Madison: University of Wisconsin Press.
- Callon, M., and J. Law. 2005. On qualculation, agency, and otherness. *Environment and Planning D: Society and Space* 23:717–733.
- Cheney-Lippold, J. 2011. A new algorithmic identity: soft biopolitics and the modulation of control. *Theory, Culture and Society* 28(6):164–181.
- Cohen, Noam. 2008. He wrote 200,000 books (but computers did some of the work). *New York Times*, April 14, Business/Media and Advertising. <http://www.nytimes.com/2008/04/14/business/media/14link.html>. [JC-L]
- Coleman, E. G. 2010. Ethnographic approaches to digital media. *Annual Review of Anthropology* 39:487–505.
- Cope, D. 2005. *Computer models of musical creativity*. Cambridge, MA: MIT Press.
- de Kerckhove, Derrick. 1995. *The skin of culture: investigating the new electronic reality*. Toronto: Sommerville House. [PE]
- Downey, G. L. 1998. *The machine in me: an anthropologist sits among computer engineers*. London: Routledge.
- Duranti, Alessandro. 2006. Transcripts, like shadows on a wall. *Mind, Culture, and Activity* 13(4):301–310. [AD]
- Duranti, Alessandro, and Steven P. Black. 2012. Socialization and verbal improvisation. In *Handbook of language socialization*. A. Duranti, E. Ochs, and B. B. Schieffelin, eds. Pp. 443–463. Malden, MA: Wiley-Blackwell. [AD]
- Eckert, P., and J. R. Rickford, eds. 2002. *Style and sociolinguistic variation*. Cambridge: Cambridge University Press.
- Eliashberg, Jehoshua, Sam K. Hui, and Z. John Zhang. 2007. From story line to box office: a new approach for green-lighting movie scripts. *Management Science* 53(6):881–893. [JC-L]
- El Or, T. 2012. The soul of the Biblical sandal: on anthropology and style. *American Anthropologist* 114(3):433–445.
- Erlmann, Veit, ed. 2004. *Hearing cultures: essays on sound, listening and modernity*. Oxford: Berg. [PE]
- Feld, Steven. 1996. Waterfalls of song: an acoustemology of place resounding in Bosavi, Papua New Guinea. In *Senses of place*. Steven Feld and Keith H. Basso, eds. Pp. 91–136. Santa Fe, NM: School of American Research Press. [PE]
- Geertz, C. 1973. *The interpretation of cultures*. New York: Basic.
- Gell, A. 1998. *Art and agency: an anthropological theory*. Oxford: Clarendon.
- Gluckman, Max. 1958. *Analysis of a social situation in modern Zululand*. Manchester: University of Manchester Press.
- Goffman, E. 1981. Footing. In *Forms of talk*. Pp. 124–159. Philadelphia: University of Pennsylvania Press.
- Gombrich, E. 1968. Style. In *International encyclopedia of the social sciences*. D. L. Sills, ed., vol. 15. Pp. 352–361. New York: Macmillan.
- Goodwin, Charles, and Marjorie H. Goodwin. 1996. Seeing as a situated activity: formulating planes. In *Cognition and communication at work*. Y. Engeström and D. Middleton, eds. Pp. 61–95. Cambridge: Cambridge University Press. [AD]
- Hallam, Elizabeth, and Tim Ingold, eds. 2007. *Creativity and cultural improvisation*. Oxford: Berg. [AD]
- Hayles, N. K. 1999. *How we became posthuman: virtual bodies in cybernetics, literature, and informatics*. Chicago: University of Chicago Press.
- Hebdige, D. 2005. *Subculture: the meaning of style*. London: Routledge.
- Heidegger, Martin. 1977. The question concerning technology. In *The question concerning technology and other essays*. Translated and with an introduction by William Lovitt. Pp. 3–35. New York: Garland. [PE]
- Helmreich, S. 1998. *Silicon second nature: culturing artificial life in a digital world*. Berkeley: University of California Press.
- . 2003. Trees and seas of information: alien kinship and the biopolitics

- of gene transfer in marine biology and biotechnology. *American Ethnologist* 30(3):340–358.
- Henshilwood, C. S., and B. Dubreuil. 2012. Style, symbolism, and complex technology: the Middle Stone Age in Southern Africa; a response to Shea. *Current Anthropology* 53(1):132–133.
- Horkheimer, M., and T. Adorno. 2002. *Dialectic of enlightenment*. Stanford, CA: Stanford University Press.
- Hutchins, Edwin. 1995. *Cognition in the wild*. Cambridge, MA: MIT Press. [AD]
- Ihde, Don. 2007. *Listening and voice: phenomenologies of sound*. 2nd ed. Albany: State University of New York Press. [PE]
- Jakobson, R. 1960. Concluding statement: linguistics and poetics. In *Style in language*. Thomas A. Sebeok, ed. Pp. 350–377. Cambridge, MA: MIT Press.
- Kiesling, S. 2009. Style as stance: stance as the explanation for patterns of sociolinguistic variation. In *Stance: sociolinguistic perspectives*. A. Jaffe, ed. Pp. 171–194. Oxford: Oxford University Press.
- Kittler, Friedrich. 1997. *Literature, media, information systems*. John Johnston, ed. Amsterdam: G+B Arts International. [PE]
- Kockelman, P. 2011. Biosemiosis, technocognition, and sociogenesis: selection and significance in a multiverse of sieving and serendipity. *Current Anthropology* 52(5):711–739.
- Kroeber, A. 1957. *Style and civilizations*. Ithaca, NY: Cornell University Press.
- Latour, B. 2005. *Re-assembling the social*. New York: Oxford University Press.
- Lavie, Smadar, Kirin Narayan, and Renato Rosaldo, eds. 1993. *Creativity in anthropology*. Ithaca, NY: Cornell University Press. [AD]
- Liep, John, ed. 2001. *Locating cultural creativity*. London: Pluto. [AD]
- Mackenzie, A. 2003. Bringing sequences to life: how bioinformatics corporalizes sequence data. *New Genetics and Society* 22(3):315–332.
- Maurer, Bill. 2011. Afterword: mobile money, money magic, purse limits and pins; tracing monetary pragmatics. *Journal of Cultural Economy* 4(3):349–359. [IG]
- McLuhan, Marshall. 1964. *Understanding media: the extensions of man*. New York: McGraw-Hill. [PE]
- Mohler, G. O., M. B. Short, P. J. Brantingham, F. P. Schoenberg, and G. E. Tita. 2011. Self-exciting point process modeling of crime. *Journal of the American Statistical Association* 106:100–108. [AD]
- Nettl, B. 1995. *Heartland excursions: ethnomusicological reflections on schools of music*. Urbana: University of Illinois Press.
- Nettl, Bruno, and Melinda Russell, eds. 1998. *In the course of performance: studies in the world of musical improvisation*. Chicago: University of Chicago Press. [AD]
- Nierhaus, G. 2010. *Algorithmic composition: paradigms of automated music generation*. New York: Springer.
- Ochs, Elinor, and Tamar Kremer-Sadlik, eds. 2013. *Fast forward families: home, work, and relationships in middle-class America*. Berkeley: University of California Press. [AD]
- O'Hara, David, and John Kaag. 2013. Friends with benefits. *Chronicle of Higher Education*, May 28.
- Pachet, F. 2003. The Continuator: musical interaction with style. *Journal of New Music Research* 32(3):333–341.
- Pariser, E. 2011. *The filter bubble: what the Internet is hiding from you*. London: Viking.
- Rabinow, Paul. 2008. *Marking time: on the anthropology of the contemporary*. Princeton, NJ: Princeton University Press. [AD]
- Rabinow, Paul, and George Marcus, with James D. Faubion and Tobias Rees. 2008. *Designs for an anthropology of the contemporary*. Durham, NC: Duke University Press. [AD]
- Sahlins, Marshal. 1976. *Culture and practical reason*. Chicago: University of Chicago Press.
- Sapir, E. 1985a. Culture, genuine and spurious. *Selected writings of Edward Sapir in language, culture, and personality*. David G. Mandelbaum, ed. Pp. 308–331. Berkeley: University of California Press.
- . 1985b. Language. *Selected writings of Edward Sapir in language, culture, and personality*. David G. Mandelbaum, ed. Pp. 7–32. Berkeley: University of California Press.
- Sawyer, R. Keith. 2001. Play as improvisational rehearsal: multiple levels of analysis in children's play. In *Children in play, story and school*. A. Göncü and E. Klein, eds. Pp. 19–38. New York: Guilford. [AD]
- Seaver, N. 2012. Algorithmic recommendations and synaptic functions. *limn* 2. <http://limn.it/algorithmic-recommendations-and-synaptic-functions/>, accessed October 23, 2012.
- Seaver, Nick. 2011. "This is not a copy": mechanical fidelity and the re-enacting piano. In *The sense of sound*. Rey Chow and James A. Steintrager, eds. Special issue, *differences: A Journal of Feminist Cultural Studies* 22(2–3):54–73.
- Selfridge-Field, E. 2001. Composition, combinatorics, and simulation: a historical and philosophical enquiry. *Virtual music: computer synthesis of musical style*. David Cope, ed. Pp. 186–219. Cambridge, MA: MIT Press.
- Silverstein, M. 1995. Shifters, linguistic categories and cultural description. In *Language, culture and society*. Ben G. Blount, ed. Pp. 187–221. Prospect Heights, IL: Waveland.
- Sontag, Susan. 1961. The anthropologist as hero. In *Against interpretation*. Pp. 69–81. New York: Delta.
- Sorokin, P. 1957 (1937). *Social and cultural dynamics: a study of change in major systems of art, truth, ethics, law and social relationships*. Boston: Horizons.
- Spengler, O. 1991 (1918). *The decline of the West*. Oxford: Oxford University Press.
- Stocking, G. W., Jr. 1966. Franz Boas and the culture concept in historical perspective. *American Anthropologist* 68(4):867–882.
- . ed. 1988. *Malinowski, Rivers, Benedict and others: essays on culture and personality*. Madison: University of Wisconsin Press.
- . 1989. Introduction: the basic assumptions of Boasian anthropology. In *A Franz Boas reader: the shaping of American anthropology, 1883–1911*. George W. Stocking, ed. Pp. 1–20. Chicago: University of Chicago Press.
- Suchman, L. 2007. *Human-machine reconfigurations: plans and situated actions*. Cambridge: Cambridge University Press.
- Taylor, C. 1989. *Sources of the self: the making of the modern identity*. Cambridge, MA: Harvard University Press.
- Thompson, L. 1945. Logico-aesthetic integration in Hopi culture. *American Anthropologist* 47(4):540–553.
- Toynbee, A. J. 1987. *A study of history*. Oxford: Oxford University Press.
- Valentino-Devries, Jennifer, Jeremy Singer-Vine, and Ashkan Soltani. 2012. Websites vary prices, deals based on users' information. *Wall Street Journal*, December 24.
- Virilio, Paul. 1998. *The Virilio reader*. James Der Derian, ed. Oxford: Blackwell. [PE]
- White, Hayden. 1978. Tropics of discourse: essays in cultural criticism. Baltimore: Johns Hopkins University Press. [NS/TB]
- Wilf, Eitan. 2010. Swinging within the Iron Cage: modernity, creativity, and embodied practice in American postsecondary jazz education. *American Ethnologist* 37(3):563–582.
- . 2011. Sincerity versus self-expression: modern creative agency and the materiality of semiotic forms. *Cultural Anthropology* 26(3):462–484.
- . 2012. Rituals of creativity: tradition, modernity, and the "acoustic unconscious" in a U.S. collegiate jazz music program. *American Anthropologist* 114(1):32–44.
- . 2013a. From media technologies that reproduce seconds to media technologies that reproduce thirds: a Peircean perspective on stylistic fidelity and style-reproducing computerized algorithms. *Signs and Society* 1(2).
- . 2013b. Sociable robots, jazz music, and divination: contingency as a cultural resource for negotiating problems of intentionality. *American Ethnologist* 40(4):605–618.
- . 2014. *School for cool: the academic jazz program and the paradox of institutionalized creativity*. Chicago: University of Chicago Press. Forthcoming.
- Winckelmann, J. 1972. *Writings on art*. New York: Phaidon.
- Zaloom, C. 2006. *Out of the pits: traders and technology from Chicago to London*. Chicago: University of Chicago Press.