Routledge, 2003), Kofi Agawu argues passionately for not reducing African music to rhythm.

14. When Oumou Sangare performs she is often hugged by audience members on stage.

15. In Bamanankan, the singular form is *jeli*, the plural *jeliw* (pronounced jel-ee-ou).

16. Eric Charry, *Mande Music: Traditional and Modern Music of the Maninka and Mandinka of Western Africa* (Chicago: University of Chicago Press, 2000), 291.

17. Nicholas Cook, *Analysing Musical Multimedia* (Oxford: Oxford University Press, 1998), 23, 270.

18. Ingrid Monson, "Hearing, Seeing, and Perceptual Agency," *Critical Inquiry* 34, no. S2 (2008): S36–S58.

19. Philip Auslander, *Liveness: Performance in a Mediatized Culture* (New York, Routledge, 1999).

ROGER MOSELEY

Playing Games with Music (and Vice Versa)

Ludomusicological Perspectives on *Guitar Hero* and *Rock Band*

I wonder about the future, when not so many people are playing *Guitar Hero* or *Rock Band* any more. The many guitar controllers made of plastic: where do they go? Have you seen that, in Africa, some countries accept e-waste from Europe? I saw so many CD and cassette players. I really don't like that kind of situation.

—MASAYA MATSUURA[1]

CENTURIES FROM NOW, one might imagine, archaeologists combing landfill sites in Africa in search of clues concerning musical culture at the beginning of the millennium will be confronted with bewildering evidence. The organic materials from which traditional instruments are currently made will have decayed, their metal turned to rust. If not irreparably damaged, the delicate circuit boards of the digital audio workstations on which early twenty-first-century music is created and recorded will have been frozen in obsolescence; the binary code enciphering their musical operations, etched in concentric rings on hard disk platters, will need to be decrypted. In any case, all such remnants will be dwarfed by mountains of undersized plastic guitars, preserved in excellent condition owing to their petrochemical composition. Manufactured in China, they will be found to have traveled all over the globe—particularly to North America—en route to their final resting places.

Organologists of the future might puzzle over the musical function of these stringless and pickup-less pseudo-chordophones, for it will quickly

become apparent that they have never been capable of generating any sound beyond the clatter of five brightly colored buttons on the neck and the click of a rocker switch in the middle of the body: they lack even a MIDI interface. Were they toys for children, mere models of "real" guitars, or fetish objects that transmitted the bardic lore of ancient "rock 'n' roll"? Did they represent an electronic evolution of the electric guitar, or were they aligned with the revolution of early digital musical culture? Did their ubiquity signify a democratization or a debasement of musical skills and values? Most intriguing of all, how were they played, and what kinds of musical experience did they enable?

At the height of their popularity in 2008, the *Guitar Hero* and *Rock Band* franchises seduced millions of players with the promise of the ultimate in rock-star verisimilitude.[2] By the end of 2010, however, players had begun to relegate their plastic instruments to the attic in what will perhaps prove to be the first legs of their journeys to African landfill sites such as those observed by Masaya Matsuura, the Japanese musician and game developer who has been hailed as a founder of the "rhythm-action" genre of digital games.[3] By pondering the ultimate fate of *Guitar Hero* and *Rock Band* peripherals and their unintended environmental consequences, Matsuura tacitly draws attention to the complex economic and cultural forces that both shape and issue from the West's insatiable appetite for novel forms of entertainment. From the vantage point of an imaginary future, we might gain perspective on the vertiginous rise and decline of these games over the course of the last decade. But beyond that, we might also begin to map out larger historical and geographical networks that locate *Guitar Hero* and *Rock Band* within an epistemological and technological trajectory connecting Athanasius Kircher's Rome, Jacques de Vaucanson's Lyon, Charles Babbage's London, and Matsuura's Tokyo to Cambridge, Massachusetts, home of Harmonix Music Systems, the games' original development studio. Before we proceed, however, a short description of these games and the type of musical gameplay they enable will be in order for the uninitiated.[4] For this purpose, *Rock Band 3*, developed by Harmonix and published by MTV Games in 2010, will represent the ten *Guitar Hero* and *Rock Band* games released for digital game consoles between 2005 and 2010.[5]

Rock Band 3 invites up to seven people to form a band in order to "perform" rock songs from the 1960s to the 2010s via a game console, a television, and plastic peripherals in the form of microphones, guitars, a two-octave keyboard, and a drum kit. On guitar, drums, and keyboard, the games demand rhythmic accuracy and manual dexterity: players watch

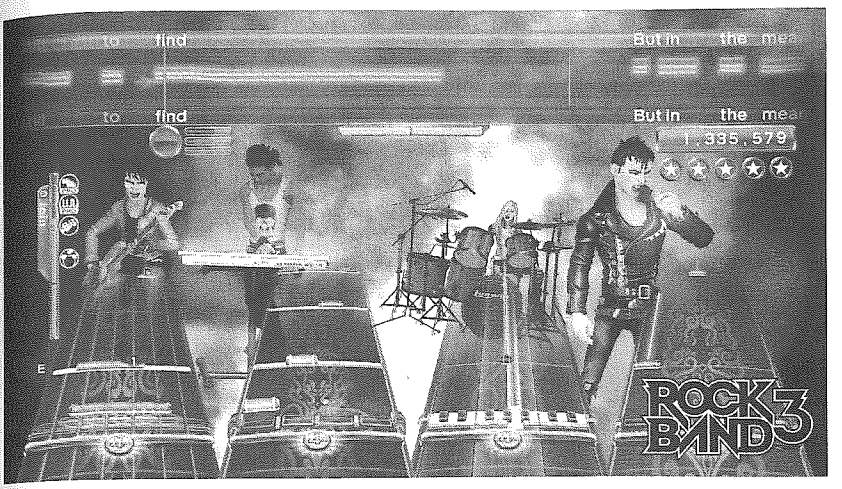

Fig. 1. Promotional image featuring the *Rock Band 3* gameplay interface, reproduced courtesy of Harmonix Music Systems. The lyrics and relative pitches for three vocalists scroll from right to left along the "staff" at the top of the screen, while color-coded "gems" travel toward the four instrumentalists (from left to right: guitar, drums, keyboard, and bass). The guitar and keyboard are depicted in "Pro" mode, discussed in note 64. The vertical bar on the left indicates how well each member of the band is playing; the current collective score and star rating are on the right. (Image © 2010 Harmonix Music Systems, Inc.)

color-coded "gems" travel toward them via "note tunnels" that constitute a form of animated tablature, melding a piano roll with the iconography of a guitar fretboard and the multi-dimensionality of a journey through both space and time (see figure 1).[6] Players react either by hitting the appropriate color-coded drums or keys, or by holding down the relevant colored buttons on the neck of the guitar and activating the "strum bar," when the gems cross a threshold at the bottom of the screen. Using a karaoke-style microphone, the vocalist attempts to hit the pitches indicated by horizontal lines across the top of the screen, although he or she is free to switch octaves (and phonemes) at will. The band's collaborative performance is quantified in points and reflected in the on-screen crowd's reaction: play well and they will respond enthusiastically; play poorly and boos will ring out. At the successful completion of each song, the game presents players with metrical evaluations of their rendition, summarized by a star rating akin to those dispensed by music critics. The group's "career" progresses

through numerous set-lists and venues across the world until global rock-stardom has been achieved (or the console has been powered down for the night).

The enormous commercial success that *Guitar Hero* and *Rock Band* enjoyed between 2006 and 2009 was as unexpected as it was dramatic. Faced with the unlikely transformation of the concept from an obscure, expensive, and impractical digital game into a multi-billion-dollar pop-culture phenomenon, commentators grasped for superlatives.[7] The *New York Times* hailed *The Beatles: Rock Band* as "a cultural watershed," "a transformative entertainment experience," and quite possibly "the most important video game yet made."[8] For many rock stars and guitar teachers, conversely, the proliferation of plastic guitars was an insulting commoditization that trivialized the rock-star ethos and its discourses of authenticity, rebellion, and individualism.[9] In 2008, Alex Rigopulos, co-founder of Harmonix, alumnus of the MIT Media Lab, and one of *Time Magazine*'s 100 most influential people of 2008, asserted, "We're at the beginning of a . . . revolution of music now where playing with music [rather than listening to it] is what people are going to expect to do with music that they love."[10] Few dared to disagree, for better or for worse, especially since MTV's acquisition of Harmonix in 2006 had lent powerful corporate backing to the notion that revenue streams from digital games might even save the entire recorded music industry. By the end of 2009, however, the multi-billion-dollar bubble was deflating fast: music-based game sales were down by $784 million on the previous year.[11] Although macroeconomic factors doubtless contributed to this state of affairs, the game publishers' exploitation of their franchises also led to accusations of overkill.[12] MTV's parent company Viacom disposed of Harmonix in 2010, thereby restoring the studio's independence, and Activision announced the closure of its *Guitar Hero* division the following year.[13]

Despite the unprecedented and transformative impact that technological innovations have had on music over the last two centuries, the period is also littered with the detritus of futures that never came to be. Alongside Johann Nepomuk Maelzel's wildly successful metronome, for instance, languishes his ill-fated panharmonicon.[14] Moreover, when a new technology manages to grip the imagination, it rarely does so in quite the manner envisaged by those behind it: think of the saxophone, the phonograph, or the Hammond B-3 organ. From this perspective, perhaps it was the very clarity of the future promised by *Guitar Hero* and *Rock Band* that so quickly reduced them to yesterday's vision of tomorrow. At the same time, their rise and fall adheres to the template of a classic rock narrative: the arc charting their fortunes traces that of the indie band whose meteoric commercial suc-

cess elicits disdain from elitists and accusations of "selling out" from its devoted fan-base, precipitating a rapid return to obscurity. Just as the games' popularity grew in large part through the buzz created via online communities, viral marketing, and other forms of memetic transmission (including old-fashioned word of mouth), so did their fortunes wither owing to the same relentless pursuit of novelty on the part of consumers and the saturation of the marketplace that was fueled by ruthless competition between the games' publishers.[15] There is no doubt that *Guitar Hero* and *Rock Band* were thoroughly enmeshed in the labyrinthine networks of (re)mediation through which twenty-first-century economic and social capital circulate, as Kiri Miller has shown; she has also demonstrated however, that first-person encounters with these games are characterized by an intense immersion in the moment.[16] The engrossing experiences that they afford hints at a deep relationship between the absorptive and ephemeral attributes of musical performance and digital gameplay. In this essay, I will explore the terms on which that relationship might be articulated under the rubric of "ludomusicology."

To the best of my knowledge, the digital-game researcher and music theorist Guillaume Laroche coined the Graeco-Latin word "ludomusicology" in 2007.[17] Whereas Laroche's deployment of the term has reflected a primary interest in music *within* games, I am more concerned with the extent to which music might be understood as a mode of gameplay. In my view, ludomusicology involves the study of both the musically playful and the playfully musical. Bringing music and play into contact in this way offers access to the undocumented means by which composers, designers, programmers, performers, players, and audiences interact with music, games, and one another. It promises to account for competitive behavior, the acceptance and evasion of protocols and constraints, the pleasures of rhythmic bodies in motion, and the dizzy delight taken in exhibitions of virtuosity. Ludomusicology is thus more concerned with performativity—with discourses that, in Austinian terms, do what they say—than it is with the text-based preoccupations of representation, meaning, and interpretation.[18] In other words, ludomusicology recognizes that music and digital games are not merely to be read, seen, or heard, but *played*. Music, from this perspective, constitutes a set of cognitive, technological, and social affordances for behaving in certain ways, for playing in and with the world through the medium of sound and its representations. For their part, digital games offer rules—which is to say possibilities bound by constraints—for entering into relationships with the world that are simultaneously material and imaginary, real and virtual.

Guitar Hero and *Rock Band* serve as excellent test cases for ludomusicology because they explicitly conflate the playing of games and of music.

They thus provide an opportunity to investigate how concepts and terminology associated with digital games might illuminate musical artifacts and practices.[19] To demonstrate the scope of ludomusicological inquiry, I will first consider what musical performance and digital gameplay have in common as alternatives, supplements, or antonyms for "work." Drawing on an influential taxonomy developed by anthropologist and sociologist Roger Caillois, I will outline a conceptual framework for the types of musical play that *Guitar Hero* and *Rock Band* invoke and combine before considering the material elements that enable them. The games' controllers draw on the rhetoric of toys in order to invite playful engagement; at the same time, they serve as interfaces between the digitality of computer code and of players' fingers, thereby translating dexterous performance into the terms of information theory and cybernetics. As both toys and machines, these guitar controllers undermine the discourse of authenticity so central to rock music's mythology, instead forcing players to confront the recursively mediated quality of their ludomusical experiences.

How do the hardware and software of these games configure the interactive possibilities for those who engage with them? Players of *Guitar Hero* and *Rock Band* shuttle between the roles of the traditional performer and the contemporary listener, for whom to "play" means to trigger the reproduction of a performance by pressing a button on an electronic device. Playing the "guitar" thus entails playing the music *back* via the interaction of fingers and buttons, but it also involves playing *along with* it. Multiple implications of "recreation" are apt here: as well as connoting the pleasure and entertainment derived from playful activity, the term connotes the games' reproductive aspects and the extent to which they inspire players both to play according to the rules and to create anew via disruptive play, hacking, and the modification (or "modding") of both software and hardware. The complex and diverse manifestations of recreation that emerge from ludomusical engagement with *Guitar Hero* and *Rock Band* can be traced back to a range of North American, European, and Japanese sources, objects, and traditions. By charting this nexus and revealing connections that reach across both space and time, I hope to suggest how a ludomusicological approach might inform the study of disparate musical texts and practices.

From Work to Play: Definitions and Taxonomies

Exploring the motives and purposes of human play has preoccupied anthropologists, sociologists, cognitive scientists, economists, philosophers,

psychologists, and educators.[20] Within Western culture, the issue of how play and work mutually define, exclude, and complement each other has been a central concern, as a glance at definitions of the two words in the *Oxford English Dictionary* confirms. To paraphrase: work is obligatory while play is voluntary; work moves objects via effort and exertion, while in play they oscillate and revolve freely; work transforms things from one state into another via laborious construction, while play involves quicksilver shifts between states; work is tiresome while play is pleasurable; and work is real while play is make-believe. Perhaps most relevant in this context, work has to do with the production of the plastic fine arts—and, of course, the *musical* work—whereas play has to do with the enactment of drama, on the one hand, and musical performance and *re*production, on the other.

The markedness of this binarism, and in particular the elevation of work over play in moral, religious, and economic spheres, was noted by Max Weber, who accounted for it in terms of the rise of Protestantism and capitalism.[21] In *Die rationalen und soziologischen Grundlagen der Musik*, Weber subjected the history of European art music to similar treatment: he argued that while the rational, systematic basis of literate "art" music held great potential for composers, conductors, and audiences from the nineteenth century onward, it did so at the expense of improvisatory, informal styles of play.[22] Weber's historical reflections registered the discursive influence of *Musikwissenschaft*, according to which music was treated primarily as a textual medium, and pride of place was reserved for the reified musical work and its associated ethic. Perhaps this is unremarkable in light of the discipline's philological heritage, but its effects have been far-reaching. The imposing figure of Beethoven embodies the values of this system: his compositional labor, painstakingly documented by copious sketches and manifested through *thematische Arbeit*, has been privileged over the performer's responsibility to play the carefully tallied score.[23] Such musical works have been curated in an imaginary museum, to cite Lydia Goehr's resonant formulation, as canonical objects to be venerated rather than as pretexts for playful performance.[24]

In his 1958 book *Les jeux et les hommes*, Caillois echoed Weber's argument that the reasons for valuing work over play were moral and economic, since "play is an occasion of pure waste: waste of time, energy, ingenuity, skill, and often of money. . . . Nothing has been harvested or manufactured, no masterpiece has been created, no capital has accrued."[25] For Caillois, as for Weber, play was at odds with the commitments to productivity, utility, and hard work typical of industrialized societies. The uncertainty surrounding the outcome of play, its governance according to arbitrary rules,

its focus on the pleasures and challenges of the moment, and its celebration of novelty, fantasy, and make-believe defy the moral rigor of work. But, as Caillois went on to argue, these attributes of play might also enable it to be construed as the most profound of pursuits. This belief has a long and distinguished history stretching back to Plato's Athenian sage in the *Laws*, who asked, "What, then, will be the right way to live? A man should spend his whole life at 'play'—sacrificing, singing, dancing."[26] Framed this way, play is not mere escapism from the daily grind but rather its ultimate purpose: humans work in order to be able to play.

Hans-Georg Gadamer observed that "the word 'Spiel' originally meant 'dance'. . . . The movement of playing has no goal that brings it to an end; rather, it renews itself in constant repetition."[27] Gadamer's formulation suggests an aesthetic connection between inutility and Immanuel Kant's notion of "purposiveness without purpose" that locates the beautiful in a realm beyond the reach of utilitarian function or explanation. Following Kant, as Claus Pias points out, Friedrich Schiller conceived of this realm as a space for interplay between life and form, power and law, nature and reason, through which "a state of the highest reality" could be attained.[28] For Schiller, the *Spieltrieb* (or play instinct) drove the pursuit and unification of aesthetics, happiness, and moral perfection: "Humans only play when they are in the fullest sense of the word human beings, and *they are only fully human when they play.*"[29] In their different ways, then, Plato, Kant, Schiller, and Gadamer perceived work to be a necessary prelude to the rituals of play, embodied through motion, rhythm, and pattern.

In his influential book *Homo Ludens*, first published in 1939, Johan Huizinga directly challenged the cultural valorization of work over play. Huizinga noted that the display of skill, the pleasure in testing the limits of one's own abilities and those of others, and sometimes even the endangerment of one's safety and well-being for no apparent reason pervade many societies, often to an extent which defies utilitarian explanation.[30] Going further, Huizinga asserted that a culture's most vital elements—its religious, philosophical, political, and artistic fields—should be understood as fundamentally playful in that they foreground theatricality, competition, challenge, virtuosity, and improvisation.[31] These characteristics shed light on the linguistic and conceptual parallels between music and games. In many ancient and modern languages, the verb "to play" is applicable to both: Huizinga speculated that "it seems probable that the link between play and instrumental skill is to be sought in the nimble and orderly movements of the fingers."[32]

Despite—or perhaps owing to—its boldness, Huizinga's thesis runs the

risk of essentializing play and understating the degree to which it is socially embedded. While play has undoubtedly suffered as work's marked antonym, merely inverting their hierarchical relationship fails to address the historical and social contingency of each term. In *The Adventures of Tom Sawyer*, Mark Twain encapsulated the difficulty of distinguishing between the two with striking simplicity: "Work consists of whatever a body is *obliged* to do, and . . . Play consists of whatever a body is not obliged to do."[33] The notion of obligation that articulates Twain's opposition of work and play can be understood in many ways, depending on whether one adopts an economic, sociological, or psychological perspective. There is nothing intrinsic about a given activity that defines it as either "work" or "play": it is categorized as such according to the values, functions, and imperatives assigned to it within a given society or ideology, as well as by the psychological profiles of the individuals involved. The very conditions and characteristics that make play enchanting—motion, rhythm, repetition, and the challenges posed by rules—can be identical to those that make work tedious and arduous, as any professional athlete will testify.[34] In a musical context, Twain's maxim warns against mapping work and play onto the activities of composers and performers/listeners respectively. While taking account of the economic and sociocultural formations that construct the work/play dichotomy, we will thus have to look beyond them in order to identify the material and phenomenological conditions under which music becomes playful and play musical.

Play's resistance to definition has proved to be one of its defining qualities, but this has not precluded attempts to name and classify its manifestations. In *Les jeux et les hommes*, Caillois refined Huizinga's identification of play's components and attributes, enumerating six central characteristics: freedom (play must be voluntary), separateness (play takes place in what Huizinga called a "magic circle" that is marked off from everyday life even as it constitutes part of it), uncertainty (the outcome must not be known in advance), unproductivity (the object of a game is not to produce goods or capital, although it may redistribute them, as is the case with gambling), regulation (whether by rules, customs, or taboos), and fictiveness (play unfolds in a subjunctive mood, "as it were" rather than "as it is").[35] In accordance with what he termed his "diagonal" orientation, Caillois also proposed a taxonomic system according to which games can be understood in terms of four basic categories (or certain combinations thereof): *agôn* (games of competition, from chess to gladiatorial combat), *alea* (games of chance, such as roulette or certain card games), *mimicry* (playful activities involving simulation or make-believe, such as theater, charades, or masked

Table I. Classification of Games

	AGÔN (Competition)	ALEA (Chance)	MIMICRY (Simulation)	ILINX (Vertigo)
PAIDIA	Racing, Wrestling, Etc. (not regulated)	Counting-out rhymes	Children's initiations	Children "whirling"
Tumult	Athletics	Heads or tails	Games of illusion	Horseback riding
Agitation			Tag, Arms	Swinging
Immoderate laughter			Masks, Disguises	Waltzing
Kite-flying	Boxing, Billiards	Betting		Volador
Solitaire	Fencing, Checkers	Roulette		Traveling carnivals
Patience	Football, Chess			Skiing
Crossword puzzles	Contests, Sports in general	Simple, complex, and continuing lotteries*	Theater	Mountain climbing
			Spectacles in general	Tightrope walking
LUDUS				

N.B. In each vertical column games are classified in such an order that the *paidia* element is constantly decreasing while the *ludus* element is ever increasing.

* A simple lottery consists of the one basic drawing. In a complex lottery there are many possible combinations. A continuing lottery (e.g. Irish Sweepstakes) is one consisting of two or more stages, the winner of the first stage being granted the opportunity to participate in a second lottery. [From correspondence with Caillois. M.B.]

Table 1. "Classification of Games," reproduced from Roger Caillois, trans. Meyer Barash, *Man, Play, and Games*, 36.

carousing at the Venetian carnival), and *ilinx* (activities involving vigorous motion that induces disorientation or vertigo, such as dancing the tarantella or riding on roller coasters).[36] Caillois's categories, along with examples of games that fall into each, are represented in table 1.

Caillois proposed this taxonomy as a corrective to what he saw as Huizinga's narrow focus on play as *agôn*. The categories of *alea*, *mimicry*, and *ilinx* were posited to reflect the pecuniary and arbitrary aspects of play, its social formations and rituals, and its unruly kineticism. Caillois thus aimed to deepen and complicate Huizinga's fundamental insight into the importance of play by showing it to be more than the rehearsal or enactment of antagonistic conflict.

In musical terms, the competition associated with *agôn* is brought to the fore in contests based on skill and popularity, from the mythical duel between Apollo and Marsyas to the historic clash between Mozart and Clementi, and from the song contest in Wagner's *Die Meistersinger von Nürnberg* to the television show *American Idol*. *Agôn* is also a feature of certain musical genres or idioms, from the "dozens" (the African-American tradition of head-to-head improvised verbal sparring that contributed to the rise of battle rap in the late 1970s) and the trading of improvised jazz solos to the classical concerto (which typically pits the heroic soloist against the massed forces of the orchestra). The vast majority of digital games inculcate or reflect *agôn:* it is particularly prominent in first-person shooters and sports games, but can be found in any game featuring multi-player modes, adversarial artificial intelligence, or high-score tables. *Guitar Hero* and *Rock Band* facilitate individual and co-operative competition between rival players (both locally and online) in which the player or band with the higher score prevails. Moreover, *Guitar Hero III: Legends of Rock* infuses the *agôn* of the musical contest with the digital-game convention of the "boss battle," a titanic encounter that pits the human "guitarist" against a computer-controlled opponent.[37] In a Faustian finale worthy of Niccolò Paganini, the game culminates in a virtuosic duel with "Lou the Devil" to the strains of "The Devil Went Down to Georgia."[38]

Caillois's category of *alea* accounts for games in which players abdicate their agency to the vagaries of chance. Its musical manifestations are relatively rare, and are more often found in compositional strategies than in playful performance: from this perspective, eighteenth-century musical dice games rub shoulders with aleatoric compositions by John Cage, Karlheinz Stockhausen, and Pierre Boulez.[39] The only relevant aspect of *Guitar Hero*, however, is the randomly allocated "power-up" (a temporary gameplay aid) that the player can earn during boss or multiplayer battles.

By contrast, the category of *mimicry*, or simulation, offers many possibilities for parsing the complex and ambiguous ways in which *Guitar Hero* and *Rock Band* negotiate between fantasy and reality.[40] Chief among these is the degree to which the games' miniaturized plastic guitars encourage imaginary role-playing by fostering the illusion that the player is "playing" a rock star, even as they convey an ironic awareness of the absurdity of the conceit. Caillois points out that this type of contradiction is more apparent than real, since the pleasure of *mimicry* lies in playful imitation rather than serious deception: "The child who is playing train may well refuse to kiss his father while saying to him that one does not embrace locomotives, but he is not trying to persuade his father that he is a locomotive."[41] In other words, the child simultaneously is and is not a locomotive, just as the actor is and is not Hamlet.[42] The subjunctivity of *mimicry* sidesteps the oft-rehearsed arguments over whether plastic guitars are "real" or "fake": to insist on the distinction in a ludic context is as meaningless as it would be to argue over the toxicological effects of the "poison" taken by Leonora in a production of *Il trovatore*.[43]

The category of *ilinx* is most directly applicable to the kinesthetically thrilling experience of musical performance. For Caillois, *ilinx* is centered on testing the limits of the player's embodied control and proprioception, as exemplified by activities such as rolling down hills to induce dizziness, certain drinking games, or bungee jumping.[44] Its emphasis on risk-taking and the loss of self-possession allies *ilinx* to the exhibition of musical charisma and virtuosity, the disorienting effects of which are often transmitted to the audience (as in the case of those who swooned in the presence of Liszt or The Beatles). *Ilinx* is also associated with certain musical genres: the unpredictable rhythmic dislocations and boisterous humor of a Beethoven scherzo, for example, burlesque the staid eighteenth-century minuet by infusing it with a heady dose of *ilinx*. In the context of *Guitar Hero* and *Rock Band*, players may incorporate *ilinx* as part of their rock-star *mimicry* by performing such feats as playing the guitar behind their heads, or with their eyes closed. The games themselves encourage such exuberant behavior by allowing players to activate "Star Power" or "Overdrive" (modes in which the player's score is temporarily multiplied) by screaming into the microphone, crowning a drum fill with a climactic strike on the pad representing the crash cymbal, or thrusting the guitar into a vertical position, which is registered by a motion sensor in its body.

Across all four of Caillois's categories, a perpendicular axis of play registers the degree of *paidia* (the player's childlike delight in defying or ignoring constraints, and the pleasure taken in tumult, improvisation, and

contrary behavior) as opposed to *ludus* (the player's willing submission to the non-negotiable rules that govern the pursuit of games, and the pleasure taken in confronting—or ingeniously circumventing—arbitrary and recurrent obstacles). As examples of *paidia*, Caillois lists somersaults, scribbling, pulling threads, and deliberately holding up queues, while crosswords and anagrams are representative of *ludus*.[45] This continuum reflects the social mediation of the player's psychological approach as much as it characterizes activities themselves: even chess, which for Caillois is paradigmatic of *ludus*, can be played with a devil-may-care or willfully disruptive attitude that introduces an element of *paidia*.[46] However, certain compositional approaches (and, to varying degrees, the performative modalities they suggest or mandate) are more readily identified with one than the other: the serial technique and Sudoku-like construction of Webern's Concerto op. 24, for instance, are redolent of *ludus*, while the spirited badinage of Poulenc's song "Couplets bachiques" veers toward *paidia*.[47]

The *ludus* of digital games lies in the arbitrary rules, stringent conditions, and harsh consequences with which they traditionally confront the player: the awarding of three "lives" at the outset of a game, for instance, or the punishment of infractions with instant "death." While all manner of games depend on rules, digital games differ from their predecessors in the extent to which they simultaneously enact and enforce rules according to their intrinsic mathematical structures: the computational power behind the digital game allows it to act as architect, interface, opponent, and referee.[48] Recent games aimed at a broader audience have taken great pains to conceal the cold logic that underpins them, presenting players with a user-friendly veneer of *paidia*. One of the secrets of *Guitar Hero*'s initial success was the degree to which its plastic guitar and artfully casual presentation promised the *paidia* associated with rock music while appearing not to demand the investment of time, energy, and concentration typical of *ludus:* the game affects to take care of the hard work for its players by serving as their virtual manager, roadie, teacher, and fan base.[49]

The notion that game players could reap the virtual rewards of superstardom without putting years of effort into mastering an instrument proved unpalatable to many rock musicians. Stemming in part from the stakes invested in professional musical performance, their criticism was based on the tacit assumption that playing the electric guitar—itself once commonly disparaged as a waste of time and "genuine" musical talent—is a worthwhile and productive pursuit. Its terms ironically transposed, the culturally dominant work ethic thus re-asserted itself against the unabashed play ethic of the digital game. Both despite and owing to the aura of re-

bellious *paidia* that surrounds it, rocking out can be a serious business, as bands—and brands—such as The Beatles know only too well.

It is thus hardly surprising that Noel Gallagher of the band Oasis explicitly rejected the parallels between music and games: "I always tell kids playing a guitar is not a video game; there is no level to get to."[50] However, by bemoaning the fact that players of *Guitar Hero* and *Rock Band* partake of "the guitar-playing experience . . . without . . . having to put anything into it," rock musician John Mayer revealed a fundamental sense in which he *does* conceive of music as a game.[51] By charging game players with breaking the unwritten rules governing musical pedagogy and performance in order to get more for less, Mayer in effect accused them of cheating, a notion that makes most sense when framed ludically.[52] From the valved horn to Auto-Tune, controversies over the use and abuse of technological assistance in the creation and performance of music have typically been framed within discourses of authenticity: the term certainly resonates throughout *Guitar Hero* and *Rock Band*.[53] But we might also consider these debates in the light of music's *ludus*, the game-like sense in which it operates according to rules that impose arbitrary constraints on its players. Why, for instance, is it admirable for a two-handed pianist to tackle the demanding solo part of Ravel's Piano Concerto for the Left Hand *come scritto*, but ignoble if she avails herself of her right hand at particularly tricky moments? Although doubling her manual resources at the keyboard might well increase the chances of an accurate performance, any benefits would likely be negated by the audience's perception of her behavior as somehow unsporting.

Mayer's dismissal of *Guitar Hero* and his condescension toward "the masses" who play it evinced a brand of elitism often displayed by "hardcore" gamers: in both cases, a sense of superiority derives from a mastery over—and thus an investment in—the rules and obstacles that deter "casual" players.[54] Committed *Guitar Hero* aficionados soon discover that playing the game on its higher difficulty levels requires a considerable investment of time and labor.[55] Many such players strip away all traces of *paidia* in favor of scrutinizing and exploiting the game's rules and mechanics in order to maximize their scores. Some calculate the optimal junctures at which to activate "Star Power" or "Overdrive" within each song and do so with the press of a button rather than the *ilinx*-fueled brandishing of the guitar, which jeopardizes the player's "combo" (a streak of flawless execution that leads to higher scores).[56]

Conversely, there will always be those who refuse to conform to the game's *ludus* and take delight in playing according to their own rules.

Throughout the technological realm, members of hacking and "modding" communities perform ingenious alterations on software and hardware. Both *Guitar Hero* and *Rock Band* have been subjected to a bewildering array of such projects, from the conversion of guitar controllers into functional MIDI instruments to hacks allowing for the insertion of the player's own choice of music into the games.[57] Far from frowning on such transgressive tendencies, Matt Boch of Harmonix actively encouraged them: the punk rock–inspired do-it-yourself ethos of their exploits fed back into official development, contributing both to the content and to the counter-cultural image that the games purveyed.[58]

In the case of both music and digital games, the *ludus-paidia* dialectic encapsulates many of the tensions and ambiguities that performance brings to the fore. A central paradox lies in the fact that while both music and games are celebrated for the freedom of expression they are perceived to facilitate, the acquisition and manifestation of this freedom depend upon a complicated, inflexible set of rules and conventions. The years of practice through which an individual such as Mayer develops proficiency in playing the guitar require perseverance in the face of severe conditions and constraints, whether self-imposed or enforced by the authoritarian figure of the teacher. Success thus calls for a strong commitment to the principles of *ludus*, even—or especially—when the music that emerges is heard to convey *ilinx* or *paidia*. The *paidia* of punk rock, for example, may have been rooted in its rejection of the elaborate *ludus* governing the composition and performance of progressive rock, but punk's anti-establishment aesthetic enacted its own form of *ludus*, exemplified by the mandate that no more than three chords per song were necessary. Likewise, the symbiotic relationship between the rational, *ludus*-governed world of the computer and the *paidia*-inspired counter-cultural hacking and modding communities bears out Eric Zimmerman's claim that play "exists both because of and also despite the more rigid structures of a system."[59] The joy of *paidia* and the illicit pleasures of cheating are inextricable from the regulatory discipline of *ludus* and the sober principles of fair play.

Caillois's modular taxonomy offers a useful means of naming playful musical practices for which a vocabulary has hitherto been largely lacking.[60] But the identification of elements is merely the first step in accounting for the particular forms that such practices can assume through processes of representation and mediation. In order to articulate more precisely what musical play involves in *Guitar Hero* and *Rock Band*, we will have to take account of the material objects that enable and constrain it.

Instruments of Mediation

The plastic peripherals of *Guitar Hero* and *Rock Band* constitute the prime interfaces between the ludic and the musical: they simultaneously serve as controllers and instruments, mediating between the player, the game, and the music. Placing *Guitar Hero*'s iconic controller (a version of which is shown in figure 2) alongside the standard Xbox 360 controller (illustrated in figure 3) reveals some obvious similarities. Whereas the resemblance of *Guitar Hero II*'s Gibson X-Plorer to its real-world counterpart is morphological rather than functional, its kinship with the Xbox 360 controller is both. In particular, four of the X-Plorer's five brightly colored fret buttons can be found arranged in a diamond formation on the Xbox 360 controller: the lineage of both devices passes through the red, yellow, blue, and green buttons of *Simon*, the iconic electronic memory game designed by Ralph Baer and Howard Morrison and released by Milton Bradley in 1978, and its arcade precursor *Touch Me*.[61]

Going further, the colors of game controllers' buttons can be traced back to Milton Bradley's personal commitment to the nineteenth-century ludic and pedagogical theories of Friedrich Froebel, the German founder of the Kindergarten movement.[62] As a strong advocate of Froebel's concepts, Bradley formulated the standard shades of red, yellow, blue, green, orange, and purple still used today in the production of Froebel's series of *Spielgabe* (play gifts) for young children.[63] By featuring these colors prominently both on-screen and off, *Guitar Hero* thus embedded itself in a long tradition of toys and games, ensuring that suitably "literate" players would instinctively grasp its mechanical and ludic configuration. But this accessibility came at the cost of credibility with those among the non-gaming audience for whom the controller's toy-like appearance confirmed preconceptions that the digital-game medium and constituency were irredeemably childish.[64]

It is indeed the guitar's toy-like nature that identifies it as a vehicle for *paidia* (a word used by Plato's sage when advocating for the importance of play), which means "childish play, pastime, or amusement."[65] Perhaps this explains in part the discrepancy between the miniaturized plastic guitar and the real/imaginary counterpart invoked by its skeuomorphic pegs and Gibson branding. The "reality gap" opened up between the player and the rock star is analogous to the temporal gap that the "toy" guitar opens up between an adult player and his or her childhood, a time span also reflected by the games' retro-flavored set-lists. Cumulatively, they cover half a century of blues, rock, metal, and country music, constituting a veritable soundtrack of modern North American history (and thus a history of

Figs. 2. (L) White Gibson X-Plorer controller for *Guitar Hero II* (Microsoft Xbox 360); (R) Standard Microsoft Xbox 360 controller.

the modern North American soundtrack). The cheerful naïveté of *Guitar Hero*, *Rock Band*, and their controllers invokes nostalgia for imaginary bygone days when life was simpler and music better, thereby creating a space in which the full-grown player can shamelessly enjoy the pleasures of make-believe and *mimicry*.[66] Giorgio Agamben's insight into the historicity captured by the banal materiality of the toy applies here: "What the toy preserves of its sacred or economic model, what survives of this after its dismemberment or miniaturization, is nothing other than the human temporality that was contained therein. . . . The toy is a materialization of the historicity contained in objects, extracting it by means of a particular manipulation."[67] Many adult players of *Guitar Hero* and *Rock Band* manipulate their controllers not to relive the past but to recall the prospect of a future that never came to pass.

Situating the *Guitar Hero* guitar within an organological context illuminates other aspects of its form and function. Viewed this way, the electronic "guitar" represents a continuation of the process by which the electric guitar displaced its acoustic forerunner during the second half of the twentieth century. Steve Waksman has shown that much of the controversy surrounding the rise of the electric guitar lay in the extent to which its sound was disembodied, produced by amplifiers and effects pedals rather than plucked by the performer's fingers.[68] The *Guitar Hero* controller extends this process of sonic devolution, divesting the last acoustic traces from the instrument itself by delegating the (re)production and processing of sound to the game console, to which it relays the player's input in almost precisely the same manner as a standard controller. Indeed, it is possible to play *Guitar Hero III* with a standard Xbox 360 controller: the game even awards the player "achievements" for satisfying certain conditions while doing so.[69] By eschewing strings in favor of buttons, the *Guitar Hero* controller digitizes the electric guitar; the guitar, in other words, becomes a keyboard. The digitality of its buttons facilitates the algorithmic modulation of the player's more or less dexterous input into musical output via a cybernetic relationship with the software.

In order to investigate how and why rock's digitization took this particular form, a brief detour to Tokyo will be necessary. In 1997, the Japanese entertainment corporation Konami released *BeatMania*, an arcade game that presents players with a five-note keyboard and a turntable as input devices with which to match rhythmically ascending or descending symbols on the screen to a sequence of songs and tracks.[70] The success of *BeatMania* led Konami to dedicate what became known as their Bemani division to the development of games that explored the common ground between gameplay, music, and rhythmic entrainment.[71] These games share fundamental gameplay and interface elements while varying the form and function of the player's input device.[72] In *BeatMania*'s successor, *Dance Dance Revolution*, players match the on-screen symbols by activating the corresponding panels of a metal dance pad: the *ilinx* and *paidia* thus induced helped make the game an international smash hit.[73]

The next arcade games in the Bemani series were *GuitarFreaks* and *DrumMania*, released in 1998 and 1999 respectively, and the two could be connected to enable cooperative and competitive play. Collectively, these games contain practically all the conceptual and mechanical elements found in *Guitar Hero* and *Rock Band*, from the peripherals to the fundamental principles—and many specific details—of the software design.[74] It is thus unsurprising to discover that Eran Egozy, co-founder of Harmo-

nix, was influenced by the Bemani series, as well as by Masaya Matsuura, when he and Rigopulos visited Tokyo in 1999: "There was a fairly pivotal moment over there when we saw this form of music gameplay—in games like *BeatMania* and *PaRappa* and *Dance Dance Revolution*—that was really compelling and addictive. We thought that maybe we should be the music company that takes these types of ideas . . . and brings them to the U. S."[75] In a reversal of the stereotyped process according to which Japanese industry merely copies and refines Western innovations, *Guitar Hero* and *Rock Band* turn out to be imitations of Japanese "originals." Although *Rock Band* appears to have been modeled on the classic Anglo-American four-piece outfit, the game's guitars, drums, and microphones can all be traced back to Japan's arcades and karaoke bars.[76] But, of course, the dynamics of global mediatized culture were already at play in the design of Komani's Bemani games, as they had been in karaoke itself. While their soundtracks typically focus on Japanese pop, techno, and associated electronic genres, *GuitarFreaks* and *DrumMania* clearly allude to "analog" Western musical instruments and traditions.

It is thus perhaps less useful to think in terms of "originals" and "copies" than to reflect on how concepts, practices, and objects are transformed through transmission within and across musical cultures. In this light, we might consider the multiple meanings of the word "score" insofar as it refers to the quantification and summation both of a game and of a musical composition. In Bemani games as well as *Guitar Hero* and *Rock Band*, both the musical score (the charted gems, or notes, that approach the player through space and time) and the ludic score (measured in points) regulate players' reproductive accuracy: the former prescribes while the latter motivates and evaluates. *Rock Band*'s musical score for guitar and drums operates as a form of tablature, in that the five fret buttons or drum pads are represented on screen as they appear (or feel) to the player; in Peircean terms, the actions to be taken are represented iconically rather than encoded symbolically. At the same time, the procession of notes resembles nothing more than the unspooling of a player-piano roll, an early version of which was invented by Claude-Félix Seytre in 1842 (illustrated in figure 3). The games' scrolling "note tunnels" depicted in figure 1 are visually and kinetically analogous to Seytre's spooling "music belt," while his "music disk" could be construed as a "prophetic relic" (to borrow Alan Liu's terminology) that indexes the optical disks on which *Guitar Hero*, *Rock Band*, and their music are stored and distributed.[77]

Such parallels suggest that the broader history and sociology of music in both Japanese and Western contexts can offer illuminating perspectives

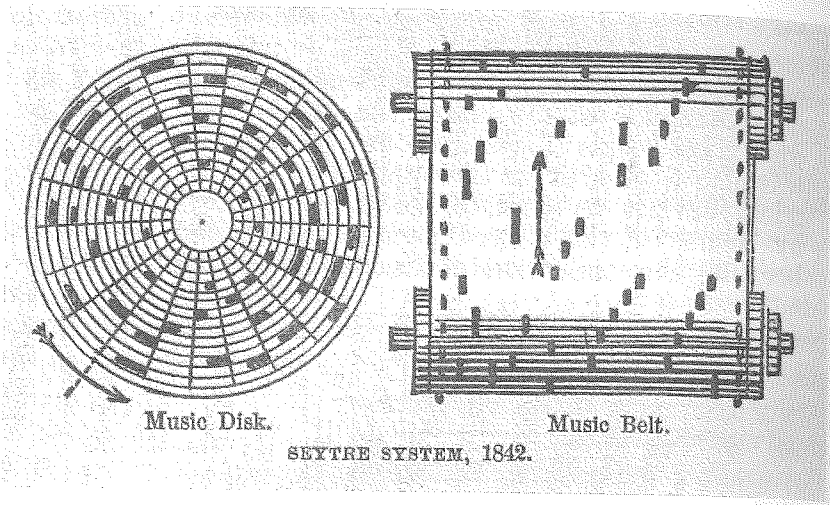

Fig. 3. Seytre's "music disk" and "music belt," reproduced from *Appletons' Annual Cyclopedia and Register of Important Events of the Year 1885*, 615.

on the ludic concepts that the games invoke and evoke. It is worth pointing out that Egozy of Harmonix is an accomplished clarinetist who regularly performs chamber music, and also that the domestic setting in which *Guitar Hero* and *Rock Band* are collaboratively played—typically a spacious living room, given the high cost and logistical demands of the requisite hardware and software—is more characteristic of *Hausmusik* than it is of the classic garage rock band.[78] The same could be said of the games' emphasis on the reproduction of (more or less) canonical musical texts with the greatest possible fidelity, particularly in the case of *The Beatles: Rock Band*.[79] Rigopulos himself has made the historical connection between *Rock Band* and earlier technologies of musical recreation: "When there were no record players, [there were] people in the house who knew how to render sheet music into music on their pianos. I see what we are doing now as a massive historical throwback."[80] Again, the divergent meanings of "recreation," pertaining to faithful reproduction on the one hand and leisure activity on the other, find common ground on the field of play.

Depictions of mechanized representational systems capable of prescribing (or transcribing) musical performance can be extended from the water organ designs depicted by Athanasius Kircher in his *Musurgia universalis*, published in 1650 but based on a sixteenth-century instrument at the Villa d'Este in Tivoli, to the "piano roll" viewing mode commonly found

in the MIDI sequencing software used for contemporary music production.[81] From Kircher to Harmonix, all such systems binarize notation in that their musical data consists of arrays of bits that signify either a note or its absence. As David Suisman has observed, the concept of Seytre's music belt was derived from earlier developments in the pre-history of computing: Jacques de Vaucanson's design and Joseph-Marie Jacquard's execution of the automated loom head in Lyon had been conceived along similar lines, as were the punch cards that Charles Babbage designed for his speculative "analytical engine" in London.[82] From this angle, *Guitar Hero* and *Rock Band* expose the degree to which music notation is a form of information technology that transcodes sight into sound, script into action. The colored gems the games send toward the "guitarist" are converted by fingers into a form of binary: the five fret buttons offer thirty-one input combinations which, depending on the selected difficulty level, operate algorithmically when triggering the reproduction of the music. The player's fingers—literally, the digits—thus compute the outcome. If successful, the corresponding portion of the recording is played back; if not, a chastening "clunk" sound is followed by an awkward silence until the next gem offers the possibility of redemption.[83] Unwittingly, the successful player becomes an expert decipherer, a fact that has not gone unnoticed by neuroscientists and cryptographers.[84]

The operation of the software is itself predicated on the same technological foundation. Binary logic governs the thousands of lines of code that are compiled, executed by the console's central processing unit in order to enact and enforce the game's *ludus*, and modulated into audio-visual output that facilitates the players' *paidia*. The player, the instrument, the software, and the hardware thus form a nexus through which cognitive and musical responsibilities are digitized and distributed according to an ever-shifting balance between uncertainty and redundancy.

From these multiple perspectives, the *Guitar Hero* controller can be understood to combine the morphology of Konami's *GuitarFreaks* guitar, the topography of the keyboard, the mechanicity of the piano roll, and the cybernetic logic of *Simon*, encoded and adorned by Froebel's cheerful colors. It thus synthesizes elements from Kindergarten, the bourgeois parlor, Japanese arcade culture at millennium's end, and—above all—the post-war military-industrial complex in the United States that gave rise to digital games in general, and to *Simon* in particular. (Ralph Baer was working for Sanders Associates, a defense contractor, when he developed it.)[85] While this might seem jarring, it is entirely commensurate with the history of both toys and digital play: consider bows and arrows, cap guns, and *Call*

of Duty in the light of Friedrich Kittler's assertion that "the entertainment industry . . . is an abuse of army equipment."[86] Inflecting this perspective with Agamben's historicity, we might suggest that as weapons age, they become more toy-like. In the case of the axe, at least, *Guitar Hero* seems to bear this hypothesis out.

Genuine Fakery

Matt Boch of Harmonix has alluded to the problematic ontology of the plastic guitar by pointing out the ambiguity of its central strum bar. Understood in terms of a "real" guitar, its singularity would imply that the instrument has only one (imaginary) string, but its function in the game—particularly in relation to the playing of "chords"—makes matters more complex: "What does the strum bar represent? Is the strum bar the pick dragging across the strings? Is it the strings? Is it the pick and the strings? It's none of those things."[87] Boch's questions suggest that the game controllers be conceived not as real guitars *manquées* but as haptic devices whose primary function is to prompt the gestures and sensations associated with John Mayer's "guitar-playing experience." They can be understood not only within the context of guitar history, technology, and virtuosity outlined by Waksman, but also in relation to the parallel history of air guitar, a realm of musical make-believe and fantasy that Caillois would classify as characteristic of *ilinx* as well as *mimicry* and *paidia*. To (mis)appropriate Jean Baudrillard's terminology, the guitar controller is best understood not as a simulation of its real-world counterpart but as a simulacrum, a representation of the air guitarist's imaginary instrument.[88]

Rock music has always given rise to debates over authenticity, whether they circulate around Elvis Presley, glam rock, nu metal, or emo.[89] The central issue lurking behind them is always the contingency of the reality at stake, and—more important—who has the power to define and lay claim to it. By presenting their players with simulacra, *Guitar Hero* and *Rock Band* offer them the opportunity to redefine what is real. In Lawrence Grossberg's diagnosis of the postmodern predicament, "[the] only possible claim to authenticity is derived from the knowledge and admission of your own inauthenticity. . . . The only authenticity is to know and even admit that you are not being authentic, to fake it without faking the fact that you are faking it."[90] *Guitar Hero* and *Rock Band* are emblematic of a tendency to soften rock's hard edges by satirizing its excesses with tender irony: the plastic guitar domesticates and infantilizes the phallic potency of the electric guitar in the spirit of films such as *This Is Spinal Tap*, *Wayne's World*, and

School of Rock. By freely admitting their inauthenticity, both plastic and air guitarists generate pleasure from the knowing, creative manipulation of artifice, paradoxically delivering a "real" experience. Through the double logic of *mimicry*, they represent the concept of the "genuine fake."

Guitar Hero and *Rock Band* thus question the tenets of authenticity even when presenting the music of a band widely perceived to epitomize them. In September 2008, Metallica released their album *Death Magnetic* as downloadable content for *Guitar Hero III* and *Guitar Hero: World Tour*. This version of the album has been called "definitive": according to many fans and industry professionals, it sounds better than the CD release owing to the latter's excessive compression.[91] But buyers of *Death Magnetic* via *Guitar Hero* are required to play the game flawlessly in order to hear all the music recorded by Metallica: moreover, players will also hear the reactions of the in-game crowd while contributing their own musical elements in the form of improvised drum fills, vocal additions to (and timbral deviations from) James Hetfield's master tracks, and modulated guitar sounds via the effects switch and vibrato arm. Even an attempt to reproduce the album as faithfully as possible will thus transform it into a cover version.

If live performance is to be understood as an index of authenticity, however, it could be argued that a play-through of *Death Magnetic* by four *Guitar Hero* players is in some ways *more* authentic than Metallica's own recording. Like most contemporary rock music, the tracks on *Death Magnetic* were recorded piecemeal and subjected to extensive digital manipulation; they thus only rarely and partly reflect the band's continuous collective performance, whereas a rendition of the album via *Guitar Hero* and its instruments obliges players to play (along with) entire songs in real time.[92] In such a scenario, who is "real," who is "faking," and can anyone be accused of cheating?

In *Liveness*, Philip Auslander asserts that "initially, mediated events were modeled on live ones. The subsequent cultural dominance of mediatization has had the ironic result that live events now frequently are modeled on the very mediatized representations that once took the self-same live events as their models."[93] In this light, it is telling that Harmonix was acquired by MTV in 2006: Alex Rigopulos himself drew parallels between the two companies' transformation of musical culture.[94] Just as MTV revolutionized popular music in the 1980s by representing it as a (tele)visual medium rather than as a primarily auditory phenomenon, so *Guitar Hero* and *Rock Band* add an extra sensory dimension by introducing haptic interactive elements in concert with audiovisual stimuli. Instead of watching a band on television, players virtually *become* a band on television: by

showcasing an adoring crowd fixated on the on-screen antics of the players' customized avatars, the game intimates that the television is watching the player rather than vice versa. Although the animations are canned and the music pre-recorded, the performance in the living room is unmistakably live. Adding a recursive twist to Auslander's formulation, then, we might propose that *Guitar Hero* and *Rock Band* enable live performances predicated on the reproduction of pre-recorded music tracks via input devices that invoke tropes associated with live rock performance that themselves draw on an iconographic repertoire transmitted via music video, which was itself founded on the reification of earlier live performance.[95] The *Guitar Hero* and *Rock Band* controllers thus (re)mediate between the ludic and the musical, the live and the recorded, and the "fake" and the "real."

Bearing the Japanese origin of these controllers in mind, the pedagogy and performance of Western art music in Japan offer intriguing parallels to the discourses of authenticity, originality, and mechanization that attended the reception of *Guitar Hero* and *Rock Band* in North America and Europe. Addressing the perception of a "robotic" performance style associated with Shin'ichi Suzuki's method of violin instruction, Robert Fink contends that American parents were troubled by the notion that their children were striving for no more than "the 'mindless' reproduction of a mechanical reproduction."[96] Noel Gallagher and John Mayer's phobic reactions to *Guitar Hero* reprise those anxious parental reactions with uncanny precision. They represent both a fear that the changing rules of the musical game threaten to strand them on the wrong side of a generational and technological divide, but also an aversion to the mechanical and the jejune.[97] The suturing of buttons onto a guitar arouses scornful laughter from those who perceive "something mechanical encrusted on the living," to recall Henri Bergson's resonant phrase.[98] As Miller and her subjects eloquently demonstrate, the perception of mechanicity in *Guitar Hero* and *Rock Band* is filtered through ethnic, gendered, and sexualized stereotypes.[99] They stem in part from the games' ludic logic, instrumental configurations, and Japanese associations, which challenge common assumptions concerning rebellion, authenticity, and ethnicity in relation to rock.

As Fink suggests, however, Suzuki's philosophy and method can be understood in very different terms, notably those provided by Zen Buddhism.[100] "Do not play; let the bow play," proclaimed Suzuki. Rather than interpreting the motto as a mechanistic repression of individuality, we might place it in ludic dialogue with Gadamer's observation that people are played rather than playing, that "all playing is a being-played."[101] As we have seen, while games and music allow for the expression of personal

and social identity, their *ludus* also involves elements that enchain players to rules and protocols, an experience that can nonetheless feel liberating rather than coercive. While games are constructs, they in turn construct the subjectivity of their players. This chiastic relationship between game and player reflects a ludic invertibility and reciprocity: in Schiller's words, play configures a relationship between the material and the formal so that "the operation of the one at the same time confirms and limits the operation of the other."[102] *Guitar Hero* and *Rock Band* allow the willing player to become the instrument of the game: in Suzuki's terms, he or she does not play but lets the strum bar play. If all goes well, the song will play too.

Margaret Robertson has drawn attention to the parallels between a musical score and the machine code of a digital game: "Creators devise an experience, and commit it to code. The code then sits there, lifeless, until a performer picks it up. Then, through a complex tool which requires substantial manual dexterity to master, the performer interprets the experience the creator devised. No two people will play the code the same way. Some players will perform better than others. Some will get stuck and give up before the end."[103] Although both musical notation and game code exist in a literary form, they are not primarily texts to be read but rather programs for courses of actions to be taken.[104] This helps explain why, when discussing *Rock Band*'s effect on how players experience music, Rigopulos declared that "the instruments reprogram you."[105] On the one hand, we might consider the potential of this concept to account for how musicians organize and process information in the course of training and performance; on the other, we might follow Suzuki and Gadamer by exploring how musical culture and literature program, reprogram, and even debug the people who engage with them.

As I suggested above, connections between digital games and musical experience could start with the transferal of terminology: what might it mean to conceive of chamber music as "multi-player co-op," of Chopin's "Minute" Waltz as engaging "speed run" mode, or of Liszt's *Réminiscences de Don Juan* as a "single-player mod" of Mozart's eight-player opera?[106] More broadly, a ludomusicological approach to Western art music might help trace its capricious shuttling between the drastic and the gnostic, to echo Vladimir Jankélévitch and Carolyn Abbate.[107] Rather than conceiving of texts and performances in terms of works and renditions, we might think of a score as describing and constituting the ludic rules according to which music is to be played. The insights yielded by the experience of play in the digital age might thus be brought to bear on what has now become known as the analog era, a retronym that conceals the extent to which both "digi-

tal" and "analog" concepts and practices co-existed before the two terms were forced into binaristic opposition.[108]

Conversely, ludomusicology might bring new—or freshly old—historical and cultural perspectives to bear on Robertson's claim that *all* digital games "have a music about them," and that "common to them . . . are [the] elements of performance, rhythm, interpretation and difficulty."[109] In *Donkey Kong: Jungle Beat*, the game that prompted her article, the player controls the simian protagonist's movements using the "DK Bongos" controller developed for Namco's rhythm-action game *Donkey Konga*.[110] Other ostensibly non-musical games have turned guitar controllers into instruments of the player's will, transforming "musical" input into visual and kinetic on-screen output.[111] Approaching such games from the perspective of performance might help reveal why, in the opinion of legendary Nintendo developer Shigeru Miyamoto, "those directors who have been able to incorporate rhythm . . . in their games have been successful."[112]

Both digital gameplay and musical performance are fugitive phenomena: to adopt Hans Ulrich Gumbrecht's formulation, they undo themselves as they emerge.[113] Oscillating between categories, they simultaneously rely on and evade the terms that seek to define them. Game play emerges through the interaction between players and objects, on the one hand, and the rules and constraints that regulate their motion, on the other. Musical play takes place in the spaces that open up between sign and sound, instruction and execution, the permissible and the imaginable. It is from these interstices of the material and the epistemological that the discipline of ludomusicology might emerge as a way to bring insights yielded from studying musical performance to bear on how ludic experiences are constructed and represented, and vice versa. Ludomusical play can be conformist or transgressive, erotic or violent, virtuosic or rudimentary, since players operate both within and against the technological and ideological constraints that define the rules of sonic engagement. By making these rules legible, ludomusicology sets out to register—and perhaps even to navigate—the flux between script and improvisation that characterizes the experience of playing both music and digital games.

For all the depth, complexity, and sheer fun that they offer, *Guitar Hero* and *Rock Band* afford only a tantalizing glimpse of what twenty-first-century musical games might become and how they promise to reconfigure musical theory, practice, pedagogy, and creativity. Matsuura's gloomy vision of their environmental consequences, conversely, reminds us that the freedom of play comes at a cost, that its formations are never ideologically neutral, and that to lose ourselves in the pleasures of a ludic present may

put the future at risk. Ultimately, however, play refuses to be pinned down: neither utopian nor apocalyptic, literate nor oral, digital nor analog, finite nor infinite, play twists and splices binaristic continua into Möbius strips. While its precise significance may elude our grasp, we can perhaps make a first move toward registering the delights, dangers, and transformative potential of both music and games by acknowledging in earnest the importance of being playful.

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Quest for Fame. Developed by Virtual Music Entertainment. Ōta: Namco, 1999.
Rock Band. Developed by Harmonix. Redwood City: Electronic Arts/MTV Games, 2007.

Rock Band 2. Developed by Harmonix. Redwood City: Electronic Arts/MTV Games, 2008.
Rock Band 3. Developed by Harmonix. Redwood City: Electronic Arts/MTV Games, 2010.
Rock of the Dead. Developed by Epicenter Studios. Pomona: Conspiracy Studios and UFO Interactive, 2010.
Simon. Developed by Ralph H. Baer and Howard J. Morrison. East Longmeadow: Milton Bradley, 1978.
Taiko no Tatsujin. Developed by Namco. Ōta: Namco, 2001.
Touch Me. Developed by Atari. Los Angeles: Atari, 1974.

NOTES

1. Brandon Sheffield, "Marching to His Own Drummer: Masaya Matsuura's Thoughts," posted March 6, 2009, http://www.gamasutra.com/view/feature/3955/marching_to_ his_own_drummer_.php.

2. The original *Guitar Hero*, developed by Harmonix for Sony's PlayStation 2 game console and released in 2005, met with relatively modest success; the greater impact of its sequel, *Guitar Hero II*, attracted the involvement of industry behemoths and rivals Activision Blizzard and Electronic Arts, leading to the bifurcation of the games' concepts, mechanics, and other intellectual property into two competing franchises, *Guitar Hero* and *Rock Band*, published by Activision and EA respectively. For a complete list of games in both franchises and a succinct account of their operation, see Kiri Miller, *Playing Along: Digital Games, YouTube, and Virtual Performance* (Oxford: Oxford University Press, 2012), 86–93.

3. For a brief description of Matsuura's career as musician and game developer, see Tristan Donovan, *Replay: The History of Video Games* (Lewes: Yellow Ant, 2010), 281–83. On the heavy human and environmental toll on Africa that has been exacted by Western demand for videogames, see Nick Dyer-Witherford and Greig de Peuter, *Games of Empire*, 215–29. Throughout this essay, I use the term "digital game" rather than "video game" not only as a corrective to oculocentric discourse but also to acknowledge both the nature of the electronic medium and its interfacing with thumbs and fingers.

4. For an excellent overview of *Guitar Hero* and *Rock Band*, and a comprehensive ethnographic study of the diverse ways in which they have been played, see Miller, *Playing Along: Digital Games, YouTube, and Virtual Performance*.

5. *Rock Band 3* was released for Microsoft's Xbox 360, Nintendo's Wii, and Sony's PlayStation 3 consoles in 2010; other iterations of the franchises have been released for handheld devices including Nintendo's DS, Sony's PlayStation Portable, Apple's iPhone, iPod touch, and iPad, and the Android mobile operating system.

6. On the representation of musical time and space in digital games, including *Guitar Hero*, see Peter Shultz, "Music Theory in Music Games," *From Pac-Man to Pop Music: Interactive Audio in Games and New Media*, ed. Karen Collins (Aldershot: Ashgate, 2008), 180–84. As well as playing together in the traditional sense, guitar heroes and rock bands can play online, both collaboratively and competitively. To

adopt David Borgo's terminology, the musicking that these games enable hovers between the second and third order ("Beyond Performance: Transmusicking in Cyberspace," this volume).

7. In January 2009, it was announced that Neversoft's *Guitar Hero III: Legends of Rock* had become the first digital game to surpass $1 billion in sales (Kris Graft, "Activision: *Guitar Hero III* Passes $1b," posted January 9, 2009, http://www.edge-online.com/news/activision-guitar-hero-iii-passes-1b). On the economic impact of *Guitar Hero* and *Rock Band*, see the unsigned article "Playing Along," *Economist*, October 11, 2008, 89; and Jeff Howe, "Here It Goes Again," *Wired*, March 2009, 19–20.

8. Seth Schiesel, "All Together Now: Play the Game, Mom," *New York Times*, September 6, 2009, http://www.nytimes.com/2009/09/06/arts/television/06schi.html.

9. For examples of rock luminaries' negative reactions to the games, see Judy Berman, "Rolling Stones, Pink Floyd Hate *Guitar Hero*, *Rock Band*, Teenagers in General," posted September 8, 2009, http://blog.limewire.com/posts/25764-rolling-stones-pink-floyd-hate-guitar-hero-rock-band-teenagers-in-general/.

10. James Brightman, "Interview: Alex Rigopulos on *Rock Band* 2, Competing with *Guitar Hero*, and Evolving the Music Genre," posted July 24, 2008, http://www.gamedaily.com/articles/features/interview-alex-rigopulos-on-rock-band-2-competing-with-guitar-hero-and-evolving-the-music-genre-/?page=3.

11. Antony Bruno, "Sales of Music Video Games Plummet in 2009," posted December 18, 2009, http://www.reuters.com/article/idUSTRE5BH5DS20091218?type=technologyNews.

12. See Jesse Divnich, "The Divnich Debrief: Roadblocks in the Music Genre," posted July 20, 2009, http://www.industrygamers.com/news/the-divnich-debrief-roadblocks-in-the-music-genre/; Matt Matthews, "Analysis: *Guitar Hero* vs. *Rock Band*—Beyond the Numbers," posted October 23, 2009, http://www.gamasutra.com/php-bin/news_index.php?story=25739; Ben Reeves, "MTV Games Lays Off 39 Harmonix Employees," posted December 10, 2009, http://gameinformer.com/b/news/archive/2009/12/10/news-mtv-game-s-layoff-39-harmonix-employees.aspx; Jim Reilly, "Layoffs at Radical, Neversoft—Luxoflux Closes," posted February 11, 2010, http://xbox360.ign.com/articles/106/1068657p1.html; Brendan Sinclair, "Analysts Blame 2009 Slump on Music Genre, Lack of Innovation," posted January 15, 2010, http://www. gamespot.com/news/6246485.html; and David Wesley, "Too Much of a Good Thing: Explaining the Decline of *Guitar Hero* and *Rock Band*," posted October 28, 2009, http://performancetrap. org/2009/10/28/decline-of-guitar-hero-and-rock-band/.

13. See Leigh Alexander, "Activision Dissolves *Guitar Hero* Business, Refocuses on Digital," posted February 9, 2011, http://www.gamasutra.com/view/news/32946/Activision_Dissolves_Guitar_Hero_Business_Refocuses_On_Digital p.php and Leigh Alexander, "Report: Harmonix Sold for Just Under $50," posted January 4, 2011, http://www.gamasutra.com/view/news/32271/Report_Harmonix_Sold_For_Just_Under_50.php.

14. It is telling that despite Maelzel's musical and ludic efforts to animate the mechanical, such as the panharmonicon (for which Beethoven wrote his battle sym-

phony *Wellingtons Sieg*, op. 91) and the chess-playing "automaton" known as the Turk, his lasting achievement—the metronome—did quite the opposite: it mechanized the human.

15. For an example of these dynamics (and the extent to which they can be manipulated), see Steven E. Jones, *The Meaning of Video Games: Gaming and Textual Strategies* (New York: Routledge, 2008), 69–96.

16. Miller, *Playing Along: Digital Games, YouTube, and Virtual Performance*, 85–151. On the logic, operation, and political import of such networks, see Alexander R. Galloway and Eugene Thacker, *The Exploit: A Theory of Networks* (Minneapolis: University of Minnesota Press, 2007).

17. On Laroche's initial ludomusicological activities, see Tasneem Karbani, "Music to a Gamer's Ears," posted August 22, 2007, http://www.uofaweb.ualberta.ca/arts/news.cfm?story=63769; I independently hit upon the term in 2008 (see Roger Moseley, "*Rock Band* and the Birth of Ludomusicology." Paper delivered at the Annual Meeting of the Society for Ethnomusicology at Wesleyan University, Connecticut [2008], and at "Music and the Moving Image," New York University [2008]). The term "ludomusicology" is partly derived from ludology, itself a recent neologism attributed to Gonzalo Frasca, who defines it as a "discipline that studies game and play activities" (Gonzala Frasca, "Ludology Meets Narratology: Similitude and Differences between (Video) Games and Narrative," accessed June 19, 2012, http://www.ludology.org/ articles/ludology.htm). "Ludomusicology" has gained currency in recent years, as was borne out by the founding of the Ludomusicology Research Group UK in 2011 (http://www.ludomusicology.org).

18. Ian Bogost's *How To Do Things With Videogames* makes this Austinian point both via its title and through Bogost's acknowledgment of music's parallax relationship with gameplay (30–36). Ian Bogost, *How To Do Things With Videogames* (Minneapolis: University of Minnesota Press, 2011), 30–36.

19. A burgeoning community of scholars has framed the relationship between music and digital games in creative, pedagogical, ethnographic, and theoretical contexts: see Juha Arrasvuori, *Playing and Making Music: Exploring the Similarities Between Video Games and Music-Making Software* (Tampere: University of Tampere, 2006); Shultz, "Music Theory in Music Games"; Miller, "Jacking the Dial: Radio, Race, and Place in *Grand Theft Auto*," *Ethnomusicology* 51, no. 3 (2007): 402–38; Kiri Miller, "Schizophonic Performance: Guitar Hero, Rock Band, and Virtual Virtuosity," *Journal of the Society for American Music* 3, no. 4 (2009): 395–429; David Sudnow's pioneering *Pilgrim in the Microworld: Eye, Mind, and the Essence of Video Skill* (New York: Warner Books, 1983) (especially in conjunction with his account of learning how to improvise jazz piano, *Ways of the Hand)*; McKenzie Wark, *Gamer Theory* (Cambridge: Harvard University Press, 2007), 126–50. Digital-game critics and developers have also recognized the correspondences between music and games: see Ollie Barder, "Symphony of Play," posted November 24, 2009, http://www.escapistmagazine.com/articles/view/issues/issue_229/6806-Symphony-of-Play; J. C. Herz, "Making Music Without the Instruments," *New York Times*, January 20, 2000, G17; Margaret Robertson, "One More Go: *Donkey Kong: Jungle Beat*," posted January 7, 2009, http://www.offworld.com/2009/01/one-more-go-donkey-kong-jungle.html.

20. For a comprehensive summary of scholarly approaches to play, see Brian Sutton-Smith, *The Ambiguity of Play* (Cambridge: Harvard University Press, 1997).

21. Max Weber, *Die protestantische Ethik und der Geist des Kapitalismus*, ed. Dirk Kaesler (Munich: C. H. Beck, 2004). For an extension of Weber's concept of rationalization to the realms of play and leisure, see Thomas S. Henricks, *Play Reconsidered: Sociological Perspectives on Human Expression* (Urbana: University of Illinois Press, 2006), 78–108; Victor Turner, "Liminal to Liminoid, in Play, Flow, and Ritual: An Essay in Comparative Symbology," *From Ritual to Theatre: The Human Seriousness of Play* (New York: PAJ Publications, 1982), 37–41.

22. Max Weber, *Die rationalen und soziologischen Grundlagen der Musik* (Munich: Drei Masken Verlag, 1921).

23. In this context, Beethoven's disdain toward the violinist Ignaz Schuppanzigh when he dared to mention the difficulty of a passage in one of the "Razumovsky" Quartets, op. 59, is telling: "Do you think I care for your wretched fiddle when the spirit speaks to me?" Heinrich Schenker, "Genuine and Sham Effects," *Der Tonwille: Pamphlets/Quarterly Publication in Witness of the Immutable Laws of Music*, ed. William Drabkin, 2 vols., 2:115–16 (Oxford: Oxford University Press, 2003).

24. See Lydia Goehr, *The Imaginary Museum of Musical Works: An Essay in the Philosophy of Music* (Oxford: Oxford University Press, 1992). Within historical musicology, playfulness has rarely been acknowledged as a meaningful aesthetic stance beyond the contexts of twentieth-century modernism (outlined by Andrew Westerhaus in "Stravinsky and the Ludic Metaphor," PhD diss., University of Chicago, 2012) and avant-garde, counter-cultural, or experimental movements such as Dada and Fluxus.

25. Roger Caillois, *Les jeux et les hommes: le masque et le virtige* (Paris: Gallimard, 1958), trans. Meyer Barash, *Man, Play, and Games* (Urbana: University of Illinois Press, 2001), 5–6.

26. Plato, *Complete Works*, trans. Trevor J. Saunders, ed. John M. Cooper and D. S. Hutchinson (Indianapolis: Hackett, 1997).

27. Hans-Georg Gadamer, *Truth and Method*, trans. W. Glen-Doepel, Joel Weinsheimer, and Donald G. Marshall (London: Continuum Books, 2004), 104.

28. Claus Pias, "The Game Player's Duty: The User as the Gestalt of the Ports," *Media Archaeology: Approaches, Applications, and Implications*, ed. Erkki Huhtamo and Jussi Parikka, 164–83.

29. Emphasis in original. Friedrich Schiller, *Briefe über die ästhetische Erziehung des Menschen*, ed. Artur Jung (Leipzig: Teubner, 1875), 57.

30. *Homo Ludens* appeared in German in 1939 and was published in English in 1955; all citations refer to the latter version. Johan Huizinga, *Homo Ludens: Versuch einer Bestimmung des Spielelementes der Kultur* (Amsterdam: Pantheon, 1939). Translated as *Homo Ludens: A Study of the Play Element in Culture* (Boston: Beacon Press, 1955).

31. Hector Rodriguez, "The Playful and the Serious: An Approximation to Huizinga's *Homo Ludens*," *Game Studies* 6, no. 1 (2006), http://gamestudies.org/0601/articles/rodriges.

32. Johan Huizinga, *Homo Ludens*, 42. According to Huizinga, languages that feature a "playfully homologous" relationship between music and games include Japanese and Greek as well as French, German, and English (43).

33. Capitalization and emphasis in original. Mark Twain, *The Adventures of Tom Sawyer* (New York: Penguin Putnam, 2002), 21.

34. Just as work can be pleasurable, so can games become a slog: players of

role-playing games talk of "grinding" (engaging in mindlessly repetitive in-game activities) in order to "level-up" their characters and facilitate progress (see Steven Poole, "Working for the Man," posted October 27, 2008, http://stevenpoole.net/trigger-happy/working-for-the-man/). Such nominally playful activities are sometimes outsourced as paid labor.

35. Roger Caillois, *Les jeux et les hommes: le masque et le virtige*, trans. Meyer Barash, *Man, Play, and Games*, 9–10.

36. Roger Caillois, *Les jeux et les hommes: le masque et le virtige*, trans. Meyer Barash, *Man, Play, and Games*, 11–36. Caillois drew the term *mimicry* from biology, where it describes the sharing of perceived similarities between species. In his essay "Mimicry and Legendary Psychasthenia," Caillois interprets the *mimicry* of insects as non-utilitarian, as a playful luxury rather than a Darwinian adaptation for survival, as described in Thomas S. Henricks, "Caillois's *Man, Play, and Games:* An Appreciation and Evaluation," *American Journal of Play* 3, no. 2 (2010): 157–85, 4. On Caillois's notion of "diagonal science" and his complex relationship with Huizinga, surrealism, the animal world, and the sacred, see Claudia Mesch, "Serious Play: Games and Early Twentieth-Century Modernism," *From Diversion to Subversion: Games, Play, and Twentieth-Century Art*, ed. David J. Getsy (University Park: Pennsylvania University Press, 2011), 60–72.

37. On boss battles, see Clive Thompson, "Who's the Boss?," *Wired*, posted May 8, 2006, http://www.wired.com/gaming/gamingreviews/commentary/games/2006/05/70832. Tellingly, the introduction of agônic conflict in *Guitar Hero III* was coeval with the outbreak of economic competition between Neversoft, Harmonix, and their respective publishers.

38. In *Guitar Hero III*, "The Devil Went Down to Georgia" is Steve Ouimette's cover version of the original song by the Charlie Daniels Band in which Johnny, a young fiddler, bests the devil in a violin-playing contest. On the satanic iconography of rock music, and heavy metal in particular, see Robert Walser, *Running With the Devil: Power, Gender, and Madness in Heavy Metal Music* (Middletown, CT: Wesleyan University Press, 1993).

39. On musical dice games, see Neal Zaslaw, "Mozart's Modular Minuet Machine," *Essays in Honor of László Somfai on His Seventieth Birthday: Studies in the Sources and Interpretation of Music*, ed. László Vikárius and Vera Lampert (Lanham, MD: Scarecrow Press, 2004), 220–26.

40. Digital games facilitate and draw upon *mimicry* in many forms, from the fantasy world of the role-playing game (which often also involves the operations of *alea*, in keeping with its dice-rolling origins in table-top games such as *Dungeons & Dragons*) to the "realism" of the sports management simulator.

41. Roger Caillois, *Les jeux et les hommes: le masque et le virtige*, trans. Meyer Barash, *Man, Play, and Games*, 21.

42. For an alternative perspective on this dichotomy, see Philip Auslander's adaptation of Erving Goffman's theories concerning performer-audience relationships in "Jazz Improvisation as a Social Arrangement," this volume. Philip Auslander, "Tryin' to Make It Real: Live Performance, Simulation, and the Discourse of Authenticity in Rock Culture," *Liveness: Performance in a Mediatized Culture*, 2nd ed. (London: Routledge, 2008), 73–127.

43. See Hans-Georg Gadamer, "The Play of Art," *The Relevance of the Beautiful*

and Other Essays, trans. Nicholas Walker, ed. Robert Bernasconi (Cambridge: Cambridge University Press, 1986), 127–28. Despite their sonic and social disparities, both opera and certain sub-genres of rock music, such as glam metal, share an intense engagement with play through *mimicry:* in addition to their musical intensity, both feature masks, costumes, pyrotechnics, and other theatrical accoutrements that collectively entreat the audience to suspend its disbelief.

44. First-person digital games are best at imparting the sense of motion and disorientation typical of *ilinx:* examples include EA Digital Illusions Creative Entertainment's parkour-inspired *Mirror's Edge* and Dejobaan Games' vertigo-inducing *AaaaaAAaaaAAAaaAAAAaAAAAA!!! A Reckless Disregard for Gravity. Mirror's Edge,* developed by EA Digital Illusions Creative Entertainment (Redwood City: Electronic Arts, 2008). *AaaaaAAaaaAAAaaAAAAaAAAAA!!! A Reckless Disregard for Gravity,* developed by Dejobaan Games (Watertown, MA: Dejobaan Games, 2009).

45. Roger Caillois, *Les jeux et les hommes: le masque et le virtige,* trans. Meyer Barash, *Man, Play, and Games,* 28–30. It should be noted that the sense in which Caillois deploys *ludus* ("game" or "play" in Latin) is at odds with the English adjective "ludic," which connotes undirected and spontaneously playful behavior: confusingly, these are precisely the characteristics that Caillois ascribes to *paidia.*

46. For example, a player might recklessly sacrifice her queen for the pleasure of watching the game unravel (or simply to annoy her *ludus*-oriented opponent). Bernard Suits defines such players as "triflers" who recognize the rules but not the goals of a game (Bernard Suits, *The Grasshopper: Games, Life, and Utopia* [Peterborough, Ontario: Broadview Press, 2005], 58–60).

47. See David Cohen, "Webern's Magic Square," *Perspectives of New Music* 13, no. 1 (1974): 213–15. As its title suggests, the *paidia* of "Couplets bachiques" is mixed with a good measure of drunken *ilinx.*

48. For a theoretical overview of the constitutive, operational, and implicit rules that enable and constrain gameplay, see Katie Salen and Eric Zimmerman, *Rules of Play: Game Design Fundamentals* (Cambridge: MIT Press, 2004), 101–5, 141–49.

49. These features distinguished *Guitar Hero* from Harmonix's previous rhythm-action game *Frequency,* which traded on the synergy between its comparatively esoteric electronic soundtrack and its futuristic presentation: while these attributes enhanced its appeal for technophiliac gamers, they restricted its mass-market potential. On the factors behind the rapid expansion and diversification of the digital-game audience in recent years, in which the success of *Guitar Hero* and *Rock Band* played a major role, see Jesper Juul, *A Casual Revolution: Reinventing Video Games and Their Players* (Cambridge: MIT Press, 2010).

50. Robin Murray, "Noel Gallagher on *Guitar Hero:* Not a Fan, It Seems," posted February 3, 2009, http://www.clashmusic.com/news/noel-gallagher-guitar-hero.

51. Quoted in Brian Hiatt, "Secrets of the Guitar Heroes: John Mayer," posted June 12, 2008, http://www.rollingstone.com/news/story/21004549/secrets_of_the_guitar_heroes_ john_mayer/print. Rigopulos has cheerfully admitted the element of truth in Mayer's complaint, going so far as to specify the game's algorithmic input/output ratio: "A game like *Rock Band* gets you maybe 50 percent of the way [toward the experience of musical performance] with 3 percent of the effort" (quoted in Daniel Radosh, "While My Guitar Gently Beeps," *New York Times,*

August 16, 2009, http://www.nytimes.com/2009/08/16/magazine/16beatles-t.html?pagewanted=all).

52. In the world of digital games, cheating does not necessarily imply dishonesty or deception: circumvention of a game's prevailing rules may or may not be enabled and sanctioned by its developers (see Julian Kücklich, "Forbidden Pleasures: Cheating in Computer Games," *The Pleasures of Computer Gaming*, ed. Melanie Swalwell and Jason Wilson (Jefferson, NC: McFarland, 2008), 52–71). Suits defines the cheat as the trifler's counterpart: she acknowledges the goals but not the rules of a game (Bernard Suits, *The Grasshopper: Games, Life, and Utopia*, 60).

53. See Trevor J. Pinch and Karin Bijsterveld, "'Should One Applaud?': Breaches and Boundaries in the Reception of New Technology in Music," *Technology and Culture* 44, no. 3 (2003): 536–59.

54. "I mean, what would you rather drive, a Ferrari or one of those amusement-park cars on a track?" (Mayer, quoted in Brian Hiatt, "Secrets of the Guitar Heroes: John Mayer").

55. The games themselves acknowledge this by incorporating "practice" modes in which players can tackle troublesome passages at a reduced tempo. *Rock Band 2* even features a dedicated "drum trainer" mode, which instructs the player according to the principles of traditional drumming pedagogy. For the *ludus*-averse, *Rock Band 2* also introduced a "no-fail" mode in which the show always goes on, no matter how shambolic the performance.

56. Such players congregate online at the ScoreHero forum (http://www.scorehero.com/ forum/), where they exchange arcane strategies and techniques in pursuit of ever-higher scores. See Miller, *Playing Along: Digital Games, YouTube, and Virtual Performance*, 137–41.

57. See the project undertaken by the Guitar Zeros ("The Zero Guide") and www. scorehero.com forum user Reptiliack's tutorial for inserting new tracks into the PlayStation 2 version of *Rock Band* (Reptiliack, "How to Get Custom Songs Into *Rock Band*," posted May 26, 2008, http://rockband.scorehero.com/forum/viewtopic.php?t=9189).

58. "I'm super-proud of the online community that has popped up around [the peripherals]. I think they're an awesome and relatively cheap project box for doing all sorts of crazy, different things. We're hoping to see people plug these things into their computers, and perform in their band with them" (Matt Boch, quoted in Chris Dahlen, "Interview: Harmonix Music Systems," posted July 17, 2008, http://www.avclub.com/articles/harmonix-music-systems,14273/). The potential for compositional creativity, previously the exclusive domain of hackers and modders, was officially enabled by the MIDI-based Music Studio mode of *Guitar Hero: World Tour* and was extended by the establishment of Harmonix's Rock Band Network, a "system that [allows] bands, studios and record labels to create and sell playable game content from their master recordings using the same professional tools used by our developers" ("Coming Soon," accessed June 19, 2012, http://creators.rockband.com/statichome).

59. Eric Zimmerman, "Narrative, Interactivity, Play, and Games: Four Naughty Concepts in Need of Discipline," *First Person: New Media as Story, Performance, and Game*, ed. Noah Wardrip-Fruin and Pat Harrigan (Cambridge: MIT Press, 2004), 159. Jon Dovey and Helen W. Kennedy frame the same insight in politicized terms,

asserting that digital gaming is simultaneously the "prodigal son of the military/industrial/capitalist complex and its illegitimate and unruly child" (Jon Dovey and Helen W. Kennedy, *Game Cultures: Computer Games as New Media* [Maidenhead: Open University Press, 2006], 36).

60. Despite its virtues, Caillois's ethnocentric perspective on play both limits and over-extends the scope of his taxonomy; moreover, it could be argued that his categories cannot account for the complexities of technologically mediated play. Sutton-Smith's seven "rhetorics" of play (outlined in Brian Sutton-Smith, *The Ambiguity of Play*, 9–12) draw upon a broader range of intellectual and cultural resources; see also Salen and Zimmerman's succinct but powerful definition ("play is free movement within a more rigid structure," Katie Salen and Eric Zimmerman, *Rules of Play: Game Design Fundamentals*, 304).

61. Among other peripherals, this shared ancestry incorporates the controller for the Japanese version of the Super Nintendo Entertainment System, released in 1990, as well as *Simon*, which was based on the arcade game *Touch Me*, released by Atari four years earlier. Although *Simon* was a memory game, it is telling that its primary-colored quadrants emitted musical pitches that collectively constituted a C-major triad.

62. On Froebel, see Joachim Liebschner, *A Child's Work: Freedom and Guidance in Froebel's Educational Theory and Practice* (Cambridge: Lutterworth Press, 2006).

63. See Milton Bradley, *Color in the Kindergarten: A Manual of the Theory of Color and the Practical Use of Color Material in the Kindergarten* (Springfield, MA: Milton Bradley, 1893).

64. Successive iterations of the *Guitar Hero* and *Rock Band* guitars have become ever-more "realistic" in appearance as ever-greater authenticity has been claimed for the games themselves, culminating in the painstaking attention to detail that characterizes the music, instruments, iconography, and historical presentation of *The Beatles: Rock Band* (documented by Radosh in "While My Guitar Gently Beeps"). Beyond that, Fender produced both "simulated" and "hybrid" six-string guitar controllers (licensed from Mustang and Squier respectively) for use in *Rock Band 3*, released in 2010. These controllers offer players the chance to develop "actual musical skills" through the introduction of accurately tabulated "Pro" modes: the invocation of professionalism serves to distinguish such serious pursuits from the casual dabbling of the amateur, thereby reconstructing a work/play dichotomy within the game itself. In 2011, Ubisoft pursued this tendency to its logical conclusion by releasing *Rocksmith*, an "authentic guitar game" that connects to any electric guitar: players thus "really" perform the game's songs, within the ambit of an adaptive difficulty system. *Rocksmith*'s very title evokes artisanship rather than heroism, work rather than play.

65. Henry George Liddell and Robert Scott, rev. Henry Stuart Jones, *A Greek-English Lexicon* (Oxford: Clarendon Press, 1940), s.v. παιδιά. Plato's use of the term reflected his conception of humans as playthings of the gods and of ritual as a "game" played out in the gods' honor. *Paidia* (play or game), *paideia* (education or culture), and *paides* (children) share the same etymological root.

66. For a polemical diagnosis of this cultural condition, see Simon Reynolds, *Retromania: Pop Culture's Addiction to Its Own Past* (New York: Faber and Faber, 2011).

67. Giorgio Agamben, "In Playland: Reflections on History and Play," *Infancy and History: The Destruction of Experience*, trans. Liz Heron (London: Verso Books, 1993), 80. The "toyness" of the plastic guitar is brought to the fore in *Lego Rock Band*, developed by Harmonix in collaboration with Traveller's Tales, which "mashes up" primary-colored franchises in order to appeal simultaneously to children and to their nostalgic parents.

68. Steve Waksman, *Instruments of Desire: The Electric Guitar and the Shaping of Musical Experience* (Cambridge: Harvard University Press, 1999). See also André Millard, ed., *The Electric Guitar: A History of an American Icon* (Baltimore: Johns Hopkins University Press, 2004).

69. "Achievements" contribute toward every Xbox 360 player's "Gamerscore," a cumulative tally of his or her accomplishments in all games played and thus an index of skill, devotion, and free time.

70. Later iterations of *BeatMania* expanded the keyboard's range to seven keys. The two-octave keyboard peripheral introduced with *Rock Band 3* draws directly upon this lineage; likewise, FreeStyleGames' *DJ Hero*, a spinoff from the *Guitar Hero* franchise, is indebted to both *BeatMania* and *Frequency*. Its innovation lies in the degree to which its soundtrack, centered on turntablism and mash-ups of electronic music, hip-hop, and pop, reflects the archetype of the DJ whose musically creative activities revolve around the selection and combination of pre-existent elements rather than focusing on the composition and performance of "original" material.

71. By 2010, the Bemani division had released thirty-nine different arcade cabinets since the original *BeatMania* (cited in the unattributed article "Rhythm Attraction—The Rise of the Beatmatching Business: How Rhythm-Action Topped the Charts," *Edge* 211 (February 2010): 74).

72. On Japanese arcade culture in general and rhythm-action games in particular, see Brian Ashcraft and Jean Snow, *Arcade Mania! The Turbo-Charged World of Japan's Game Centers* (Tokyo: Kodansha International, 2008), 50–65; Chris Kohler, *Power-Up: How Japanese Video Games Gave the World an Extra Life* (Indianapolis: BradyGames, 2004), 132–64. For broader cultural context and commentary, see Joseph Tobin, ed., *Pikachu's Global Adventure: The Rise and Fall of Pokémon* (Durham: Duke University Press, 2004); Larissa Hjorth and Dean Chan, eds., *Gaming Culture and Place in Asia-Pacific* (New York: Routledge, 2009).

73. See Joanna Demers, "Dancing Machines: *Dance Dance Revolution*, Cybernetic Dance, and Musical Taste," *Popular Music* 25, no. 3 (2006): 401–14; Jacob Smith, "I Can See Tomorrow in Your Dance: A Study of *Dance Dance Revolution* and Music Video Games," *Journal of Popular Music Studies* 16, no. 1 (2004): 58–84. Smith describes the bifurcation of *Dance Dance Revolution* communities into "tech" and "freestyle" contingents. In Caillois's terms, tech players focus on *agôn* and *ludus* while freestylers exhibit *mimicry* and *paidia*. Miller discusses similar types of ludic attitudes to *Guitar Hero* and *Rock Band* in *Playing Along: Digital Games, YouTube, and Virtual Performance*, 127–29.

74. The Aerosmith-themed *Quest for Fame*, developed in the United States by Virtual Music and initially released for PC in 1995, merits a mention here, particularly since an arcade version was manufactured by the Japanese company Namco as a rival to Konami's Bemani games in 1999. There is no evidence, however, that it directly influenced either Konami or Harmonix.

75. Maggie Overfelt, "How 'Horrendous Failure' Led to *Rock Band*," posted September 3, 2009, http://money.cnn.com/2009/09/03/smallbusiness/harmonix_rock_band_startup_story/index.htm. *PaRappa The Rapper*, a "rhythm-action" game developed by NanaOn-Sha under Masaya Matsuura's direction, was released in Japan for the PlayStation in 1996. According to Rigopulos, "the release of *PaRappa* was a life-changing event for me—it wasn't the first rhythm-action game, but it was the first great one, and it altered Harmonix's trajectory" (quoted in "Rhythm Attraction—The Rise of the Beatmatching Business: How Rhythm-Action Topped the Charts," 71). Harmonix also gained invaluable experience by collaborating with Konami in developing and localizing the Japanese *Karaoke Revolution* digital-game franchise for the North American market; see Randy Smith and Greg LoPiccolo, "All the Way to 11," *Edge* 194 (November 2008): 74–75.

76. While imitation might be the sincerest form of flattery, Konami responded by suing Harmonix for patent infringement; see Chris Kohler, "Konami Sues Harmonix Over *Rock Band*," posted July 10, 2008, http://www.wired.com/gamelife/2008/07/konami-sues-har/. By early 2011 the case had reached settlement, details of which had not been made public.

77. Liu defines prophetic relics—or reverse skeuomorphs—as "epistemological rather than instrumental stitches between past and present. They are an index or placeholder (rather than cause or antecedent) of the future" (Alan Liu, "Transcendental Data: Toward a Cultural History and Aesthetics of the New Encoded Discourse," *Critical Inquiry* 31 [2004]: 72). For a historical perspective on the piano roll as "software" and the ontological and legal uncertainty to which it gave rise, see Lisa Gitelman, "Media, Materiality, and the Measure of the Digital; Or, the Case of Sheet Music and the Problem of Piano Rolls," *Memory Bytes: History, Technology, and Digital Culture*, ed. Lauren Rabinovitz and Abraham Geil (Durham: Duke University Press, 2004), 199–217. For a complementary perspective that situates the piano roll and *Guitar Hero* in the context of "re-performance," see Nicholas Seaver, "A Brief History of Re-performance," MSc diss., Massachusetts Institute of Technology, 2010.

78. A full set of instruments and software for *Rock Band* initially retailed for approximately $200. The private, domestic setting of the typical North American *Guitar Hero* experience contrasts with the vibrant public spaces of the Japanese arcades in which *BeatMania*, *Dance Dance Revolution*, and *GuitarFreaks* are usually played; the exoticized fascination such spaces can exert on the Western imagination is reflected in Sofia Coppola's film *Lost in Translation* (2003). Although rhythm-action games are played domestically in Japan and publicly in North America, the converse is the prevailing norm (see Miller, *Playing Along: Digital Games, YouTube, and Virtual Performance*, 129–41; Shinichiro Kumano, "Konami: Jōshiki wo kutsugaesu ongaku gēmu dai-hitto, Kanren shōhin nado tamen-tenkai," *Nikkei bijinesu*, February 15, 1999, 61–64).

79. *The Beatles: Rock Band* removes the improvisatory elements present in *Rock Band 2* (such as freestyle drum fills and cadenza-like "Big Rock Endings") and prohibits singers from substantially reducing the levels of the original vocal tracks.

80. Quoted in Daniel Radosh, "While My Guitar Gently Beeps." In this vein, Miller draws a telling analogy between *Guitar Hero* notation, transcription, and gameplay and the culture of four-hand amateur pianism in the nineteenth century (Miller, *Playing Along: Digital Games, YouTube, and Virtual Performance*, 105–6).

81. Kircher's design for an elaborate water organ is reproduced in Siegfried Zielinski, *Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by Technical Means*, trans. Gloria Custance (Cambridge: MIT Press, 2006), 127. See also the eighteenth-century conception of a "machine that shall write Extempore Voluntaries" as described in John Freke, "A Letter from Mr. John Freke F. R. S., Surgeon to St. Bartholomew's Hospital, to the President of the Royal Society, Inclosing a Paper of the Late Rev. Mr. Creed, concerning a Machine to Write Down Extempore Voluntaries, or Other Pieces of Music," *Philosophical Transactions (1683–1775)* 44 (1746–47): 446; and V. D. de Stains's representation of barrel organ notation in *Phonography*, plate VII (V. D. de Stains, *Phonography; Or the Writing of Sounds*, 2nd ed. [London: Effingham Wilson, 1842], 190–91). The keyboard peripheral released alongside *Rock Band 3* makes explicit the game's "piano roll" notational lineage and provides a more conventional input device for interacting with it: for players, guitar parts and keyboard parts are interoperable (see Justin Haywald, "What *Rock Band 3*'s Pro Keyboard Can Teach You About Real Music," posted August 17, 2010, http://www.1up.com/ do/reviewPage? pager.offset=0&cId=3180908&p=).

82. See David Suisman, "Sound, Knowledge, and the 'Immanence of Human Failure': Rethinking Musical Mechanization through the Phonograph, the Player-Piano, and the Piano," *Social Text* 28, no. 102 (2010): 19; Gerhard Nierhaus, *Algorithmic Composition: Paradigms of Automated Music Generation* (Vienna: Springer, 2009), 39–43; Lisa Gitelman, "Media, Materiality, and the Measure of the Digital; Or, the Case of Sheet Music and the Problem of Piano Rolls," *Memory Bytes: History, Technology, and Digital Culture*, ed. Lauren Rabinovitz and Abraham Geil, 203–4.

83. Despite or owing to their efforts, the Guitar Zeros' conversion of *Guitar Hero* controllers into functional MIDI instruments accentuates the disparity between the MIDI-like digital latticework of the games' interfaces and the analog modulations of the electric guitar itself: the former binarize—and inevitably fall short of—the latter. See Jaron Lanier, *You Are Not a Gadget: A Manifesto* (New York: Knopf, 2010), 7–10.

84. See Hristo Bojinov et al., "Neuroscience Meets Cryptography: Designing Crypto Primitives Secure Against Rubber Hose Attacks," https://www.usenix.org/conference/usenixsecurity12/neuroscience-meets-cryptography-designing-crypto-primitives-secure.

85. On the relationship between digital games and the military-industrial complex, see Patrick Crogan, *Gameplay Mode: War, Simulation, and Technoculture* (Minneapolis: University of Minnesota Press, 2011); Claus Pias, "The Game Player's Duty: The User as the Gestalt of the Ports," *Media Archaeology: Approaches, Applications, and Implications*, ed. Erkki Huhtamo and Jussi Parikka, 164–83. On Baer's involvement with the military, see Steven Karras, ed., *The Enemy I Knew: German Jews in the Allied Military in World War II* (Minneapolis: Zenith Press, 2009), 131–49.

86. Friedrich Kittler, *Gramophone, Film, Typewriter*, trans. Geoffrey Winthrop-Young and Michael Wutz (Stanford: Stanford University Press, 1999), 96–97.

87. Chris Dahlen, "Interview: Harmonix Music Systems." *Quest for Fame* featured a similarly ambiguous "V-Pick."

88. Jean Baudrillard, *Simulacra and Simulation*, trans. Sheila Glaser (Ann Arbor: University of Michigan Press, 1996).

89. See, for instance, Hugh Barker and Yuval Taylor, eds., *Faking It: The Quest for*

Authenticity in Popular Music (New York: Norton, 2007); Philip Auslander, "Tryin' to Make It Real: Live Performance, Simulation, and the Discourse of Authenticity in Rock Culture," *Liveness: Performance in a Mediatized Culture*, 73–127.

90. Lawrence Grossberg, "The Media Economy of Rock Culture: Cinema, Post-Modernity, and Authenticity," *Sound and Vision: The Music Video Reader*, ed. Simon Frith, Andrew Goodwin, and Lawrence Grossberg (London: Routledge, 1993), 185–209.

91. Victor Godinez, "Metallica Fans Say *Guitar Hero* Versions of *Death Magnetic* Songs Beat Those of the CD," posted September 25, 2008, http://www.popmatters.com/pm/article/metallica-fans-say-guitar-hero-versions-of-death-magnetic-songs-beat-those-/. See also Ian Shepherd, "Metallica['s] *Death Magnetic* Sounds Better in *Guitar Hero*," posted September 15, 2008, http://mastering-media.blogspot.com/2008/09/metallica-death-magnetic-sounds-better. html.

92. The tired arm of an expert player testifies not only to the repetitiveness of certain riffs but also to the superior efficiency of copying and pasting in Pro Tools compared to human-powered techniques of replication. For footage of the recording of *Death Magnetic* that features Pro Tools and click tracks, see *The Making of Metallica's* Death Magnetic, directed by Metallica (bonus DVD with Metallica, *Death Magnetic* Box Set Limited Edition, Vertigo 00602517804609, 2008).

93. Philip Auslander, "Tryin' to Make It Real: Live Performance, Simulation, and the Discourse of Authenticity in Rock Culture," *Liveness: Performance in a Mediatized Culture*, 73–127.

94. Chris Kohler, "Full-On *Rock Band* Makes Jamming Follow-Up to *Guitar Hero*," Wired, posted September 14, 2007, http://www.wired.com/gaming/gamingreviews/magazine/15-10/mf_harmonix?currentPage=all.

95. To add one final twist, in 2008 VH1 Classic broadcast *Rock Band 2: The Stars*, a "reality" show along the lines of *Big Brother*. Living in a mansion under the threat of weekly elimination, participants vied with one another for the title of the best *Rock Band* 2 player: criteria relating to both *ludus* (technical accuracy and high scores) and *paidia* (energy and attitude) were applied by judges Alice Cooper and Sebastian Bach.

96. Robert Fink, *Repeating Ourselves: American Minimal Music as Cultural Practice* (Berkeley and Los Angeles: University of California Press, 2005), 221. From a different perspective, Paul DeGooyer of MTV Games has compared *Rock Band* to the Kódaly Method of music instruction, particularly its pedagogical approach to rhythm (cited in Daniel Radosh, "While My Guitar Gently Beeps."

97. Gallagher has admitted, "I've never played *Guitar Hero* myself. I suppose I'm a bit old-fashioned" (Robin Murray, "Noel Gallagher on *Guitar Hero:* Not a Fan, It Seems").

98. Henri Bergson, *Laughter: An Essay on the Meaning of the Comic*, trans. Cloudesley Bereton and Fred Rothwell (New York: Macmillan, 1921), 37.

99. Miller, *Playing Along: Digital Games, YouTube, and Virtual Performance*, 141–49.

100. Robert Fink, *Repeating Ourselves: American Minimal Music as Cultural Practice*, 226–33.

101. Shin'ichi Suzuki, *Young Children's Talent Education and Its Method*, trans. Kyoko Selden (Van Nuys, CA: Alfred, 1996), 51; Hans-Georg Gadamer, *Truth and Method*, trans. W. Glen-Doepel, Joel Weinsheimer, and Donald G. Marshall, 106.

102. Claus Pias, "The Game Player's Duty: The User as the Gestalt of the Ports,"

Media Archaeology: Approaches, Applications, and Implications, ed. Erkki Huhtamo and Jussi Parikka, 164–83.

103. Margaret Robertson, "One More Go: *Donkey Kong: Jungle Beat.*"

104. In Kittler's formulation, "code is the only language that does what it says": it is performative in the strict sense of the term (paraphrased in Alexander R. Galloway, *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006), 5). Nicholas Cook has made an analogous point in the context of chamber music: "to think of [a Mozart quartet] as a 'script' is to see it as choreographing a series of real-time, social interactions between players" (Nicholas Cook, "Music as Performance," *The Cultural Study of Music*, ed. Martin Clayton, Trevor Herbert, and Richard Middleton (New York: Routledge, 2003), 206).

105. Chris Kohler, "Full-On *Rock Band* Makes Jamming Follow-Up to *Guitar Hero.*"

106. It is suggestive that Lang Lang's 2011 album commemorating Liszt's bicentennial year is entitled *Liszt: My Piano Hero.*

107. Vladimir Jankélévitch, *Music and the Ineffable*, trans. Carolyn Abbate (Princeton: Princeton University Press, 2003), 77–79. Carolyn Abbate, "Music—Drastic or Gnostic?," *Critical Inquiry* 30, no. 3 (2004): 505–36.

108. Ian Bogost, *Unit Operations: An Approach to Videogame Criticism* (Cambridge: MIT Press, 2006), 27–28.

109. Margaret Robertson, "One More Go: *Donkey Kong: Jungle Beat.*"

110. *Donkey Konga* was adapted from Namco's *Taiko no Tatsujin*, an example of a Japanese rhythm-action game that does not draw upon Western iconography and organology: it features a controller in the form of a taiko drum.

111. See, for instance, *Fret Nice*, developed by Pieces Interactive (Torrance, CA: Tecmo, 2010); *Boom Boom Rocket*, developed by Bizarre Creations (Redwood City: Electronic Arts, 2007); *Rock of the Dead*, developed by Epicenter Studios (Pomona: Conspiracy Studios and UFO Interactive, 2010).

112. Steven Poole, *Trigger Happy: Videogames and the Entertainment Revolution* (New York: Arcade, 2000), 187.

113. Hans Ulrich Gumbrecht, *Production of Presence: What Meaning Cannot Convey* (Stanford: Stanford University Press, 2004), 113–14.

DAVID BORGO

Beyond Performance

Transmusicking in Cyberspace

- An ensemble of thirty performers prepares to improvise music together. With only basic conceptual sketches agreed upon beforehand and a language of improvised conducted gestures to guide them, this performance already carries a considerable degree of risk. Add to this the fact that the musicians and their respective audiences are physically located in three distinct venues spanning nearly 3,000 miles and the notion of "creating music together in the course of performance" may appear to enter the realm of impossibility.
- On the street, a young woman with conspicuous white cords dangling from her ears appears lost in the music she alone is hearing, and yet somehow also deeply engaged in and by her surroundings. At times she turns her entire body in response to loud sounds in her environment. At other moments she dramatically taps, shakes, and rotates the device she is holding. Sometimes she whispers garbled words, hums strange melodies, or uses objects and surfaces in her surroundings to create percussive sounds and rhythms. It is hard not to wonder what she is hearing and what compels her to these unusual activities.
- A visitor to an otherwise sedate museum is asked to remove his shoes, don a brightly colored robe, and wear a blindfold. With assistance he enters a ritualized space full of unusual and disorienting sounds and sensations. Others who are similarly dressed saunter and even dance about, variously pulled together or swept apart as if by magnetic or other invisible forces. In reality, each participant is honing in on a personal "sound signature" that can modulate in response to one's own actions, to the proximity of others, or to the subtle prodding of a hidden computer operator. These strangely clad and sight-impaired individu-