Human Bodies, Computer Music

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ABSTRACT

The author considers the absence of the artist's body in electronic music, a missing element that he finds crucial to the success of any work of art. In reviewing the historical development of electronic music from *musique concrète* to analog and then digital synthesizers, the author finds that the attainment of increased control and flexibility has coincided with the reduction of identifiable bodily involvement by the performer. He contrasts this trend with the highly physical intervention and manipulation, first practiced with atypical electronic instruments such as the theremin, subsequently introduced to the electric guitar by Jimi Hendrix and his followers, and then to vinyl by turntable artists. He concludes that the tension between body and machine in music, as in modern life itself, can only exist as an experience to examine and criticize and not as a problem to resolve.

Pierre Hébert, a frequent collaborator of mine, says the measure of a work of art is whether one can sense in it the presence of the artist's body. If so, then it is a success, and if not, it's a failure.

I think this is an important insight. It is closely related to the issue of virtuosity, by which I mean what happens when someone acquires such facility with an instrument or paintbrush, or with anything physically manipulable, that an intelligence and creativity is actually written into the artist's muscles and bones and blood and skin and hair. It stops residing only in the brain and goes into the fingers and muscles and arms and legs.

Virtuosity has been out of fashion for years now, ever since the advent of punk rock, conceptual art and other movements that emphasize the idea rather than its execution. Nevertheless, virtuosity of some sort is a necessary element of almost any performance.

We all live in human bodies. Every one of us lives through every day of our lives in the reality of our bodies. We struggle to make them do the things we want them to do. We have aches and pains. We know the joy of using our bodies in an expressive and wonderful way, the frustrations of failure, and what it was like to learn whatever physical skills we have—riding a bike, playing a sport, typing, being sexual, anything. It is one thing absolutely every person has in common. So when you give a performance that takes your body out of the mundane and into something extraordinary through art, it has a profound appeal—this appeal is the foundation of all performance. It need not be limited to virtuosity in the conventional sense of, say, a violin master. There are punk rockers who can barely play their instruments but whose physical stage presences—in body motions, voices or even just facial expressions—are extraordinary.

I think most musicians working with electronics are probably not very satisfied with the state of electronic music today, and the crucial missing element is the body. Many of us have been trying to solve this problem for years but we have been notoriously unsuccessful at it. How to get one's body into art that is as technologically mediated as electronic music, with so much technology between your physical body and the final outcome, is a thorny problem.

Of course, Hébert's dictum, which began this article, about sensing the body of the artist in the art, should not be viewed too literally. It is not that it is impossible to put a sense of one's body into art made with assistance from machines. Hébert is talking about a sense of the corporeal presence of the artist emanating from the work. It is not *necessary* that an artist "touch" an image or instrument in order to achieve this result, but it certainly helps.

A New Kind of Music

I got into electronic music in the mid-1970s, playing analog synthesizers, which were just becoming available for personal use outside of research institutions. Computer music was still confined to crude programs run on mainframe computers at universities. The thinking at the time was that these electronic instruments were so new and different—their entire methodology and pedagogy seemed unique—that they would lead to the creation of a new kind of music. We eagerly searched for the outline of this new kind of music that no one had ever heard.

Today we actually do have a new kind of music that has come directly from electronics, and specifically from computers: electronic dance music. Throughout the whole history of music prior to computers, no rhythm was absolutely perfectly timed due to the limits of human accuracy. This was a good thing, however, as the nuanced irregularity in how the beat was actually played was one of the crucial things giving distinctive character to different kinds of music. The precise, perfectly timed beat was a sort of ideal grid that everyone kept in mind but never actually played. With the evolution of jazz, the discrepancy between the ideal grid and what people actually played came to be known as swing, but there was no music in the world that didn't have *some* bit of swing. With electronic dance music, the precise mental grid that had been lurking unheard for thousands of years behind human music was pushed out front and center and made audible.

That's revolutionary. It is a kind of music that could not exist without computers, and it is a natural outgrowth of using computers with sound. Electronic dance music thus meets the criteria of what in the 1970s we thought must be coming in music but could not yet see, although it did not turn out to be what anyone back then was expecting. In fact, many of us absolutely detest this kind of music. But if we step back for a moment, it is not so surprising that electronic dance music is what developed.

I remember when the first MIDI sequencers (easily manageable composition software for personal computers) came out and everyone said, "Well, that's cool, but it sounds so machinelike no one will ever listen to it." And the software makers busied themselves trying to figure out how to make MIDI sequencers sound human. But before they could solve the problem, a new generation of kids had come up who *liked* the machinelike quality of the sound, and if the software companies had then found a way to make their sequencers sound human no one would have bought the software. Apparently

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our tastes acclimate to technology faster than our ability to innovate technologically.

Or at least the tastes of young people acclimate quickly. Reaction to music with an electronically precise beat is the most generationally determined thing I have ever seen in music, or any other art form for that matter. I cannot think of a person I know over the age of 30 who likes electronic dance music, most certainly not anyone over 40.

In one sense, dance music solves electronic music's problem with performance by making music the secondary event to whatever else is happening. People don't miss the performance aspect of the music, because that is not what they are paying attention to. They are either dancing, or chatting at the bar, or taking drugs, or *something*, but they are not focused on the performance. In fact, people who make electronic dance music have been going to great lengths to divert people's attention from their actual presence: putting on light shows, showing films and videos, and so on.

One could argue that making dance music with computers is a backdoor way of getting the human body back into the music—however, the bodies are the audience's, not those of the performers. So the physical bond of performance is that everyone is dancing, while the performers hide behind a light show or a fog machine.

Dance music has become so popular that it has changed the very meaning of electronic music in our culture. In the 1970s, it was assumed that if you played a synthesizer or were interested in synthesizers, then you were out on the fringe doing something creative and unusual. The current situation is exactly the reverse: If you tell someone that you make electronic music, they assume you are making dance music. Similarly, in the 1970s, though few electronic instruments were being built, they were specifically designed for making music that was far off the beaten path. Today there is a large and specialized market for electronic musical instruments, which are nearly all narrowly tailored to dance music.

A Brief Review

Let's review the early days of electronic music, to see why things turned out the way they did. Most of the earliest electronic music was *musique concrète*, compositions made from collages of sounds recorded on magnetic tape. In general, these were studio works first and last: painstakingly assembled by cutting up pieces of recording tape with razor blades and splicing them back together. "Performance" of these works consisted of playing back the final tape. In the late 1970s I made some attempts to move tape manipulation out of the studio and into performance by building contraptions of multiple tape recorders I could crudely manipulate on stage, but this was a little far fetched.

Instead of using recorded sound, analog synthesizers generated voltages that oscillated at audio frequencies and thus could be heard as sound when amplified and sent to speakers. One way to "play" these synthesizers was to control the shape, amplitude and frequency of their audio signals with other voltage sources that changed at a rate slow enough for the changes to be perceived as distinct events instead of changes of pitch or timbre. This was a very enticing idea: since both the shape of the sound and the shape of a composition could be controlled in the same world of automated voltages, complex and surprising systems could be set up within the synthesizer itself, which produced music that was startlingly new and different. "Composing" in this situation meant setting up the connections and parameters of the synthesizer so as to set in motion the processes one had designed, and "playing" the composition involved listening to the output and intervening in the evolution of the process one had set up by fine-tuning parameters and connections as things progressed.

This is what I generally did in the 1970s. But whereas most others working along these lines worked alone or with other synthesizer players, I moved to New York and immersed myself in the downtown improvised music scene, trying to develop the skill necessary to set up "play" processes in my synthesizer as quickly and accurately as collaborators such as John Zorn (on alto sax) [1] or Fred Frith [2] (on guitar) could on their instruments.

A completely different way to play the synthesizer that also evolved during this time involved rigging a conventional instrument to generate voltages that could control synthesized sound. Keyboards were designed that translated the depression of the keys into a voltage the synthesizer could accept. Less successful experiments used guitars, drums and other instruments as input devices.

Many people, including myself, thought the use of keyboards and the like a dead end, for it meant using a great deal of technology to play music that could be readily played with a piano or a guitar. When confronted with a row of keys that look like those of a piano and are laid out in a pattern of 12 unique notes in an octave in the key of C, most people would understandably start to think like piano players and to think in conventional terms of harmony and melody. But the situation was even worse than that because acoustic instruments never sound two notes in exactly the same way. There are too many variables in how one's fingers or breath actually produce the sound. Just as small variations in the beat turned out to be a critical nuance that has shaped different styles of music, small changes in sound from note to note have turned out to be crucial to the vitality of the sound (at least to the ears of those of us who grew up listening to music pre-computer). It is impossible to get that kind of note-by-note variation from a synthesizer, and this is what gives conventional music played on a synthesizer its characteristic flat, machinelike feel.

Thus, while keyboards and guitars attached to synthesizers were able to incorporate synthesizers into conventional music in an often cheesy way, synthesizers also promised something much more radical. Exploring that direction meant throwing out the keyboards and learning to "play" the complex internal processes that seemed to be idiomatically indigenous to these new instruments.

Digital technology soon developed to the point that all the processes that synthesizers did through voltages, computers could do through numbers, and do so more accurately, more flexibly and less expensively. Digital synthesizers and samplers replaced tape recorders and analog synthesizers, but the analog synthesizer's dichotomy between its use for conventional music played mechanically and its use in unorthodox process-oriented music was carried over to the laptop fully intact.

The problem was and still is how to get one's body into the unorthodox kind of performance we are talking about. It had been problematic enough with a synthesizer, sitting on stage and carefully moving a knob a fraction of an inch, disconnecting a patch cord here and reconnecting it over there—with none of it correlating with a direct change in the sound that the audience might perceive as related to the physical motion. With the emergence of the laptop as instrument, the physical aspect of the performance has been further reduced to sitting on stage and moving a cursor by dragging one's finger across a track pad in millimeter increments.

This is often conceived among instrument designers and programmers as a

problem of "controllers"—that new kinds of physical devices are needed, the manipulation of which could integrate more appropriately into this kind of performance than a keyboard, guitar, knob or button can. For years there has been much experimentation with "alternative controllers" at research studios around the world [3]. I have tried many myself: infrared wands, drawing tablets, joysticks and game pads, video frames—anything I could get my hands on.

Despite years of research and experimentation, however, there is still no new instrument sufficiently sophisticated to allow anyone to develop even a rudimentary virtuosity with it. I believe that this failure is rooted in the premise that the problem lies in inadequate controllers. The bigger problem is this: What exactly are we going to control with these controllers we would like to invent? The performance software I have made does not require much data input to play. On the contrary, it requires very little. I might spend a whole performance making changes of very fine gradation to just a few variables.

If I had some really wild controller that doesn't exist now but that I could dream up—such as a big ball of a mudlike substance that I could stick my hands into, squeeze and stretch, jump up and down on, throw against the wall and wrap around my head, resulting in a variety of parameter streams that would be seamlessly digitized and fed to the computer—even if I had such a thing I don't know how I would use it. I have no software that could use all that data and I don't think anyone else does either. The problem is inherent in the very concept of the music: if we are "playing" by intervening in ongoing automated processes, then most of what is going on requires no input from the performer, and subtle interventions on the performer's part are more likely to add compositional coherence to the result than big, dramatic ones.

A Different Direction

There were, however, some early electronic instruments that integrated the body differently. The theremin, designed by Leon Theremin in 1919 [4], produced sound by means of the beat or difference effect, using two oscillators at inaudible radio frequencies to produce an audible difference tone controlled by changing electrical capacitance. This variable capacitance was made by moving one's hands around an antenna, sticking the body "into" the sound in a most literal way.

The theremin was very limited, however: it could play one timbre, and that was pretty much it. Since the performer only had control over volume and pitch, its application was limited to performing fairly conventional music. Over the years the theremin also found a niche in making spooky effects for science-fiction movies. However, it does stand as possibly the only electronic musical instrument on which one could become a virtuoso. Clara Rockmore, in particular, became a bona fide theremin virtuoso by any definition of the word and performed on the instrument in concert settings [5].

The key here is that the theremin used actual skin capacitance as the central element in controlling the instrument. There were thus fewer layers of technology between hand and sound than in other electronic instruments. The way the theremin sound was generated and the way it was controlled are an integrated package that one could literally stick one's fingers right into. Furthermore, the theremin was a conceptually complete instrument that did not undergo a constant series of revisions, redesigns and "upgrades." One could devote years to learning to play it without worrying that all that hard work would be made useless every 6 months by an "upgrade" that changed everything.

The most successful electronic instrument to date, however, came much later: the electric guitar. This is not even a "pure" electronic instrument in that its sound is not generated electronically but physically, by a vibrating string that is then amplified electronically. Within academia it is not typically even included within the realm of electronic music, identified as it is with blues and rock and roll. It took the genius of Jimi Hendrix to blow the lid off the conventional use of this instrument and point to a whole new way of playing it as a whole new kind of instrument. Hendrix's crucial innovation was playing at high volume and standing close to the speaker to obtain feedback that he could control in an extremely nuanced way with the position and angle of the guitar, the weight and position of his fingers on the strings, even the exact position of his entire body.

At his most experimental, Hendrix made the most successful electronic music to date. It is music that would be impossible to make, impossible even to imagine, without electronics. It is also hard to imagine a musician on any instrument in any genre integrating his/her body into the performance as totally as Hendrix did. Even now, watching films of him is a revelation; his guitar and his body appear as one, and it seems that everything from his toes to his hair is involved in shaping the sound [6].

The radical element in Hendrix's work was later developed by Keith Rowe and Fred Frith, among others [7]. These two have approached the electric guitar explicitly conscious of leaving behind the entire tradition of the acoustic guitar, starting from the idea that they were dealing not with a guitar per se, but with amplified vibrating strings stretched over a resonant body. By using amplification, they found that even tiny disturbances to the string could be made into musically useful sound.

Interestingly enough, electronic modification of the sound is not central to the work of any of these three musicians. Hendrix used a wah-wah pedal, which is just a very crude filter. When I first started playing with Frith, he was using no electronic sound modification at all. Although later he began using a variety of foot pedals that manipulate the string sound in various electronic ways, the physical control of the vibration of the strings and electronic amplification of the same have remained at the center of his work.

In addition to the electric guitar, the turntable has emerged as an interesting hybrid instrument, pioneered in the Bronx in the mid-1970s by artists such as Kool Herc, Afrika Bambaataa and Grandmaster Flash. And just as Rowe and Frith took Hendrix's guitar innovations systemically outside the bounds of popular music where they could be explored more rigorously, Christian Marclay did the same for the turntable [8].

The turntable is now the focus of intense experimentation by an entire generation of DJs, and the term "turntablism" has come into vogue. Here again, we have a sound that is generated physically: the vibrations of a stylus as it is dragged across grooved surfaces. Once again, the crucial element that the electronics provide is amplification, which makes the very subtle control of the stylus meaningful. Any further electronic processing of the sound is just icing on the cake. And finally, once again we have a development that was missed entirely by electronic music research institutions, coming instead from popular culture. People like Marclay and the Invisibl Skratch Piklz [9] have developed substantial skills that require very fine control and techniques, something like virtuosity.

In contrast, the approach favored in electronic music research facilities has been to electronically process conven-

tional instruments. For example, a clarinetist performs with a second musician who sits at a computer that records the clarinet sound and manipulates it in various ways. With few exceptions, this direction of work has produced stunningly uninteresting results. Music that uses electronically generated sound from synthesizers or computers suffers from the problem that one cannot actually get one's fingers into the generation of the sound. Hybrid instruments like the electric guitar solve this problem by using sound sources controlled by the body and amplifying them. But acoustic/electronic collaborations, such as have been the rage in academic computer music, make the problem even worse by dividing the tasks of the generation and control of the sound and giving them to two different people. The sound might be generated by an extremely skilled player with masterful control over the sound, but this is often all but irrelevant since that person does not actually control the final output.

A Fertile Ground

The integration of the human body into the performance of music in which the sound is generated by machines thus remains quite problematic. This should come as no surprise. It is a fundamentally new problem. Before the advent of machines that could automate sophisticated processes, there was no performance *without* the body. Since the body could not be removed, no one had to worry about how to put it back in. The problem can be precisely dated to the moment when early tape music pioneers first put a tape deck onstage and announced that their performance would consist of hitting the "play" button, and a confused audience scratched their heads and asked, "Was that really a *performance*?"

Since then, the problem has been reformulated again and again in various ways yet never solved. Nor will it be. For the entire problem is just one window into the tension residing at the very core of modern life—that between the human body and the machine. It is what structures our time and civilization. It finds expression in every aspect of our existence: work, play, health, reproduction, war, love, sex, politics and art. The fact that musicians have not resolved this tension indicates no failure of imagination on their part. It cannot be *solved* in the sense of a solution that can make a problem disappear. It can only be *experienced* in various ways. This makes it an excellent terrain for art and in particular for artists who work from an aesthetic such as mine, which prioritizes struggle and tension. For we can explore this difficult terrain without the catastrophic consequences of weapons development, the astronomical costs of space exploration, the biological casino of gene technology or the profit imperative of high-tech business. We might not be able to *perform* with machines, but we can *play* with them, which may be the best thing humans can do with them at this moment of history. Negotiating this terrain, however, requires that artists who use machines must do so critically: not celebrating technology but questioning it and probing it, examining its problematic nature, illuminating or clarifying tensions between technology and the body, and thus offering the kinds of insights only art can provide concerning the nature of life at the dawn of the third millennium.

References and Notes

1. For more information about John Zorn, see <http://www.tzadik.com/>.

2. For more information about Fred Frith, see <http://www.fredfrith.com/>.

3. In the United States, synthesizer pioneer Don Buchla has produced the most interesting alternative controllers, including the thunder, the lightning and the marimba lumina; see <http://www.buchla.com/>. In Europe, the STEIM studio has been most active, basing a variety of systems around their Sensorlab; see <http://www.steim.nl/>.

4. *Leonardo Music Journal* 6 (1996) published a special section guest edited by Bulat Galeyev entitled "Leon Theremin, Pioneer of Electronic Art," which included an article by Leon Theremin ("The Design of a Musical Instrument Based on Cathode Relays"); a biography of Theremin written by his niece; an article by his great-niece and theremin performer Lydia Kavina ("My Experience with the Theremin"); Bulat Galeyev's overview of the life of and politics surrounding Theremin; and other texts. See also Bulat M. Galeyev, "L.S. Termen: Faustus of the Twentieth Century," *Leonardo* **24**, No. 5, 573–579 (1991). A bibliography of works by and about Theremin, a discography of theremin recordings and a directory of theremin resources are available on Leonardo On-Line at: <http://mitpress2.mit.edu/Leonardo/isast/spec.projects/biblios.html>. Galeyev's *LMJ* **6** text, "Light and Shadows of a Great Life: In Commemoration of the One-Hundredth Anniversary of the Birth of Leon Theremin, Pioneer of Electronic Art," is also available on-line at <http://mitpress2.mit.edu/Leonardo/isast/journal/journal96/LMJ6/galeyevintro.html>.

5. Clara Rockmore is discussed in Kavina [4] p. 54.

6. The best of the many Hendrix concert films is *Jimi Plays Berkeley* (1971), available at most home video stores.

7. For information on Keith Rowe, see <http://www.l-m-c.org.uk/texts/rowe.html>. For more information on Fred Frith, see [2]; in particular, see his recordings *Guitar Solos Volumes 1 & 2*.

8. See <http://www.addict.com/issues/5.02/html/hifi/Cover_Story/Turntablism/History_Of/>; <http://www.egs.edu/faculty/christianmarclay.html>.

9. For information on the Invisibl Skratch Piklz, see <http://www.skratchpiklz.com/>.

Discography of Works by the Author

Say No More Project CDs 1 & 2, MVORL (2002). Originally released separately as *Say No More* (1993) and *Say No More in Person* (1994). Re-issued in MVORL limited edition in 2002. With Joey Baron (percussion), Mark Dresser (bass), Gerry Hemingway (percussion) and Phil Minton (voice). Assembled on computer from fragments of solo improvisations.

Say No More Project CDs 3 & 4, MVORL (2002). Originally released separately as *Verbatim* (1996) and *Verbatim Flesh & Blood* (2000). Re-issued in MVORL limited edition in 2002. With Gerry Hemingway (percussion), Mark Dresser (bass), and Phil Minton (voice). Third and fourth and final CD, from the *Say No project*. Assembled on computer (3) and recorded live in Gent, Belgium (4).

PantyChrist, Seeland 510 (1999). With Otomo Yoshihide (DJ) and Justin Bond (vocal).

Twins! Creativeman 0030 (1996). With Otomo Yoshihide (DJ). Resampled "twins" of parent tracks by Herb Robertson, Chris Cutler, and Yagi Michiyo.

Fear No Love, Avant 041 (1995). With Mike Patton, Fred Frith, Justin Bond, Lynn Breedlove, 15 others.

A Melody, No Bitterness: Bob Ostertag Solo Volume 1, Seeland 508 (1997). Solo improvisation. Re-issued in MVORL limited edition in 2001.

All the Rage, Elektra-Nonesuch 79332-2 (1993). Kronos Quartet plays Ostertag's transcriptions of gay riots in San Francisco. Libretto by Sara Miles.

Burns Like Fire (1992). Riots, country and western, and gospel. Companion piece to *All the Rage*. Re-issued in MVORL limited edition in 2001.

Sooner or Later, RecDec 37 (1991). Solo. Based on a recording of a Salvadoran boy burying his father. Re-issued on MVORL/Seeland in limited edition in 2001.

Attention Span, Rift 14 and RecDec 33 (1990). With John Zorn (alto sax) and Fred Frith (guitar). Re-issued in MVORL limited edition in 2001.

Voice of America, RecDec 907 (1982). With Fred Frith (guitar) and Phil Minton (voice). Recorded in concert in London and NYC. Re-issued in MVORL limited edition in 2001.

Like Getting a Head, Rift (1980). With Charles K. Noyes (percussion) and Fred Frith (guitar). Uses unorthodox instrument built from tape recorders and helium balloons. Re-issued in MVORL limited edition in 2001.

Fall Mountain: Early Fall, Parachute Records LP (1979). With Ned Rothenberg (wind instruments) and Jim Katzin (violin). Recorded at the Oberlin Conservatory of Music.

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Composer, performer, instrument builder, journalist, activist, kayak instructor—Bob Ostertag and his work cannot be easily summarized or pigeonholed. As a composer, he has released 20 CDs and has appeared at music, film and multimedia festivals around the globe. His political journalism has been published on every continent and in many languages. He designs his own electronic instruments for both music and video performance. His collaborators include the Kronos Quartet, avant-gardists John Zorn and Fred Frith, heavy-metal star Mike Patton, jazz great Anthony Braxton, dyke punk rocker Lynn Breedlove, drag diva Justin Bond and filmmaker Pierre Hébert.