



*The Case for Reduction*, ed. by Christoph F. E. Holzhey and Jakob Schillinger, Cultural Inquiry, 25 (Berlin: ICI Berlin Press, 2022), pp. 175–90

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## **Reduction in Computer Music Bodies, Temporalities, and Generative Computation**

CITE AS:

Federica Buongiorno, 'Reduction in Computer Music: Bodies, Temporalities, and Generative Computation', in *The Case for Reduction*, ed. by Christoph F. E. Holzhey and Jakob Schillinger, Cultural Inquiry, 25 (Berlin: ICI Berlin Press, 2022), pp. 175–90 <[https://doi.org/10.37050/ci-25\\_09](https://doi.org/10.37050/ci-25_09)>

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**ABSTRACT:** In the age of pervasive computing the way our body interacts with reality needs to be reconceptualized. The reduction of embodiment is a problem for computer music since this music relies heavily on different layers of (digital) technology and mediation in order to be produced and performed. The article shows that such a mediation should not be conceived of as an obstacle but rather as a constitutive element of a permanent, complex negotiation between the artist, the machinery, and the audience, aimed at shaping a different temporality for musical language (as the Italian artist Caterina Barbieri develops).

**KEYWORDS:** Embodiment; Philosophy of music; Phenomenology; Minimalism; Minimal music; Temporality; Computation; Computer music; Digital technology

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# Reduction in Computer Music

## Bodies, Temporalities, and Generative Computation

FEDERICA BUONGIORNO

### PREMISE

'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'.<sup>1</sup> Bob Ostertag made this observation in his 2002 article 'Human Bodies, Computer Music', and to some extent, twenty years later we are still facing the very same problem. As a result of this 'crucial missing element', the concept or idea of composition has gained priority over execution, so 'virtuosity has been out of fashion' for some time now: all those steps between the artist's body and the final outcome, mediated by computers and digital technologies, tend to render invisible what musicians physically do onstage.<sup>2</sup>

In the age of codes and pervasive computing, the way our body interacts with reality needs to be reconceptualized: As Mark B. N. Hansen puts it, the body can be referred to as a 'body-in-code', meaning 'a

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1 Bob Ostertag, 'Human Bodies, Computer Music', *Leonardo Music Journal*, 12 (2002), pp. 11–14 (p. 11).

2 Ibid. As Dani Deahl notes, performing electronic music live basically means having two options: 'stand behind a table with a bunch of gear and knobs and faders, or play a backing track and sing on top'. See Dani Deahl, 'Electronic Music Has a Performance Problem, and This Artist is Trying to Solve It', *The Verge*, 5 April 2019 <<https://www.theverge.com/2019/4/5/18277345/chagall-van-den-berg-performance-sensors-gloves-motion-tracking-suit>> [accessed 9 November

body whose (still primary) constructive and creative power is expanded through new interactional possibilities offered by the coded programs of “artificial reality”:<sup>3</sup> Thus, the body-in-code is ‘submitted to *and constituted* by an unavoidable and empowering technical deterritorialization — [it is] a body whose embodiment is realized, *and can only be realized*, in conjunction with technics.’<sup>4</sup> The modes of this type of embodiment are particularly clear in contemporary electronic music, which heavily relies on different kinds of (digital) technology in order to be produced and performed and which, as we shall see, can also employ generative computation for sound production. Computer music represents an interesting field to reflect on the problems related to human-machine interaction: ‘the twentieth century sets the stage for a new intensified kind of musical inquiry, which contributes to a new techno-embodied form of artistic inquiry and creativity.’<sup>5</sup> It is precisely this ‘new techno-embodied form’ that I wish to explore in this contribution.

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2021]. For some artists neither of these options is acceptable. For instance, Chagall van den Berg (a musician and performer from the Netherlands) claims that: ‘Either it was going to be real and live, but boring to watch and distant from the audience, or I’d play a recording and be able to dance around onstage. Dancing around and being one with the audience was way more appealing, but the musician in me really didn’t like the idea of singing along to a track. So I had a dilemma’ (quoted by Deahl). Deahl comments: ‘This dilemma van den Berg faced is a problem many DIY and electronic artists encounter — how do you incorporate movement and expressiveness when you essentially perform standing at a desk, using an interface the audience will likely never see? And then make it interesting?’. One might furthermore ask how to involve the audience in a counter-intuitive set based on acousmatic listening, where the audience has no intuition of the source of sound and cannot correlate the movements to the sonic outcome. Van den Berg proposed a high-tech solution: she ‘performs wearing motion-tracking gloves and a full-body suit covered in sensors, which, during this [...] performance, not only control a projection of a digital avatar that appears behind her, but also control nearly every instrument and effect in the music and her voice. As she moves across the stage, her avatar, floating in space, moves in sync. [...] Every hand and body movement has cause and effect, crafting a pop-infused dreamscape that’s mesmerizing to watch’ (ibid.).

3 Mark B. N. Hansen, *Bodies in Code: Interfaces with Digital Media* (London: Routledge, 2006), p. 38.

4 Ibid, p. 20; emphasis in the original.

5 Joshua B. Mailman, ‘Cybernetic Phenomenology of Music, Embodied Speculative Realism, and Aesthetics-Driven Techné for Spontaneous Audio-Visual Expression’, *Perspectives of New Music*, 54.1 (2016), pp. 5–95 (p. 7). The technology of any era tends to expand the instrumentalism of music, as observed by Pauline Oliveros with her remark that ‘every instrument is a prosthesis’ — Oliveros also coined the term ‘deep listening’ in 1989, to describe the practice of radical attentiveness in listening to experimental compositions. See the record by Pauline Oliveros, Stuart Dempster, Panaiotis, *Deep Listening* (Important, 473, 2020: reissue).

## 1. BODIES, INSTRUMENTS, AND TECHNOLOGIES

Before computer music, compositions could never be perfectly timed due to the limits of human accuracy. It was part of virtuosity to work around these limits, around imperfections that made each piece and each execution something unique. With the advent of digital technology, processes that up until then had been physically executed with analog synthesizers could be translated into a mathematical, exact computer language. This meant an unprecedented precision in timing beats. As Ostertag noted, composing now means pre-setting and organizing the connections and parameters of synths, while performing a composition means executing these pre-arranged sets of parameters by intervening in the evolution of the musical process and altering those parameters while performing live. But if one plays by operating on automatic processes, the performer's input is radically *reduced* because her body barely moves and virtuosity is not necessarily a requirement.<sup>6</sup> However, there is something fundamental that computer music still shares with traditional music: the negotiation with instruments, which is pretty much a physical — meaning embodied — process, even if those instruments are now computers.

In a 2013 article, Mark Fell tells an interesting story, which dates back to 1987. In that year, Spanky and DJ Pierre — a duo of producers also known as Phuture — purchased a Roland TB303, 'a more or less ignored little synthesizer known for its astonishingly bad imitation of bass guitar.'<sup>7</sup> They had no idea of how to use the instrument, which came without a manual. They experimented with the synth, simply starting 'to turn the knobs', and the result of this process was the making of 'Acid Tracks', i.e. the first Acid House record in the history of music. It turns out that Phuture reversed the process of composition: there was no priority of the concept over the execution, it was all

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6 Ostertag, 'Human Bodies, Computer Music', p. 13. Of course, this is not always true, as Ostertag observes: in 1919 Leon Theremin created the 'theremin', an instrument capable of producing sound by employing two oscillators at non-audible radio frequencies, so as to create a differential tone controlled through changes of the electric capacitance (ibid., p. 13). This allows for virtuosity, though the instrument remains very limited, since it can play only one timbre.

7 Mark Fell, 'Collateral Damage', *The Wire*, January 2013 <<https://www.thewire.co.uk/in-writing/essays/collateral-damage-mark-fell>> [accessed 2 November 2021].

about using the instrument with no *idea* of how to do it, engaging in a physical and practical relationship with it. In a way, they became synth ‘virtuosi’. In his article, Fell contrasts this way of proceeding with that of Thomas Dolby, a supporter of a completely different conception of composing — one that prioritizes, again, the idea over the execution. In an interview for British television back in the 1980s he was asked to describe his ideal synthesizer, and he replied: ‘I sit at the synthesizer, I imagine any sound, the synthesizer makes the sound and then I play it.’<sup>8</sup> This is quite a demiurgic way of conceiving the relation with the instrument, which is just a passive tool that executes the musician’s ideas — no embodied negotiation here, but rather a matter of pure imagination.

As Fell notes, technology should not be seen just as a form of mediation or even as an obstacle for creativity and expression: it should be considered ‘part of a wider context within which creative activity happens.’<sup>9</sup> I would argue that there are two mutually related conditions here that are phenomenologically relevant to fully understanding the potential of embodied negotiation with instrumentation. The first condition was already mentioned (albeit not developed) by Fell in his 2013 article — it is the notion of ‘structural coupling’, which comes from Humberto Maturana and Francisco Varela’s theory of autopoiesis. The second condition is the radical relativization of passivity and activity theorized by Edmund Husserl in his late writings (in the 1920s) on passive syntheses.

## 2. PHENOMENOLOGICAL EXPLANATIONS: STRUCTURAL COUPLING AND PASSIVE SYNTHESSES

In a 2018 interview, Italian producer and musician Caterina Barbieri described her own musical composition process in these terms:

You are immersed in the sound and the sound is at the same time inside and outside of you. And you cannot tell the difference, because you become that sound and that sound becomes you [...]. I really appreciate the music that involves me not only as a cultural subject. The music that forces me to leave

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8 Ibid.

9 Ibid.

behind my subjectivity and become an object myself, fused together with the sound — the music that makes me surrender to the power of sound and makes my ego die a little.<sup>10</sup>

What Barbieri is describing here is precisely a form of ‘structural coupling’. In their 1972 book *Autopoiesis and Cognition*, Maturana and Varela argued that, in order to continue living, organisms must be structurally coupled to (some elements of) their environments: in the case of human beings, eating food, for example, or breathing air or drinking water.<sup>11</sup> Living systems engage in a two-way, mutually triggering interaction with their environment. Clearly, this model is based on the principle of treating ‘cognition as a biological phenomenon’.<sup>12</sup> However, the authors were fully aware of the fact that even artificial systems can become autopoietic unities: ‘if living systems were machines, they could be made by man’, they write. If we refuse to prioritize ideas over their execution and begin to seriously value the idea of a negotiation with instruments that, as Barbieri puts it, ‘makes my ego die a little’, we enter a situation of structural coupling with instruments and the audience: we have one extended, living system made up of the composer, the instrument, and the sonic environment (which also includes the audience in a live performance, as we shall see) that can be conceived as an autopoietic system in which the musician’s intervention triggers effects in the environment that in turn have feedback effects on the musician’s activity. This implies a first methodological *reduction*, i.e. giving up Dolby’s idea that everything happens in the head of a demiurgic performer who creates sounds by exploiting passive and inert instrumentation: the artist / performer reduces her role as a creator, ruler, and subject of knowledge. This leads us to Husserl’s theory of passive syntheses.

Husserl’s phenomenological understanding of activity and passivity rests upon a (second methodological) *reduction* of their difference, which perfectly aligns with Barbieri’s concept of the creative process:

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10 See Scott Wilson, ‘Caterina Barbieri on Synthesis, Minimalism and Creating Living Organisms out of Sound’, *Fact*, July 2018 <<https://www.factmag.com/2018/07/08/caterina-barbieri-signal-path/>> [accessed 2 November 2021].

11 Humberto R. Maturana and Francisco J. Varela, *Autopoiesis and Cognition: The Realization of the Living* (Dordrecht: Reidel, 1972).

12 *Ibid.*, p. xvi.

Today it seems that the focus of music industry is very much on the simplification of music interfaces, to make the creative process faster and accessible, at least in the digital world. But I think that this approach to technology is problematic and misleading, because the creative process needs *limits* to overcome and esoteric interfaces to explore. In my experience, music always comes out of a process of *negotiation* between the design of the technology and the human imagination, rather than a simple *imposition* of an idea upon *passive* matter.<sup>13</sup>

Husserl's notion of passivity evokes an apparent paradox: how can syntheses be *passive*? In the history of philosophy, and especially in the Kantian idealistic account, syntheses are conceived of as those acts performed by consciousness in order to bind together the contents that appear to it in such a way as to disclose objective unities, which subjects can subsequently know; i.e., syntheses are activities performed by the ego. So how can they be *passive*? Passivity does not only provide the (aesthetic) material for synthetic activities. 'The synthetic activity of consciousness,' writes Victor Biceaga, does not 'consist in the application of a priori rules to a collection of isolated, simple and passively registered sense data':<sup>14</sup> sensory material is never simply 'passive'. Passive genesis is 'active' in a way, to the extent that it also discloses synthetic articulations of meanings, which are not the result of egoic activity, even though they are not totally independent of it. History, sedimentations, habitus: as noticed by Merleau-Ponty in his critique of Husserl's concept of *Sinnggebung*, subjective constitution of meaning is never absolute, since it is affected by sedimentations (bodily schema, habitus) that provide the passively instituted horizon of our experience.<sup>15</sup> The tactile, embedded, physical memory that the musician has of the instrument belongs precisely to this dimension. This passivity enters seamlessly into the performer's conscious activity and predelineates its possibilities, leaving them open — at the same time — to continuous creative reconfigurations.<sup>16</sup> In Merleau-Ponty's

13 See Wilson, 'Caterina Barbieri' (my emphasis).

14 Victor Biceaga, *The Concept of Passivity in Husserl's Phenomenology* (Dordrecht: Springer, 2010), p. xii.

15 See Maurice Merleau-Ponty, *Institution and Passivity: Course Notes from the Collège de France (1954–1955)*, trans. by Leonard Lawlor and Heath Massey (Evanston, IL: Northwestern University Press, 2010).

16 Couldn't this be a possible description of improvisation?

words: ‘consciousness [is not] the flux of *Erlebnisse*, but consciousness of lacks, of open situations’:<sup>17</sup> it is unstable by definition and results from a permanent negotiation between active constitution of meaning and passive genesis. Metaphorizing the original meaning of Maturana and Varela’s notion of ‘structural coupling’, I would say that the syntheses accomplished by the ego and passive syntheses are structurally coupled:

If the ego is able to interpret the content of its present perceptual experience despite its actual incompleteness, it is because it has at its disposal an interpretative grid comprising latent or inactive meanings that can come either from sedimentations of previous acts or from the background horizon of the present perceptual experience.<sup>18</sup>

Knowing does not proceed *ex nihilo*: in Barbieri’s terms, ‘the idea of composing from silence by means of an additive design as well as the “start/stop” logic related to the digital practice are undermined’.<sup>19</sup> The structural coupling of activity and passivity implies the structural coupling of their respective temporalities, that of the concept (the idea) of the composition and that of its execution.

### 3. ARTICULATING NEW TEMPORALITIES: PIECE TIME AND GESTURAL TIME

As many researchers have observed, there is a difference — which is at the same time a correlation — between technology as a means of *construction* and technology as a means of *expression* (to put it in Fell’s terms).<sup>20</sup> Construction is the formal, structural temporality of *writing* the piece, whereas *expression* is the temporality of its execution, of virtuosity, of the event. However, as we learned from the example of Phuture’s ‘Acid Tracks’, the boundaries between the two sides are far from being clear-cut. In an article written in 1996, Jonathan D. Kramer analysed three classical compositions by Beethoven, Mahler,

17 Merleau-Ponty, *Institution and Passivity*, p. 131.

18 Biceaga, *The Concept of Passivity in Husserl’s Phenomenology*, p. xv.

19 See Will Betts, ‘Interview: Minimalist Electronic Artist Caterina Barbieri’, *Sound of Sound*, 31 July 2017 <<https://www.soundonsound.com/news/interview-minimalist-electronic-artist-caterina-barbieri>> [accessed 2 November 2021].

20 Fell, ‘Collateral Damage’.



and Ives in order to emphasize a distinction (already theorized by Judy Lochhead) between the 'piece time' and the 'gestural time' of a composition: while piece time is 'strictly tied to temporal place-context' independently of the content, gestural time 'can be separated from its original and defining temporal place-context while still retaining part of its original significance'.<sup>21</sup> What does this mean exactly?

Again, we have two temporal orders: 'one order depends on the succession of musical events as heard in performance' (i.e. as executed: gestural time), 'while the other depends on conventionally defined gestures that carry connotations of temporal function (beginning, ending, climax, transition, etc.) regardless of their immediate context' (piece time: the piece as it is written, thought, and structured).<sup>22</sup> It is precisely at this point, in this difference, that the audience's role turns out to be pivotal to the definition of gestural time: musical time as experienced by listeners does not only exist within the succession of moments defined by piece time, but also emerges in the listeners themselves. It turns out that, at least retrospectively, musical gestures imply virtual continuities that can be very different from those given in the piece time — 'virtual' meaning precisely that those gestures do not exist 'objectively' but in the mind of listeners.<sup>23</sup> In Kramer's words:

My own personal narrative time as I listen does not simply coincide with this structural hearing, although the two are not unrelated either. Since my narrative depends in part on the emotions and memories that I associate with the various tunes quoted [the reference is to Ives's use of intertextuality] it is uniquely my own.<sup>24</sup>

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21 Judy Lochhead, 'The Temporal in Beethoven's Opus 135: When Are Ends Beginning?', *Theory Only*, 4.7 (1979), pp. 3–30 (p. 4), cited in Jonathan D. Kramer, 'Postmodern Concepts of Musical Time', *Indiana Theory Review*, 17.2 (1996), pp. 21–62 (p. 28). Kramer shows that all three examples (Beethoven's *String Quartet in F Major*, op. 135, Mahler's *Seventh Symphony*, and Ives' *Putnam's Camp*) present postmodernist characteristics even though they were composed prior to the modernist period, thereby claiming that postmodern features can be also found — in principle — in works that chronologically don't belong to the postmodernist era, since postmodernism can be understood 'as an attitude more than as a historical period' (p. 22).

22 Kramer, 'Postmodern Concepts of Musical Time', p. 28.

23 *Ibid.*, p. 30.

24 *Ibid.*, p. 60.

Minimalist music resorts to this differential relation between these two temporalities in order to structure new perceptual articulations of time. In her 2012 MA dissertation on the construction of phenomenal 'space' in experimental music, Sarah Davachi describes the peculiar static, sustained temporality that arises from La Monte Young's minimalist use of techniques such as the reduction of sonic materiality, sustenance, and repetition, in the following terms:

This phenomenal sense of totality is also characterized by a particular impression of the temporal 'whole' in that an entire duration is essentially truncated into one effectively 'irreal' moment; indeed, absolute time persists but what one tends to experience is something more like an extended sense of pure duration. [...] One could argue that what is felt is both the in-itself lived experience, and also the sense of existential discord that arises between subjective experience and the indifferent continuum of absolute time and objective materiality.<sup>25</sup>

The reference to pure duration reminds us of Henri Bergson's theory of time consciousness. Along with Husserl, Bergson is the philosopher who programmatically insisted the most on the difference between subjective, qualitative time perception and objective, quantitative time apprehension. In Bergson's account, 'pure duration' only emerges through a *reduction* of objective time to inner time perception, which represents the lived-experience of time as the continuity and permeation of states of mind that is characteristic of consciousness. Duration is contrasted by Bergson to objective time, the time measured by clocks, which consists of the succession of juxtaposed phases, external to each other, and which turns out to be a translation of inner duration into space — what the clock measures is not 'time' but the space conventionally established between the hands.<sup>26</sup> Therefore, we can identify a start-phase and an end-phase within objective, spatialized time, which is a linear time, whereas the same identifi-

25 Sarah Davachi, *Irreal Worlds: Constructions of Phenomenal 'Space' in Experimental Music, 1962–1978* (Master's Thesis, Fine Arts in Electronic Music and Recording Media, Mills College, 2012) <[https://www.academia.edu/1961555/Irreal\\_Worlds\\_Constructions\\_of\\_Phenomenal\\_Space\\_in\\_Experimental\\_Music\\_1962-78](https://www.academia.edu/1961555/Irreal_Worlds_Constructions_of_Phenomenal_Space_in_Experimental_Music_1962-78)> [accessed 3 November 2021].

26 See Henri Bergson, *Time and Free Will: An Essay on the Immediate Data of Consciousness* [1889], trans. by F. L. Pogson (Mineola, NY: Dover Publications, 2001).

cation does not hold for pure duration, which is a continuum and a cyclic time. Thus, we could also label the dimension of pure duration (time-continuum) as the *analog* dimension of time, whereas the discrete dimension of objective time could be labelled as the *digital* dimension of time. To return to Kramer's terminology, we could associate 'pure duration'/analog time with gestural time (the time of the musical event) and objective/digital time with the 'piece time' (the conventional time in which the piece is thought). Just like passivity and activity, and receptivity and synthesis, piece time and gestural time are also 'structurally coupled', i.e. in continuous mutual osmosis.

It is not by chance that, as Davachi observes, La Monte Young aims to turn the aesthetic experience inward in order to enter 'into' or, in some sense, to become closer to the essential qualities of the sound itself. Many elements central to his compositional approach were influenced (both stylistically and conceptually) by the traditional practices of Indian classical music with its cyclic temporality — a reference shared by Barbieri herself.<sup>27</sup> Her music evokes altered states of mind where perceptions of time and space are constantly distorted and challenged through minimalist techniques based on repetition and sustained attention — a journey, I would say, into (Bergson's) pure duration.<sup>28</sup>

This framework forms the background of Barbieri's second album *Ecstatic Computation*, released in 2019: the concept of 'ecstatic computation' revolves around the use of computation (i.e. sequencing techniques and pattern-based operations) to explore the modes of human perception and memory processes so as to ultimately induce a sense of ecstasy and contemplation. A *reduced* sequence of initial codes (algorithms) generatively produces a larger body of outputs. Of course — and this is the interesting point for us — resorting to computation complicates the relation between gestural time (analog

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27 See Wilson, 'Caterina Barbieri'.

28 Here I understand 'sustained attention' as a form of 'deep listening' in Pauline Oliveros's sense: 'she considered sound not only to be the audible vibrations of the air around us, but the totality of many vibrational energies throughout the universe. To listen is to be aware of one's self in that collective whole' (Jonathan Williger, review of Oliveros, Dempster, Panaiotis, *Deep Listening*, *Pitchfork*, 10 February 2020 <<https://pitchfork.com/reviews/albums/pauline-oliveros-stuart-dempster-pan-deep-listening/>> [accessed 9 November 2021]).

time) and piece time (digital time) on two levels: as I will show in the next section, it seems to deepen the differentiation between the two orders of time. While it thereby apparently radicalizes the absence of the body, it also offers a possible solution to it.

#### 4. FROM GENERATIVE COMPUTATION TO PSYCHEDELIA

Let's start with the first point, which concerns the temporal logic of computer music. As Curtis Roads explains,

a computer translates every human gesture into a formal operation. This system is encoded in the logic of a programming language and executed according to the algebra of the machine hardware. A crucial question is this: At what level of musical structure do such formalisms operate?<sup>29</sup>

In other words: if formal algorithms represent extremely powerful means of invention through which, as in Barbieri's case, the sonic universe can be enormously expanded, how do we ultimately translate them 'into the real world of acoustics, psychoacoustics, music cognition, and emotional response'?<sup>30</sup> As observed by Horacio Vaggione (quoted in Roads), 'the rigor of the generative process does not guarantee the musical coherence of the work', and this happens because 'music is not a purely formal system; rather, it is grounded in acoustics, auditory perception, and psychology'. In this sense, electronic music provides new examples of the opposition between music-making, 'the immediate spontaneity of improvised performance onstage', and 'the careful, reflective process of studio-based composition.'<sup>31</sup> Again, music as it is thought, programmed, or written is one thing, music as it is performed and heard quite another. In such cases as Barbieri's articulations of musical patterns from a reduced set of generative algorithms, how does the transition to embodied music take place?

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29 Curtis Roads, *Composing Electronic Music: A New Aesthetic* (Oxford: Oxford University Press, 2015), p. 38.

30 Ibid.

31 Horacio Vaggione, 'Analysis and the Singularity of Music: The Locus of an Intersection', in *Analyse en Musique Électroacoustique, Acts de l'Académie Internationale de Musique Électroacoustique* (Bourges: Éditions Mnémosyne, 1996), pp. 268–74, quoted by Roads, *Composing Electronic Music*, p. 39.

Roads refers to the difference between *chronos* (measurable and objective time) and *tempus* (perceived or subjective time) as is theorized by Olivier Messiaen in his *Traité* (1994). This reference should remind us of Bergson's distinction between pure duration and objective time, which we have already discussed: subjective duration does not necessarily coincide with chronometric, objective time, since it can be influenced and altered by eminently subjective elements such as memories and expectations. But it is precisely this mismatch or misalignment that creates an ecstatic effect in works such as Barbieri's: the repetition and sustaining of algorithmically generated patterns does not produce a linear, digital temporality; rather, in the perception of listeners, it turns into a circular, cyclic movement of recursiveness and differential changes, with no real starting or stopping — 'a dynamic and living being able to develop its own organic laws, whose inner potential for growth and change is embedded in the initial instructions of the sequencer'.<sup>32</sup> As I showed above: despite their difference, or indeed *because* of their difference, gestural time and piece time work together to create an ecstatic sonic environment.

But the temporality formed by the combination of generative algorithms and their modulation through analog synthesizers, i.e. through actual voltages set according to predefined parameters, does more than just reconcile gestural time and piece time. Repetition — that is, the looping technique — 'constitutes a good deal of our everyday experience of contemporary capitalism's reliance on repetition, familiarity, and virality'.<sup>33</sup> As observed by David C. Jackson in his interpretation of William Basinski's pieces, 'the ability to loop and make time return using magnetic tape has an important history in the development of the avant-garde and runs through experimental music, films, and the increased commodity form of musical instrumentation'.<sup>34</sup> Loops, then, play an important part in ordering the everyday flow of our consciousness and assembling our temporal and rhythmic interactions with machines, culture, and the social environment.

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32 I am quoting Caterina Barbieri from a conference presentation that Barbieri kindly shared with me.

33 David C. Jackson, 'Repetition, Feedback and Temporality in Two Compositions by William Basinski', *érudit*, 33 (2019), para. 1 <<https://doi.org/10.7202/1065021ar>>.

34 *Ibid.*, para. 2.

I find Jackson's interpretation of Basinski's work interesting, for it can be applied to other experiments within minimalist, electronic music and especially to Barbieri's work. Jackson shows that Basinski's works are generally composed through 'the unspooling of various loops on magnetic tape, which he has collected and archived, and the real-time processing of these loops with delays and reverbs' — the latter (delay and reverb) being effects to which Barbieri also extensively resorts. Basinski has argued for an understanding of the loop and its repetition and duration as a critical component of memory and consciousness, stating that 'memories are loops, our memories are made of loops. We have loops that constantly go around and around'.<sup>35</sup> I am fascinated by this phenomenological analogy between musical techniques and everyday experience (how loops 'go around and around' as a 'form of memory or consciousness and how they connect to ideas about everyday events, duration, and the instant'), since the analogy opens up a musical (theory and) practice that employs loops and feedback in a critical direction, aimed at questioning the usual acoustic experience through experimentation and variations on its temporality.

In Basinski's practice, producing, storing, and playing back a loop is an important part of transmitting and transforming the consciousness embedded in the technologies that record, store, and play back memories, the passage of time, and experiences. Magnetic tape, as well as other forms of time-based media, are part of our stream of consciousness and contribute to its construction and shaping, which in turn shapes our experiences through the processing of the flow of sensations and perceptions.<sup>36</sup>

If we assume, as suggested by Jackson/Basinski, that there is an analogy between the looping temporality of music and that of our everyday experience as it is shaped by the current capitalist regime, then employing looping (and other) techniques in order to shape new forms of sonic temporality — for instance, as in Barbieri's case, the cyclic temporality produced by emphasizing gestural time — means searching for ways to *transform* our collective, shared temporality: 'Entrained rhythms tie affective states, the experience of flow, to neurocapitalism

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35 Ibid., para. 3.

36 Ibid.

through repetition and feedback that harness shared collective temporal experiences, which are synchronized to multiple industrialized temporalities of consumption, digital networks, and accelerated life in the twenty-first century.<sup>37</sup> I interpret Barbieri's music as such an attempt to resist the repetitions and synchronizations of collective entrainment by deploying sustained rhythmic forces through repetition, delay, and sustained attention.

It is through this intervention on the psycho-acoustic level that we can come back to the problem of the 'crucial missing element' that the body represents in computer music and suggest a possible solution. This tentative solution involves the creation of a musical environment that is shared with the listeners and is based on:

- the undoing of the artist as a creator (demiurgic force) who imposes her 'idea' on passive and raw sonic material;
- an emphasis on the machine as a creative and active force, i.e. the introduction of generative computing as a creative technique and the subsequent emphasis on the human-machine relationship as negotiation;<sup>38</sup>
- the articulation of different time-structures through techniques such as repetition, loop, and sustained attention, and the rejection of the standardized, commodified conception of musical time, thereby altering and challenging our 'normal' psycho-acoustic experience.

This psycho-acoustic alteration can be framed as a deeper attentiveness on the listeners' part, an attention *reduced* to and focused on the

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37 Ibid., para. 5.

38 Most computer music is composed without the actual involvement of any musicians playing instruments in real time: the composer is a 'controller' who defines what elements and parameters should be put into a timeline, and where (see Robert Henke, 'Live Performance in the Age of Supercomputing', 2007 <<https://roberthenke.com/interviews/supercomputing.html>> [accessed 8 November 2021]). Even though the conception of the musician/composer as a mere 'controller' is somewhat reductive, it reinforces the idea of the composer as the 'mind' that decides which elements are relevant and which are not and treats the sonic material as a merely passive element within a design process that is the least embodied one possible, since it does not even involve any actual musician. This is a strong dualistic notion of music composition, which tends to reintroduce a sort of mind/body split, to put it with Descartes.

primary qualities of sound, i.e. as a form of ‘deep listening’ in Pauline Oliveros’s sense: ‘a practice that is intended to heighten and expand consciousness of sound in as many dimensions of awareness and attentional dynamics as humanly possible’. This technique also implies resistance to the mainstream’s musical temporality, in that its

salience resides in its contrast to mainstream culture’s riptide trajectory towards distraction and saturation, towards siloed media and political environments. It also stands in opposition to the numbing listening habits encouraged by streaming, which positions music as a utilitarian tool for productivity, something to be ignored while your concentration rests elsewhere.<sup>39</sup>

The two concepts of *negotiation* and of the alteration of the psycho-acoustic level (psychedelia) imply a strong reference to the body: it is the body of the artist, even more so than her mind, that has to ‘struggle’ with the machinery (the computer, the synths) and to acknowledge that it also produces living, sonic material; it’s her body that is onstage and that plays around with the machinery so as to create something that is co-produced and co-designed. And it is the body of the listener as a psycho-physical unity that is affected by the alteration of the linear temporality we are used to in non-experimental, mainstream music. Even if we are unable to recognize what’s happening onstage, to identify what the performer is actually doing and where the sound is actually coming from,<sup>40</sup> we do share with her the experience of a different temporality that we actually also help construct, since — as we have seen — gestural time implies the listeners’ different narratives and subjective modes of perception.

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39 Williger, review of Oliveros, Dempster, Panaiotis, *Deep Listening*.

40 ‘The audience looks at a laptop whilst listening to music. But what exactly creates the music and how the performer interacts with this tool is completely non-transparent. The laptop is not the instrument, the instrument is invisible. And to obscure things even more we have to realize that most of the time there is not one single instrument and it is not “played” by the performer’: this is how Robert Henke’s ‘Live Performance in the Age of Supercomputing’ describes the situation of ‘acousmatic listening’ in computer music, i.e. the type of listening experience a person has when she’s unable to identify the source of the sound.



## CONCLUSION

As noted by Bob Ostertag, before the advent of machines that could automate sophisticated processes, there was no performance without the body. In a sense, '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.'<sup>41</sup> This tension is the hallmark of our time, and it is not a problem that can be 'solved' and made to disappear. We can only work around it through permanent negotiation. In this sense, to return to Mark Hansen, it is true that we are 'bodies-in-code' — yet, we are still 'bodies' that (in a kind of phenomenological circle) *create* something only insofar as they are *created* by something, are *active* only insofar they are practically *limited* by material, things, artefacts, machines, and everything that exceeds our subjectivity and — as Barbieri puts it — 'makes my ego die a little'.

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41 Ostertag, 'Human Bodies, Computer Music', p. 14.

Federica Buongiorno, 'Reduction in Computer Music: Bodies, Temporalities, and Generative Computation', in *The Case for Reduction*, ed. by Christoph F. E. Holzhey and Jakob Schillinger, Cultural Inquiry, 25 (Berlin: ICI Berlin Press, 2022), pp. 175–90 <[https://doi.org/10.37050/ci-25\\_09](https://doi.org/10.37050/ci-25_09)>

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