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Silicon, Carbon, and Music

Hybrid Agency and the Entanglement of Composition and Performance in Mediated Musical Ecologies

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Abstract

This master's thesis explores how musical agency is redistributed in compositions and performances that use technology. Rather than treating the performer, computer, or score as a neutral tool or as a sound-producing instrument, this thesis brings the composer, performer, computer, and score onto the same level. All of them become objects of mediation within a compositional condition, through which musical form emerges from interactions between these objects. This viewpoint is based on ideas of distributed agency and technological entanglement, which suggest that creative outcomes do not originate from a single authorial subject, but from a network of human and nonhuman agents.

The thesis considers this through two of my own compositions, *Enough?* and *Team CEO*. *Enough?* is a purely acoustic ensemble piece whose material is selected through platform logic, renotated, vertically stacked, and downsampled. The "Q-frames" of this piece extend this process into the performance itself, with the musicians asked to operate at the threshold between sound production and its failure. *Team CEO*, however, uses real-time computer mediation: Flute is the only source of sound, and two MIDI keyboards take the flute's signal, intercept it, multiply it, and redistribute it through a system written in Pure Data.

Informed by these two works, the thesis argues that composition can be understood not as the production of a fixed musical object, but as the design of conditions in which form emerges through distributed agency, instability, and negotiation.

The scores of both works discussed in this thesis are available at www.parhambehzad.com/compositions.

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0. Introduction

0.1 Topic and motivation

My first piano was not really a piano. It was a digital instrument, a technological image of a piano, made from samples, touch sensitivity, and the promise that it could stand in for the real thing. I hadn't at that time formally considered this, but my playing was already being recorded as MIDI — a performance that could be saved, accessed, displayed visually, altered, and rearranged as data. The piano was no longer only a device for producing sound. It was an interface, a site where body, memory, and data met and rewrote one another. I did not have the vocabulary for it at the time, but the question this thesis takes up was already there in the instrument I learned on.

Later, in my composing, this issue reappeared with various notation softwares, DAWs, computer-assisted softwares. I initially used these programs to generate pitch structures, rhythms, or formal processes. Gradually, however, the systems themselves became more important than their outputs. Each tool prescribed a thought process and a number of particular compositional habits and limits. As Laure M. Hiendl suggests, compositional software does more than assist a user's workflow—it alters the very workflow itself.[1] Though Pure Data was significant in this context because it made this mediation explicit. In contrast to the more streamlined logic of DAWs and the plug-in culture, it demanded I create the conditions by which sound would be processed, directed, and altered. This led me to conceptualize my work not as music employing technology, but as music existing within mediation. Instruments, performers, tools, code, scores, and listening conditions are not separate components that meet; they come into being through the relation that holds them.

This thesis stems from this realization. Its focus is on *Enough?* and *Team CEO*, two compositions where mediation is not simply an added element, but a fundamental aspect of the compositional process.

0.2 Research question

Musical agency has never sat cleanly with a single entity. Composers, performers, instruments, rooms, and notations have always shared it. What my recent compositional

1 Dr Laure M. Hiendl, *Composition and Digitality Three Meditations on an Entanglement*, n.d., 76.

practice has brought into focus is not the distribution itself, but the apparatus that now makes it legible and operable: mediating systems that route, delay, translate, fragment, or expose musical decisions. The issue is not just what computers can generate or alter in terms of sound, but how these mediating systems shift the relationship between composition, performance, and form.

Therefore, the central research question of this thesis is: How does hybrid agency operate in mediated musical ecologies when compositional processes are distributed across human performers, computational systems, instruments, interfaces, and material conditions? Three resources shape how this question is taken up. Latour's thinking lets composition be understood as the setting of conditions in which musical behaviour can emerge, fail, shift, or be redistributed, rather than the construction of a closed object. Haraway's sympoiesis names the kind of system in which information and control are distributed across what is made-with, not held in one place. Bennett's distributed agency lets musical material, instruments, performers, and code be read as active participants in what unfolds, not as passive tools.

I take up this question through two of my own compositions, *Enough?* and *Team CEO*. In both, form is the audible trace of an assemblage that holds for the duration of a piece: procedures, bodies, thresholds, technologies, and the failures through which they meet.

0.3 Why these two works

Both *Enough?* and *Team CEO* examine a common artistic question from two different angles: how agency is redistributed when composition is mediated by systems, procedures, technologies, and performers.

In *Enough?*, mediation operates before performance. Source material is selected by platform logic, renotated, stacked, and downsampled; the score the musicians read is the residue of computation. The Q-frames extend this logic into the body during performance, where the musicians play at the threshold of sound production, and where intention, resistance, and failure become part of the musical system.

In *Team CEO*, mediation operates live. The flute is the only source of sound, and a Pure Data system intercepts it, multiplies it, and redistributes it through two MIDI keyboards in real time. The other performers operate the flute as a resource, manage it, and benefit from it at a cost.

These two works illustrate two different models of a single artistic question. *Enough?* presents hybrid agency as degradation, threshold, and suppressed emergence. *Team CEO*

depicts hybrid agency as live redistribution, infrastructural control, and exposed algorithmic behavior.

0.4 Method: practice-based artistic reflection

This thesis follows a methodology of reflective artistic practice. The main resources for this thesis are the sketches, scores, computer code, and Pure Data patches, along with the notes and events of the rehearsals I held to bring both works to life. For *Enough?*, this is downsampling a collection of music fragments using a custom Python program, the creation of Q-frames, the manipulation of acoustic sound flow by the performers, and the selection of source material. For *Team CEO*, this is the Pure Data patch, the manipulation through the manual and automated shifting of pitch, the framework, the relationships, the Trigger-Actions[2] and the dissolution between performers, Flute, Keyboards, and CPU.

0.5 Structure of the thesis

Chapter 1, after the introduction, establishes the core ideas I am using: silicon and carbon, mediation, entanglement, form as a condition, musical ecology and my own artistic position. Chapter 2 is about *Enough?* and functions as a case of score-based mediation. Chapter 3 looks at *Team CEO* as a case of live mediation. Chapter 4 compares the two and clarifies the difference between fixed extraction and live processing, degradation and redistribution, threshold and instability, and the two relations between silicon and carbon. The chapter closes by revisiting the question this thesis began with.

2 See Chapter 3.

1. Conceptual Frame

1.1 Silicon, Carbon as a compositional agency

Why chemical elements? Machine and human instantly separate us and create narrow categories which in that manner we put all our tools into the machine category and ourselves into the human category. But categorical thinking has well-documented costs, and this case is no exception.[3] For many years the piano was the pioneer of music technology, and throughout its evolution humans shaped the modern piano and new pianos shaped instrumentalists and composers' creative output. Beethoven's late sonatas were written for the extended range and heavier action of the new Broadwood and Graf instruments, and the music could not have been the music it became on an earlier keyboard.[4] Pianists constantly developed their technique, working with and against their biomechanical structure of bone and muscle. On the other side of the keyboard, instrument-makers worked on the action, the hammer felt, the spruce of the soundboard, the cast-iron frame. Therefore, can we say the agency at the Piano belongs to the machine and not the human? Body, key, hammer, string, paper, breath: it is all carbon, in different configurations. Primo Levi gave this its clearest literary form. In The Periodic Table he follows a single atom of carbon from a piece of limestone, through the air, into a vine leaf, a grape, a glass of milk, a human bloodstream, and into the neuron firing as he writes the last sentence of the book.[5] The atom does not change. What changes is the form it takes part in. Used as thesis terms, carbon and silicon work in the same way. They are metonyms: each names something already part of what it stands for, and the gap usually drawn between term and referent is hard to find. Carbon reaches further than the human and silicon further than the machine. Both stop short of metaphor. The piano and the pianist are not two kinds meeting across a divide. They are two configurations of the same substance,

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3 Geoffrey C. Bowker and Susan Leigh Star, *Sorting Things out: Classification and Its Consequences*, 1. paperback ed., 8. print, Inside Technology (MIT Press, 2008) Bowker and Star show that classification systems are never neutral: they make some things visible and others invisible, and the categories we inherit shape what we are able to think with them.

4 On the co-evolution of the piano and pianistic writing, see for instance the shift between the music written for the early Viennese fortepiano and the music written for the extended-range English instruments of Broadwood, which Beethoven received in 1818 and which shaped the writing of the *Hammerklavier* sonata, op. 106.

5 Primo Levi, *The Periodic Table*, 1st American ed (Schocken Books, 1984), 224–233.

working on each other. What silicon does on its side of the keyboard is the question the next paragraphs will take up.

A more familiar way to broaden the analysis would be to move upward, to a covering term such as actor, agent, or entity that gathers humans, instruments, computers, and infrastructures under one roof. The thesis goes inward instead. Naming the atomic level pulls in what an agentive term would still leave outside. Carbon takes the breath, the wood of the instrument body, the felt of the hammer, the cellulose of the paper, the gut strings and the synthetic polymers that replaced them, along with the body of the performer. Silicon takes the chip, the audio interface, the codec, the screen, along with the running program. None of these are agents in the usual sense, and not all of them have an interface. The move is not new at this scale. Manuel DeLanda has written a thousand years of European history at the level of three substrate flows: minerals, biological matter, and language. Cities, on his reading, are slow crystallisations of mineral traffic; populations are flows of biomass that thicken into institutions and thin out again.[6] An agent-level history would lose this. The substrate level keeps it in view. The same logic applies to a musical situation. Working downward, to what the participants are made of, lets the analysis describe what is happening without first deciding who or what counts as a participant. The two terms remain a pair, but a pair of a different kind. Human and machine are sorted by what they are. Carbon and silicon are sorted by what they are made of, and matter that is made of one is constantly passing through the other.

In this thesis, the term *Silicon* does not refer to any electronic device, but rather to devices that perform computation. The distinction is crucial. While a loudspeaker is electronic, it is not a device that performs computation. On the other hand, a microcontroller running a Pure Data patch is a computational device. If we were to group both of these devices as machines, we would be grouping them with tools like hammers and piano actions, which are devices that have a specific, finished function and perform tasks as directed. However, this does not apply to computation. A computational device inherently has its own state and can change that state by its own rules and provide outputs that are not defined by any of the previous operations. Particularly in the case of large language models and generative systems, it is become increasingly difficult to categorize these systems as mere tools. Whether the operations being carried out by the device are advanced pattern recognition, forms of computation, or something that require new, as yet undefined

6 Manuel De Landa, *A Thousand Years of Nonlinear History*, Swerve Editions (Zone Books, 1997), 21–25.

terminologies, is still a matter of debate.[7] [8] N. Katherine Hayles has argued that technical computational systems participate in cognition through nonconscious processes of interpretation and response, and that what is usually drawn as the human-machine boundary is in fact a thicker zone she calls cognitive assemblage.[9] The word machine cannot hold that zone. Machine fixes the question of what the device is. Silicon leaves the question open, naming the substrate where the boundary between executing and deciding is now in motion.

The first three reasons converge on a fourth. Once carbon and silicon are set as substrates rather than as agents, the terms point to something that the agent-language of human and machine actively obscures: the two are encoded into each other. The hand has been formed by the tools the hand has formed. The chip is fabricated by hands, and the body that picks up it was already mineral, microbial, and technical in its inheritance. The cast-iron frame of a modern piano is a small concentrated case. Steel and cast iron are not non-carbon materials. They are iron–carbon alloys, and the carbon content is what makes them rigid enough to hold the string tension of a concert grand. The Bessemer process, which made the cast-iron piano frame economically available in the second half of the nineteenth century, works by blowing air through molten pig iron to burn off carbon to a controlled level. The frame is a carbon-managed object, smelted historically with charcoal, which is also carbon, by hands and lungs that are themselves carbon. Gilbert Simondon argued that technical objects are not external to human development but constitute the milieu within which the human individuates, and that the human and the technical are mutually individuating rather than separable.[10] At the scale of substance, this encoding is visible. Carbon and silicon are not strangers meeting in the studio. They have been meeting, and inscribing each other, for as

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7 The question is not new. Alan Turing posed it in its sharpest form in 1950 in Alan M. Turing, "Computing Machinery and Intelligence," *Mind* 59, no. 236 (1950): 433–60, https://doi.org/10.1093/mind/LIX.236.433, where he proposed that the question "can machines think" was meaningless as stated, and replaced it with an empirical test: a machine sustaining a conversation indistinguishable from a human one would have to be granted the same status as a thinking thing. Three quarters of a century later, with large language models holding such conversations daily, the question is no longer hypothetical.

8 At the time of writing, the debate has crystallised around Anthropic's Claude, trained via 'Constitutional AI'. See: Yuntao Bai et al., "Constitutional AI: Harmlessness from AI Feedback," 2022, https://arxiv.org/abs/2212.08073; Two views have hardened. One holds that introspective and affective outputs cannot be dismissed as mere imitation, and that machine consciousness must be taken seriously. See David J. Chalmers, "Could a Large Language Model Be Conscious?," *Boston Review*, August 9, 2023, https://www.bostonreview.net/articles/could-a-large-language-model-be-conscious/; The other argues that apparent ethical reasoning is an engineered corporate effect, and the language of 'constitution' misrepresents a product as a moral agent, obscuring real accountability. See Lisa Klaassen and Ralph Schroeder, "The Code Is Not the Law: Why Claude's Constitution Misleads," *Lawfare*, April 9, 2026, https://www.lawfaremedia.org/article/the-code-is-not-the-law--why-claude-s-constitution-misleads The debate is unresolved, but it shows that the boundary the word 'machine' once enforced no longer holds still.

9 N. Katherine Hayles, *Unthought: The Power of the Cognitive Nonconscious* (The University of Chicago Press, 2017), 11–14, 115–42.

long as there has been anything to call a human or a tool. Whether and how this encoding produces hybrid agency in a specific musical situation is the question the rest of the thesis tests.

Now that we have the vocabulary for these two substrates, we can proceed to see how they hold together. The cybernetic tradition gives the first language for it. Postwar, Norbert Wiener and his colleagues sought to create a unified theory that treated organisms and machines as different physical instantiations of the same kind of circuit. The principle they identified was simple: a system scans its own behavior for results, and the result modifies what the system does next.[11] In this initial formulation, the circuit was conceived as closed, and the individual who was describing it was positioned outside it. Bateson's reformulation transformed this. He maintained that the observer is a component of the circuit, and therefore had to be included in the description of the system. From that point, a person's mind could no longer be restricted to the inside of a single body, and was understood as immanent in a system larger than the person, made up of person and environment together . The criterion holds even for systems without living parts.[12] Inside such a system, cause and effect cannot be told apart in the usual way, since each one continually modifies the other. Bateson refers to this situation as strict mutual causality. A circuit organized by mutual causality is what Bateson calls a feedback loop.

This logic applies at various scales. Lovelock applies it at the planetary scale. He treats the atmosphere as a dynamic extension of the biosphere. He argues that life and the conditions for life form a single regulating system that cannot be understood by isolating its elements or adding them together.[13] The same logic applies inward, to the cell. Margulis's theory of serial endosymbiosis suggests that the eukaryotic cell, the building block of complex life, was formed when different prokaryotic organisms became permanently symbiotic. Organisms like

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10 Gilbert Simondon, *On the Mode of Existence of Technical Objects*, First University of Minnesota Press Edition 2017, trans. Cécile Malaspina and John Rogove, with Univocal Publishing (MinneapolisUniversity of Minnesota Press, 2017), 15–17 Bernard Stiegler develops a related argument in; Bernard Stiegler, *Technics and Time*, Meridian (Stanford University Press, 1998), where he names the condition epiphylogenesis: each generation receives not only biological material but also technical memory stored in objects, which then shapes how the next body develops. Technics, on this account, is one of the things the body is made of, not something external to it.

11 Lawrence S. Bale, *Gregory Bateson, Cybernetics, and the Social/Behavioral Sciences*, n.d., 12, 13.

12 Bale, *Gregory Bateson, Cybernetics, and the Social/Behavioral Sciences*, 27.

13 J. E. Lovelock, *Gaia: A New Look at Life on Earth*, ed. with a new preface and corrections Revised 2000 (Oxford University Press, 1979), xii, 7, 10, 53.

the hydra remain manifestly composite today.[14] The whole does not precede its parts. The unit was always already a composition.

Latour accepts the composite and refuses the whole. In *Facing Gaia*, the planet is not an integrated whole and not a benign one. It is neither a unified system nor a providential one. The loops must be located one by one, and the whole is in fact less than the sum of its parts.[15] For Latour, it is primarily a matter of visibility. When a loop is not made traceable, not made public, the agents that reside in it are unable to answer to what they cannot see. On this account, tracing the loop is an ethical action, not a methodological one.[16] In a musical situation, the loop runs through performer, instrument, code, and signal path. Whether that loop is made traceable, on the page or on the stage, is what the case studies will test.

Timothy Morton directly criticizes this way of accounting for things. Morton argues that attempting to describe a thing solely through its feedback relations effectively undermines the thing downward into its constituent sub-processes and overmines[17] it upward into the broader systems it belongs to. In either case, the thing itself disappears.[18] Morton's counter-claim is the doctrine of withdrawal. No object fully coincides with the way it appears to any other object, and the resulting entanglements are marked by what Morton calls viscosity: the instruments and the phenomena they measure stick to one another, yet remain inaccessible to one another.[19] For Latour, the loop is what holds the agents together. For Morton, it never holds them completely.

This thesis accommodates both. The agents are what the loop relates, and they are also what withdraws from the loop. The loop brings silicon and carbon into contact. Withdrawal is what keeps them from dissolving into each other. Both are needed to describe a piece in which the two stay legible. If the loop neither produces them nor uses them up, the way they belong together has to be described in terms that feedback alone cannot supply.

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14 Lynn Margulis, *The Symbiotic Planet: A New Look at Evolution* (Phoenix, 2001), 14, 44.

15 Bruno Latour and Catherine Porter, *Facing Gaia: Eight Lectures on the New Climatic Regime* (Polity, 2017), 238, 250.

16 Latour and Porter, *Facing Gaia*, 274.

17 The terms *undermining* and *overmining* are Graham Harman's, adopted by Morton. To undermine an object is to reduce it downward to its components; to overmine it is to dissolve it upward into its effects or relations. See Harman, *The Quadruple Object* (Winchester: Zero Books, 2011), 7–18.

18 Timothy Morton, *Hyperobjects: Philosophy and Ecology after the End of the World*, Posthumanities 27 (University of Minnesota Press, 2013), 199.

19 Morton, *Hyperobjects*, 196.

1.2 Hybrid Agency as Sympoietic Condition

The last section landed on a problem. If the loop does not produce or exhaust the agents that flow through it, in what sense are they entangled? Feedback assumes two entities, already formed, that begin to communicate. Sympoiesis says they are not yet formed.

Donna Haraway says it directly: "Nothing makes itself; nothing is really autopoietic or self-organizing".[20] On this account, before the loop, there is no carbon or silicon. In the making, they are made together, and this is what hybrid agency is.

Agency was already mineral before silicon arrived. Bennett makes the case directly. Human agency has always been a network of human and nonhuman.[21] The route runs through Stiegler. Conscious reflection traces back to the first stone tool, which held the trace of its past use and produced the first interior space in which a human could think about anything at all. The body was already mineral before it was a self. We are, Bennett concludes, walking, talking minerals.[22] Silicon enters this lineage. It does not start it. What is new about silicon is double. It does something earlier tools did not, and that difference is what makes the hybridity we were already inside harder to ignore. Novelty and visibility are the same event from two sides.

Margulis carries the claim into the question of agency. The hydra does not have agents inside it; the hydra is what its symbionts do together. The cell does not act on behalf of its bacteria; the cell is what the bacteria are now doing. Agency, on this account, is not something an organism has but something a composite enacts.

If composition emerges across performer, CPU, instrument, and infrastructure, the implication for mediation follows: it is not a tool for a composer to reach for. Mediation, therefore, is a condition in which composer, performer, and machine come into being together. A condition is a state, not a property. Latour says it plainly: the more attachments the better.[23] Hiendl makes the same move for sound. To Latour's pairing of nature and culture, Hiendl adds a third leg: a machine other that cannot be reduced to physics, to human intention, or to the sum of its parts. Digital sound, on this account, exists only as the "co-creative interplay" of these radically distinct and radically converging onto-epistemologies.

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20 Donna Jeanne Haraway, *Staying with the Trouble: Making Kin in the Chthulucene*, Experimental Futures: Technological Lives, Scientific Arts, Anthropological Voices (Duke University Press, 2016), 58.

21 Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Duke University Press Durham and London, 2010), 31.

22 Bennett, *Vibrant Matter: A Political Ecology of Things*, 11.

23 Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory*, Clarendon Lectures in Management Studies (Oxford University Press, 2005), 237.

The three legs do not meet across an interface. They come into being together in the act of producing sound. Not perception mediated by the machine, but perception by the machine.[24]

The condition this framework describes is not new. Cage's *Imaginary Landscape No. 1* (1939) scores two variable-speed phonograph turntables playing frequency and constant-tone test recordings, alongside muted piano and large Chinese cymbal; the work brings the playback apparatus onto the compositional surface, where in an acoustic score the apparatus would remain implicit. Lucier's *I Am Sitting in a Room* (1969) recursively re-records a spoken text through the acoustics of the room in which it is performed until the room's resonant frequencies become audible, and the work is produced by the relation between voice, recording apparatus, and architecture rather than by any of its parts alone. Stockhausen's *Mantra* (1970) routes two pianos through ring modulators governed by sine tones derived from the work's formula, so that the resulting sound is neither simply piano nor electronics but what their relation produces. Ferneyhough's *Time and Motion Study II* (1973–76) requires the cellist to play, vocalise, and operate foot pedals controlling the live electronics at once. Martin Iddon has read the piece as a cyborg condition[25]; where cello and voice are amplified, delayed through tape loops, and ring-modulated, then returned into the room through an eight-speaker system. The audible work is neither the cello nor the electronics but the closed circuit between them. In each case, hybrid agency is at work, even where the vocabulary for naming it was not yet available. What this thesis claims is not that the condition is new, but that current compositional conditions, and the apparatuses that produce them, make the condition more readable than it has been before.

Hybrid agency is what happens when carbon and silicon come into being through the same relation. The agents are not given in advance; they are the shape the relation takes. The same logic holds inside a piece. Composition and performance do not stand in sequence either; they come into being together through what passes between them, and what passes between them is the score.

1.3 Entanglement of composition and performance

Score, in this thesis, is not only paper. It is also code, patch, MIDI file, performance instruction, the running apparatus. The score goes beyond a directive that issues predictable

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24 Hiendl, *Composition and Digitality Three Meditations on an Entanglement*, 27–29, 123.

25Martin Iddon, "On the Entropy Circuit: Brian Ferneyhough's *Time and Motion Study II*," *Contemporary Music Review* 25, nos. 1–2 (2006): 93–105, https://doi.org/10.1080/07494460600647493.

results. It becomes a dynamic framework in which the performer's agency is part of the work's formation. The result is still composed, but it is not fully determined, and it is not stable until the last moment of execution by the performer.

This entanglement has the structure of a quantum state: the score, the performer, and the apparatus together hold a superposition of potential states that performance collapses into concrete musical events.

Morton gives us a precise structure. The analogy is structural, not physical quantum objects are viscous, and complementarity means that when you nudge a quantum, it sticks to the nudging device; instrument and phenomenon, from a single whole that cannot be further analysed.[26] In the concert, performer and score, instrument and the live-electronic patch, the body and machine are the single phenomenon through which the work becomes audible.

This is not new. Adorno, within the Western art-music tradition, had to argue for it. He insisted that even Schoenberg's most detailed scores are not unambiguous enough to make the rendering interpretation unnecessary, and that the score still leaves what he calls a zone of indeterminacy unspecified.[27] Western notation had spent centuries trying to make the score sufficient, so the argument was needed. George Lewis observes that this is a Eurological position rather than a fact about music. It comes with the assumption of composition as a fully worked-out, written object.[28] Other traditions never invested in that assumption. In Persian classical music, the score, where it exists, is a reference point, while the actual music is passed “sineh be sineh”, “chest to chest”, from master to student. Each master carries their own inflections: the tuning, the micro-rhythmic shaping, the ornamental practice.[29] In jazz, the same logic shows up more compactly. A swung eighth is written as a regular eighth. Romantic rubato is written as straight time. The notation marks the position, not the performance.

The historical examples in 1.2 name a lineage this thesis stands within; the cases that follow are not predecessors but contemporaries, and the difference has to be drawn because the framework overlaps. The indeterminacy this thesis describes is not the indeterminacy of graphic notation, open form, or improvisation. The distinction worth drawing first is the one

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26 Morton, *Hyperobjects*, 37.

27 Juliane Rebentisch, *Aesthetics of Installation Art*, n.d., 201.

28 George E. Lewis, “Improvised Music after 1950: Afrological and Eurological Perspectives,” *Black Music Research Journal* 16, no. 1 (1996): 96, https://doi.org/10.2307/779379.

29 See in Hurmuz Farhat, *The Dastgāh Concept in Persian Music*, First paperback edition, Cambridge Studies in Ethnomusicology (Cambridge University Press, 2004).

with George Lewis's practice, since his work overlaps this thesis's territory more directly than any other contemporary I am aware of.[30] Lewis's *Creative Construction Set*™ (2015) gives the performers a deck of cards through which they signal one another during a group improvisation: louder, sparser, silent, higher.[31] The cards distribute agency by widening the field of performer choice. Lewis's *Voyager* (1985–87) distributes agency between a human improviser and a software system that listens and responds with improvised material of its own.[32] In both cases, agency is distributed by opening a wide space of possible outcomes and letting the participants, human or computational, decide what to do inside it. Improvisation, for Lewis, takes place "within a matrix of indeterminacy, agency, analysis, judgment, and choice."[33]

The case studies in this thesis work differently. The Pure Data patch in *Team CEO* does not choose. Its pitch tracking, its deviation coefficient, its multiplication logic, its inversion at section E are determined functions, written in advance. What makes the audible result unpredictable is not that the system is deciding but that its input is a flutist's body in a specific room at a specific moment. The space of possible outcomes is narrow, not wide. *Enough?* operates by the same logic in a different register: what I call the Grid Sampler is a determined function applied to fixed material, and the Q-frames in performance are a determined behavioural protocol whose audible result depends on what the body can and cannot do at the threshold of sound production. In both pieces, the agency is distributed not by handing out decisions but by writing a system whose behaviour is the trace of a body operating it. The composer has authored a determined function; the performer supplies the live variable; the audible work is the function's value, computable only in performance. This is what the quantum image in this thesis is meant to name. The state is not a wide superposition collapsed by a free measurement. It is a narrow superposition collapsed by a specific body, and what is unpredictable is the body, not the function.

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30 Other contemporary practitioners and theorists work in adjacent territory. Agostino Di Scipio's *Audible Ecosystemics* series and his writing on ecosystemic composition make the case for distributed agency through a different route, that of self-regulating audio ecosystems rather than performer-system improvisation. Sandeep Bhagwati's concept of "comprovisation" and his work on interactive scores for performer-machine ensembles theorise the redistribution of agency through real-time generative notation. Lewis is named here because the framing of agency through performer choice and computational response overlaps with this thesis's framework most directly.

31 George E. Lewis, "Creative Construction Set™," 2015, https://www.wisemusicclassical.com/work/65632/Creative-Construction-Set--George-Lewis/.

32 George E. Lewis, "Too Many Notes: Computers, Complexity and Culture in Voyager," *Leonardo Music Journal* 10 (2000): 33–39.

33 George E. Lewis, "Hearing Voices: A Conversation with George Lewis," October 2, 2023, https://postgenre.org/hearing-voices-george-lewis/.

1.4 Form as condition: after Cage and Tenney

In this thesis, form is understood as condition: a state in which different degrees of relation, control, distribution, and failure are probable and perceptible. To establish this, I have to move through and beyond the positions of John Cage and James Tenney.

Cage and Tenney in advance share the refusal of form as something fixed. Cage in "Composition as process" treats form as the morphology of a continuous and open structure by utilizing chance and indeterminacy. This include any sound, including sound of the environment and the sounds of unintended happenings.[34] Tenney pushes form from paper to perception: by his account, form is the construction of listener's interplay of continuity and discontinuity. Therefore this results in a cognitive activity rather than a property in the score.[35]

Cage's "process" names the morphology of a continuous and open structure, in which any sound, including the sounds of the environment and of unintended happenings, can become part of the work. Tenney's "form" names the listener's interplay of continuity and discontinuity. Both positions share the same limit. For Cage, form is the result of a process. For Tenney, form is the result of perception. Both are emergent from their causality, but neither treats form as a socio-technical infrastructure that is itself an actor, something that emerges from the medium: from the instruments, the protocols, the interfaces, the notations.

This is where the thesis develops further, with the help of Anna Kornbluh and Caroline Levine. For Kornbluh, form is composed relationality. The building of relations is itself the form, not its consequence. She calls this "the structure for new possibles," an order supplied by an infrastructure of activities.[36] Form, on this account, is what a work does rather than what it represents. Levine enters from design theory and provides the working vocabulary. A form, for Levine, is any pattern of repetition and difference, any arrangement of elements, and each form affords a limited range of potential uses and actions that are latent in any material or design.[37] Forms are portable. They travel between contexts and materials, and as they meet

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34 John Cage, "Composition as Process," September 1958, 1.

35 James H. Tenney, *Computer Music Experiences, 1961–1964*, in *University of Illinois Press eBooks* (University of Illinois Press, 2017), 1, https://doi.org/10.5406/illinois/9780252038723.003.0003.

36 Anna Kornbluh, The Order of Forms: Realism, Formalism, and Social Space (University of Chicago Press, 2019), 4, 7, https://doi.org/10.7208/chicago/9780226653488.001.0001.

Anna Kornbluh, *The Order of Forms: Realism, Formalism, and Social Space* (University of Chicago Press, 2019), 4, 7, https://doi.org/10.7208/chicago/9780226653488.001.0001.

37 Caroline Levine, *Forms: Whole, Rhythm, Hierarchy, Network* (Princeton University Press, 2015), 3–5.

other forms they collide, reroute one another, and produce results that cannot be traced back to a single intention.[38] Each form can only do so much.

When we read form this way, form becomes constitution. Algorithmic procedures, notational schemes, instrumental interfaces, and software environments are not auxiliary to a piece. Each affords its own range of what can be patterned, repeated, fragmented, sustained, or made to break. Each affords certain agencies and forecloses others. Resistance, threshold, drift, repetition, and redistribution of control are what this thesis listens for. When silicon and carbon agencies meet inside a piece, a collision of these affordances happens, and form is the audible trace of that collision. Sympoiesis names how the substrates come into being. Collision names what their configurations do when they meet inside a piece. This does not change the role of the composer, but it shifts it. The composer is not the maker of a finished object. The composer is the architect of a framework. A playground, or more precisely a platform[39]: the actual site of compositional decision. The word is borrowed deliberately. A platform is where computation, infrastructure, and bodies meet to do something neither of them does alone. Form, on this account, is the condition of everything that can be heard.

1.5 Musical ecology and distributed agency

Up to this point the chapter has worked at the scale of the single work. The unit has been one loop, one sympoietic emergence, one performative collapse, one collision of affordances. But composition does not happen at one scale alone. A piece sits inside a practice, inside the histories of the instruments it uses, inside an institutional infrastructure of festivals and ensembles and deadlines, inside a tradition of notation, inside a power supply. The silicon and carbon entanglement that holds at the scale of a work is the same entanglement, differently specified, at the scale of an ensemble of bodies and instruments, a software environment authored by carbon and modifying it back, an instrument family that has congealed centuries of design decisions into specific affordances, a composer's practice across years, a season of premieres in a city. Ecology, in this thesis, names that scaling. It is not a metaphor for general interconnection and not a synonym for system. It is a finite, situated arrangement of human and nonhuman agents whose entanglement produces effects that exceed any of them, and which holds for a time before it disassembles. An assemblage is

38 “Levine - 2015 - Forms Whole, Rhythm, Hierarchy, Network,” n.d., 6–7.

39 The term is Tarleton Gillespie's: "platform" carries computational, architectural, figurative, and political senses at once — a raised, level surface that anticipates activity without determining it. See Gillespie, "The Politics of 'Platforms,'" *New Media & Society* 12, no. 3 (2010): 347–364.

one such arrangement. An ecology is the holding of several at different scales, the piece inside the practice inside the season inside the instrument family.

Bennett gives the language for this. An assemblage has no central head, no member with the competence to determine its trajectory. Its effects are emergent and exceed the sum of its parts, while each part keeps a pulse slightly off from the grouping. What this produces is what Bennett calls a non-totalizable sum, with its own finite life span.[40] The grouping has its own effectivity, but the effectivity does not absorb its members. It assembles, holds, disassembles. Bennett gets us one scale. The next problem is several at once. The risk in moving to that scale is that ecology becomes another name for everything-is-connected, which is to say another name for system.

Latour names the problem at exactly this register. Lovelock, in writing Gaia, plunges head first into an impossible question: how to obtain effects of connection among agencies without relying on an untenable conception of the whole. Or as Latour puts the question at its sharpest, how to follow the connections without being holistic?[41] This is the question this thesis lives inside. It does not offer a method for resolving the paradox but a way of working that keeps it open. The case studies hold one assemblage at a time and let the loops that exceed it remain visible at their edges. Connection without container, to put it as a slogan. Morton names a figure for this: a mesh consists of the strands and the gaps between the strands, and ecology is the threads and the holes between the threads.[42] What holds an ecology together is also what fails to hold it together, and that failure is constitutive, not residual.

Latour and Morton describe the problem from outside compositional practice. Claudia Molitor describes it from inside, which is where this thesis also stands. She suggests that all compositional outputs that have ever occurred or will occur can be understood as feeding into the hyperobject that is music, and that each composer's practice can in turn be regarded as a hyperobject, with each piece or project a small manifestation.[43] The scales nest. The piece is one assemblage, the project a larger one, the practice larger still, the field of music larger again, and none of these can be experienced or held in full at any one moment. For Molitor this changes what compositional practice is doing. Citing Tim Ingold, she reframes it, now as an ecology of life rather than a hyperobject: not nodes and connectors but threads and traces, not the relations between organisms and their external environments but the relations along

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40 Bennett, *Vibrant Matter: A Political Ecology of Things*, 24.

41 Latour and Porter, *Facing Gaia*, 97.

42 Morton, *Hyperobjects*, 83.

43 Claudia Molitor, "Composition as Hyperobject," *APRIA Journal* 3, no. 2 (2021): 1.

their enmeshed ways of life.[44] The composer is not exterior to the assemblage. The composer is one of its threads.

If form is the audible trace of a collision of affordances inside one piece, and that piece is itself a finite assemblage in a wider field of practices and infrastructures, then what the chapter has been building toward is a question rather than a position. Does music become, in this way, an environment of conditions in which multiple agents come into co-existence? The case studies of the chapters that follow do not answer this question. They work inside it. Each holds one configuration of silicon and carbon at the scale where the entanglement can still be heard, leaving the scaffolding of the assemblage exposed rather than smoothing it away.

44 Molitor, “Composition as Hyperobject,” 6–7.

2. Enough?

For Flute, Trombone, Electric Guitar, Piano, Double Bass

2.1 Concept and inspiration

Enough? did not begin from material. Rather than asking which sounds or textures the commissioned instruments might offer, the piece began one step earlier, with the question of where music arrives from — not historically, in the sense of influence or repertoire, but materially. How does it reach the composer? What has already selected it, ranked it, circulated it, compressed it, recommended it, made it visible, made it valuable?

The working method took these questions literally. Searches such as "the most beautiful flute piece" or "best double bass pieces" treated the platform's logic as the first filter. The beauty that returned was already mediated — not a personal judgement but beauty as produced through ranking, views, thumbnails, search optimization, and circulation. The results were platform objects: musical excerpts detached from their original contexts and returned as searchable, comparable, consumable. From this the compositional question followed: what happens when this already-mediated beauty is pushed further — when the fragments are extracted, stacked, discretized, sampled, and forced into a process that does not preserve them?

Enough? is asking when a system has done enough to something. At what point does choosing things become harmful? When does repeating something cause it to disappear? And when “beauty”, after being put in order and taken out, becomes unable to continue?

2.2 Source material

The source material was gathered through simple, basic search requests: "most beautiful flute piece," "best trombone piece," "greatest electric guitar solo," "beautiful piano piece," "best double bass section," and similar formulations. The aim was not to arrive at the most proper or historically correct choice. The aim was to observe what YouTube's search engine returns once beauty, greatness, and instrumental identity are reduced to searchable phrases.

The flute material came from the Allegro of the Sonata in A minor by C. P. E. Bach, a source that proved more complicated later. The trombone material was taken from Wagner's "Ride of the Valkyries," the electric guitar from the second solo in Pink Floyd's "Comfortably Numb" (David Gilmour), the piano from Erik Satie's Gymnopédie No. 1, and the double bass from Richard Strauss's Ein Heldenleben. In each case the excerpt was roughly the first ten seconds, or a short opening passage of around that length.

The flute source turned out not to be what it first appeared. The score of the C. P. E. Bach Sonata in A minor used here is a variation written by Barthold Kuijken. The material was therefore already a copy of a copy, not the original. It had been altered through being published, reworked, played by musicians, uploaded to the internet, surfaced in a search, assigned a name as a computer file, and even misread.

2.3 Vertical stacking

Once the fragments were selected and renotated, they were layered onto one another (see Figure 1). This was the first act of compositional violence, in a precise sense: five musical objects, each with its own historical weight, instrumental logic, tempo, gesture, and cultural memory, were forced into a single shared time-space.
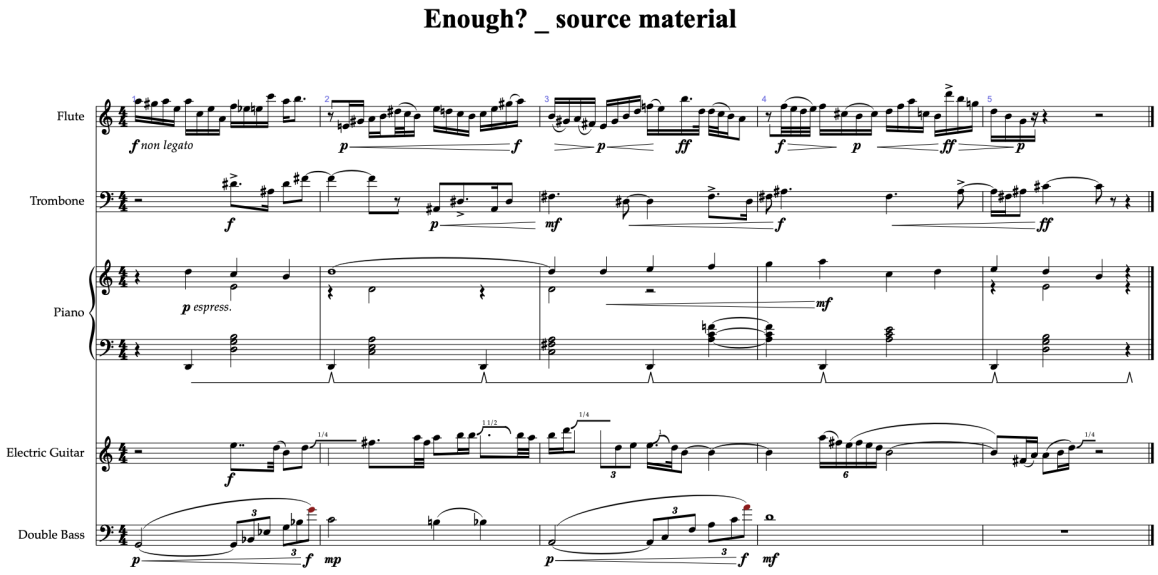
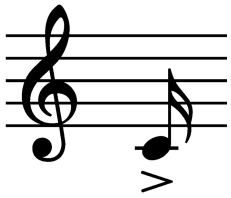


Figure 1: Source material for *Enough?*

The compositional intention was to push these sources against one another. Each piece arrived with a clear personality, but once stacked, that personality fell apart. Melodies were hidden, harmonies grew muddled, rhythms broke against one another. The origins remained audible, yet they no longer functioned as self-contained musical ideas. The original music was not erased. It was no longer secure.

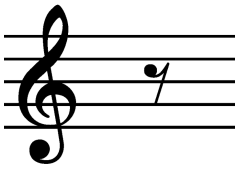
2.4 Silicon in *Enough?*

The computational stage for *Enough?* took place prior to the actual performance of the music. The work contains no live electronics, no sound system beyond the electric guitar, and no computer generated sounds during the performance. The programming was used to transform notated fragments into new notated material. The outputs became part of the acoustic score. In this sense, the computer functioned as a pre-compositional and notational processor. After rewriting five original musical sections in Sibelius, I made a Sibelius plug-in which I named it NOTES to convert the notation into a compact array in text format that later I can process it with help of Python. Each musical event, was shown as a string of characters representing the pitch (MIDI number), duration (1 = quarter note), articulation, and voice number. (See Figure 2, 3, 4, 5)



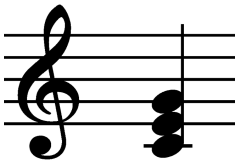
```
60/0.25/(Accent)/#1
```

Figure 2: Example from NOTES: A simple 16th note with accent



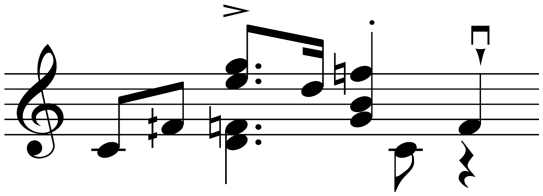
```
r/0.25#1
```

Figure 3: Example from NOTES: An 8th note rest



```
(60,64,67)/1.0#1
```

Figure 4: Example from NOTES: C major chord – quarter note



```
["60/0.5#1", "65.50/0.5#1",
"(74/77)/0.75/(Accent)#1_(62/65)/1.5#2",
"76/0.25#1", "(67/71/74)/1/(Staccato)#1",
"60/0.5#2", "65/1/(Staccatissimo/DownBow)#1",
"r/1#2"]
```

Figure 5: Example from NOTES: Complex phrase turned into an array of NOTES object

This format allowed the material to turn notation into a reduced data structure. The musical fragment was no longer only a visual score object; it became a list of parseable events. Then I created what I called a “Grid Sampler”. The important distinction is that the grid was used for grid sizing, not quantization. A grid division is a container for a length of time, not something to correct the rhythm. If a note is shorter than its division, its true length is not altered. If a note is longer, it is distributed across several cells. (See Figure 6, 7, 8)

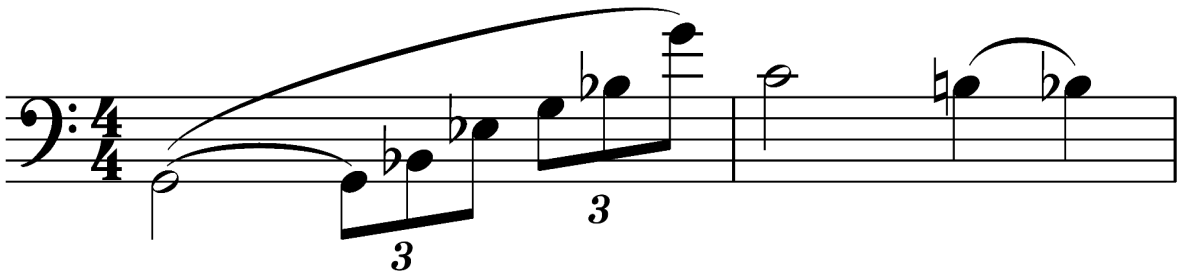


Figure 6: Grid sizing — original phrase before cell mapping.

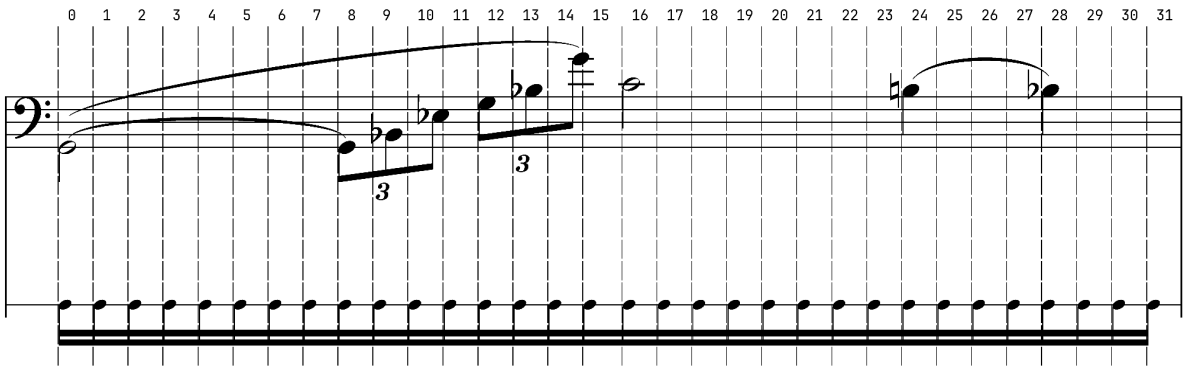


Figure 7: Grid sizing — phrase aligned with ’cell_size = 0.25’. The vertical grid shows temporal containers, not quantization points.

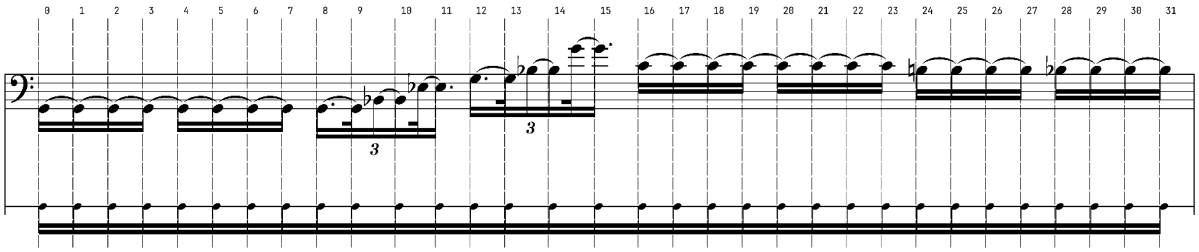


Figure 8: Grid sizing — cell-based representation after mapping. The phrase is rewritten against equal `0.25` cells while preserving the original durations, making each temporal position available for later grain extraction.

After the material was placed into a grid, the sampling process began to extract cell from it. Downsampling happened by controlling where and how often these cell were taken: ‘periodicity’ set the distance between possible sampling points, while ‘probability’ decided whether each possible point was actually used or left empty. In this way, the original phrase was not simply shortened, but thinned out through a mixture of regular spacing and chance. Some parameters could also change over time, so the extraction process itself could gradually become denser, sparser, more stable, or more unstable.

The final step was aggregation. After sampling, the result was still a list of cells, not performer-readable notation. So with help of a library in Python,[45] the system returns all processed data into notation. The complete transformation chain could be summarize as:

Sibelius notation → NOTES list → Grid Sampler → sampled cells → aggregated events → formal notation

In *Enough?*, silicon’s role is not generation or manipulation of sound. Instead, it reshapes the musical notation that the musicians will use. By the time the ensemble plays, the computer is absent, yet its operations remain in the score as cuts, omissions, repetitions, compressed rhythms, and damaged continuities. The silicon process becomes readable only through carbon performance.

2.5 Downsampling, Degradation, and Collapse

Downsampling became a compositional method because it allowed me to treat loss not as a side effect, but as form. Within this framework, downsampling breaks down smoothness by introducing what could be called "quantization gaps." As the sampling rate of the compositional grid decreases, fewer "samples" of the original musical information are preserved, leading to a coarser representation of the signal. The musical gesture is no longer a

45 SCAMP (Suite for Computer-Assisted Music in Python) 0.9.2, https://scamp.marcevanstein.com/

way of charting the progression of a narrative in time, but is instead unfolded as an acoustic mosaic.

Crucially, in the ecology of *Enough?*, repetition does not reinforce the material; it damages it. Here, however, repetition functions as erosion. Following the logic of Hito Steyerl's "poor image," the material deteriorates as it circulates through the feedback loops of the algorithm.[46] Each iteration of the Grid Sampler introduces more "holes," more information loss, until recognizable gestures become less stable and eventually collapse.[47] Repetition is not praise; it is pressure—an insistence that eats the identity of the source until it looks tired, then damaged, then stubbornly defect. While the listener may still sense a trace of the original or not —a scent of its origins—they can no longer securely recover or redeem it.[48]

2.6 Q-frames: When Degradation Leaves the Code and Enters the Body

Where the first regime employs computerised processes for loss of information or gain of information (the same process in reverse—how the piece actually begins) the second regime requires the performer to inhabit this broken continuity physically. This transition is realized by the Q-frames: dashed horizontal frames in the score indicating self-paced, improvisatory passages with abrupt starts and ends. Within these frames, the traditional hierarchy of performance—where physical action is the means and sound is the end—is inverted. The score utilizes crossed noteheads (×) to prescribe physical instrumental actions without intended sound production. These marks represent gesture, fingering, or contact rather than an acoustic result; staff pitch indicates only a specific physical configuration or fingering and must not be corrected to produce one. Furthermore, dynamic markings function as upper bounds rather than targets, with the explicit instruction that the performer must remain as quiet as physically possible at all times.

The Q-frame functions as a behavioral system that forces the carbon-based agent (i.e. the performers) to run a machine-like loop of effort and failure:

- State 0 (Absolute Minimum): Each cycle begins at the threshold of audibility—the quietest physically achievable sound.

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46 Hito Steyerl, *In Defense of the Poor Image*, 2009, 1, https://www.e-flux.com/journal/10/61362/in-defense-of-the-poor-image.

47 Morton, *Hyperobjects*, 77.

48 Craig Owens, "The Allegorical Impulse: Toward a Theory of Postmodernism," *October* 12 (1980): 77, https://doi.org/10.2307/778575.

- Transition (Unstable Zone): Through the continued mechanical pressure of the rhythmic notation, unstable partials or micro-pitches inevitably begin to emerge.
- Reset Condition (Failure): In this ecology, pitch emergence constitutes failure. It is an "overshoot" where the instrument's materiality succeeds against the performer's resistance.
- Reset: Upon the emergence of pitch, the performer must immediately return to State 0 and continue the loop.

Through this loop, the performer is placed in a contradictory state: they must maintain correct physical execution while simultaneously actively preventing sound realization. By acting as if producing sound while withdrawing the conditions that would allow that sound to stabilize, the performer becomes a site of material interference. Therefore the Q-frame is not a quiet section. It is a behavioral system for suppressing sound. And degradation is no longer an abstract process of downsampling; it is a live, effortful interaction where the performer completes the composition by inhabiting the threshold of its collapse.

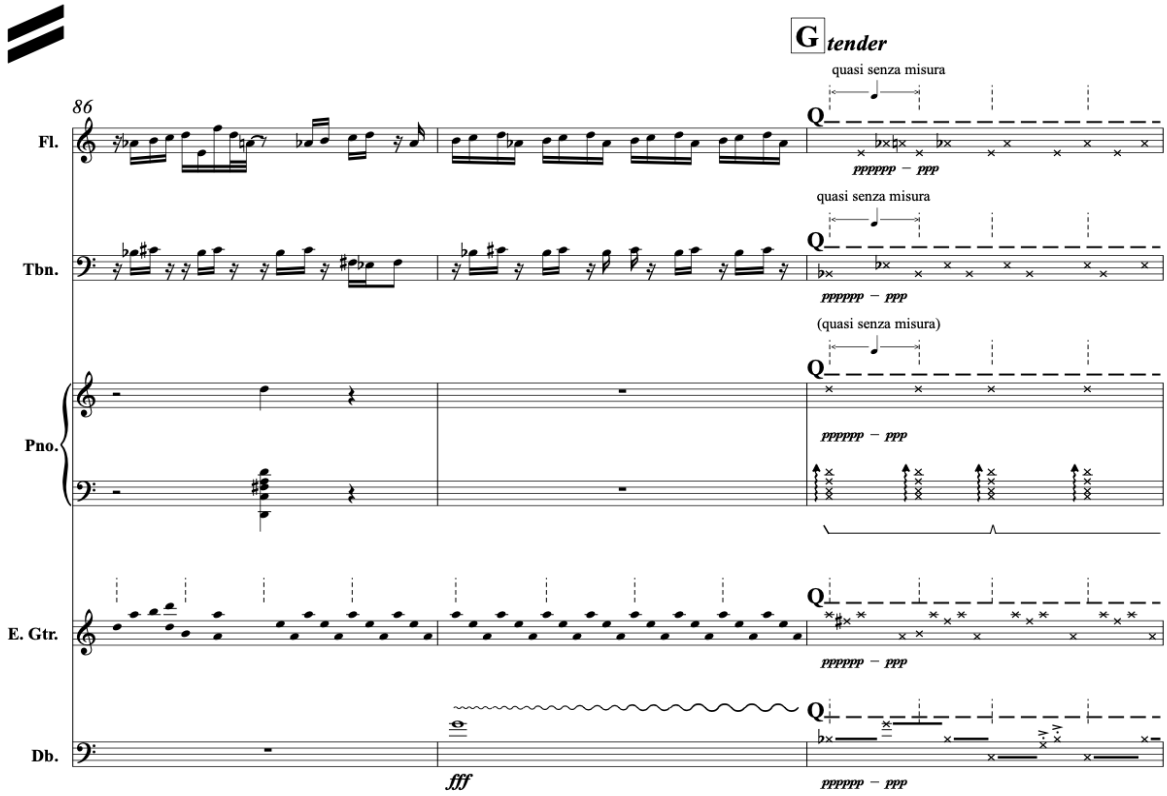


Figure 9: *Enough?*, score excerpt: loud section followed by Q-frame.

2.7 Formal Structure of *Enough?*

The formal structure of *Enough?* does not follow a logic of linear development or a teleological progression from one state to another. Instead, it operates as a dynamic condition of alternation between two primary regimes: saturation and suppression. The work oscillates between "too much sound"—an overproduction of stacked, digitalized canonical material—and "almost no sound"—a physical prevention of sound at the threshold of silence. Therefore, The piece uses no crescendo or diminuendo anywhere. Sound is either present or absent. This logic of the sounding cell as on or off resonates in the formal structure.

This contrasting structure is organized as follows:

Regime	Material	Agency	Function
notated sections	Stacked/downsampled fragments	Score/code residue	Saturation, overload, damage
Q-frames	Physical actions near silence	Performer/body/ instrument	Threshold, resistance, failure
General pauses	Suspended tension	Ensemble/listening	No release, only interruption
Senza misura / Stopwatch	Proportional time	Distributed timing	Loss of central pulse/control

In the first regime the form is dictated by silicon logic: the "confiscated" fragments of Bach, Wagner, or Pink Floyd are vertically stacked and downsampled through the Grid Sampler algorithm, resulting in a saturated, "cracked surface" of sound. The agency here resides in the score as a residue of code; the performers must execute a high-resolution,

maximum-volume (*fff max*) digital logic that systematically erodes the identity of the source material.

In contrast, the Q-frames represent a regime of suppression and prevention, and become a behavioral system. The General Pauses (G.P.) and the later senza misura sections using stopwatches further destabilize the formal container. The G.P. is not a moment of rest but a state of suspended tension that interrupts the sound mid-cycle. By the time the piece reaches the stopwatch sections (from bar 102 onward), the central pulse is completely dissolved. Timing becomes distributed; each performer monitors their own local clock, replacing centralized ensemble coordination with a parallel, independent execution. Form, in this sense, is not a container for events, but a site of negotiation between saturation, interruption, and the resistance of the body.

2.8 Rehearsal and Performance Observations

Ensemble PHACE's premiere of *Enough?* at the aspekteFESTIVAL 2026 showed that the work requires performers to inhabit a system of on-off thresholds, not a conventional score. In the rehearsal, the musicians initially struggled with the paradoxical nature of the Q-frames. While the system requires them to act as if producing sound, they found it particularly difficult to maintain the required dynamic threshold; the physical engagement necessary for the action frequently led them to produce more audible resonance than intended, or to produce no sound at all and fall into the territory of extended techniques like clicking noise. The difficulty was not to play softly, but to remain inside a task that almost contradicts playing: to execute the physical mechanics of a musical gesture while simultaneously denying its acoustic success. The normal regime in the piece demanded a focus on saturation and overload, while the Q-sections required an internal, vigilant negotiation between intention and failure. How I could succeed in changing their mindset about Q-frames was to think of the most essential parameters of producing sound on their instrument, and that is where they should apply the Q-frame’s conditions. For instance, for flute and trombone, this is their breath and embouchure; for double bass, it is the bow pressure and speed; and for piano and guitar, it is the movement of the fingers. While performers are playing the fragment, every other aspect of their performing abilities should stay the same as how they mastered them; only these certain aspects go under the radical condition of Q-frames.

In performance, I observed that the audience perceived a profound psychological tension even when minimal sound was audible. Listeners later reported a sense of discomfort

or disturbance, which appeared to stem from the visible effort of the performers and the unstable thresholds of the instruments. This latent sound—a state where music is constantly about to happen but consistently fails—transformed the silence into a site of active, suppressed emergence, where the listener experiences the system's collapse as a live event.

2.9 What *Enough?* reveals about hybrid agency

Enough? shows that silicon agency does not require live performance to remain constitutive. The Grid Sampler, the downsampling routines, and the platform-derived selection complete their work before the musicians arrive. What the ensemble plays is the residue of computation: cuts, omissions, compressed rhythms, damaged continuities held inside the notation. The score does not represent the mediation. It is *the mediation*, set. Hybrid agency, here, is not a live exchange. It is a condition that has already taken place and waits for a body to read it back.

What the Q-frames introduce is the carbon-based counterpart: the body begins to execute a silicon-based protocol. The performer enters a loop. State zero at the threshold of audibility. Mechanical persistence. Pitch overshoot. Reset. Continue. The body becomes a state machine, and breath, embouchure, and bow pressure are the variables it monitors. What this produces is not the meeting of two substrates. It is each taking on what the other was supposed to do. Form, in this ecology, is suppressed emergence: a piece that holds itself just below the point where sound would consolidate, and lets the holding be heard.

3. Team CEO

For Flute, 2× MIDI Keyboard

3.1 Why *Team CEO* is central to this thesis'

Team CEO represents the transition in this thesis from score-based mediation to live mediation and forces silicon and carbon to negotiate their identities in real time. The piece is central to my argument because it demonstrates that a composition can function as a platform rather than a fixed object. The score does not quite tell performers what sounds to produce; it provides them with a system to operate. As the performance notes specify, the flute acts as a live resource that the keyboards intercept and manufacture into multiple voices through a Pure Data environment.

3.2 Corporate ecology as compositional model

Team CEO employs formal compositional style and corporate logic to establish a musical environment built on supply and demand catalyzed by a structure of hierarchy and redistributive, resource-based sonic currency. This corporate logic manifests through:

- Resource dependency: The score says, "Flute is the source of all sound. Nothing exists without it." The system goes mute when the flutist is silent. The system depends upon the flute to produce sound energy.

- Extraction and multiplication: The keyboards lack the capacity to produce sound. They make polyphony through time-multiplication by intercepting and layering the flute signal. Each keystroke creates a new, time-shifted layer of the flute, effectively turning a flute solo into a complex corporate texture.

- Accumulation and systemic Weight: Just as employees gain power and influence by logging hours, they gain power through action. The note count on Keyboard I is constantly assessed by the Pure Data patch, and over time, it adds "systemic weight," shifting the system's internal map.

- Control transfer and inversion: At the start of the performance, the flute's level of descent directly controlled the "pitch deviation coefficient." As the keyboardists began playing, the flutist's control also began to give way, and the control inverted. By Section E, the system's mapping will have already inverted. The flute control will remain, but the system will have reorganized to make the control unstable and reversed.

In *Team CEO*, hierarchy exists as a non-linear, ephemeral ordering principle. The author portrays a dynamic ordering of power in which control of the corporate hierarchy of resource management through the 'pitch deviation coefficient' is exchanged, created, and ultimately recycled back to the system that contained it. The author uses form as a compositional device to derive an architectural system that can contain a dependency and a disruptive imbalance.

3.3 Pure Data system: source, pitch tracking, shifting, multiplication

The technical infrastructure of *Team CEO* is a real time mediation engine that has been built completely in Pure Data and has a single audio input. This system functions in an environment of absolute material dependence with the amplified flute as the sole sound source. There is no logic synthesis or sample storage—this is a silent system until the flutist provides the raw material.

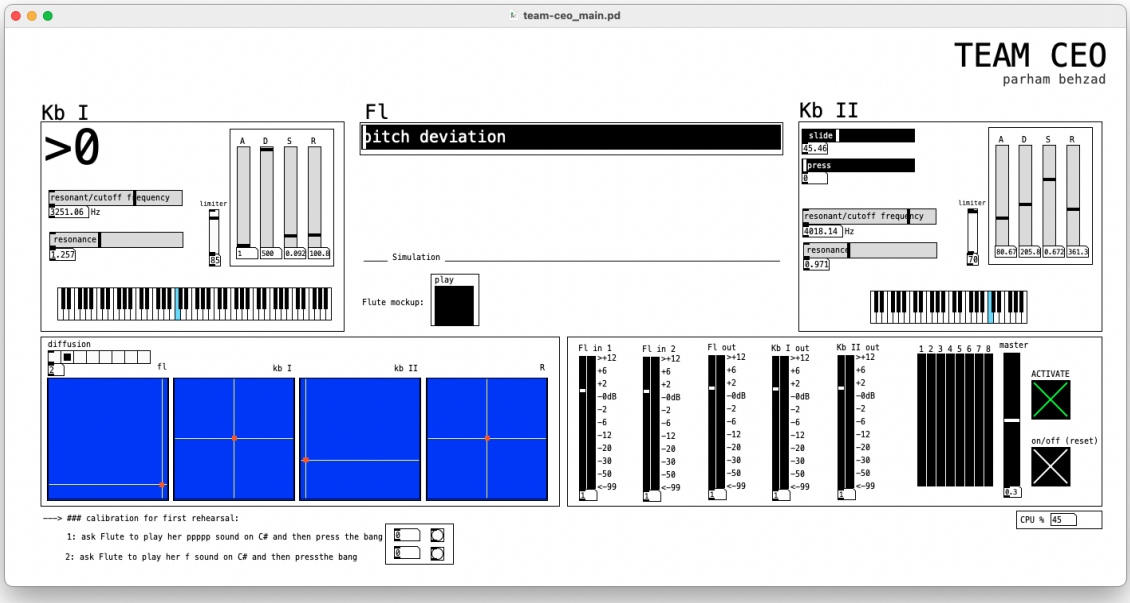


Figure 10: Screenshot from Pure Data patch for *Team CEO*

The first stage is the capture of the live output of the flute to the system, which goes to a sample and hold, and a pitch analysis. The pitch analysis attempts to find a value around which the sample will shift. For each note-on event the sample patch produces a new instance of the live flute signal. This new instance is immediately pitched and shifted to the interval between the detected pitch of the flute and the key pressed by the keyboardist. More importantly, each of these instances is a separate signal pathway through the sound field. This creates the illusion of a densely layered sound texture, all coming from a single source.

3.4 Calibration and the pitch deviation coefficient

The pitch deviation coefficient describes the deeper biomechanical tiers of *Team CEO*, symbolizing the point where the flutist's body crosses the logic of the system. Rather than a static effect, the Pure Data system scales each of the intervals produced by the keyboards, using a continuously changing coefficient from the live amplitude of the flute. This relationship requires a calibration routine, where the flutist plays her absolute softest sound and her absolute loudest. These two axioms create a normalized range of 0–1 that describes the system's internal calculations and defines the system's response to the live input. Since the range is determined by the performer's actual output, the system is never neutral the system does process an abstract or ideal flute, but the specific biological restrictions of the respective present musician.

Ultimately, this coefficient illuminates a dualistic agency with the machine in this context processing a specific sound source and being finely adjusted to this flutist in this room at this time. For lower coefficient values, the intervals contract to a unison with the original breath and, for higher values, they expand into discrete, sharp intervals. Between these two positions lie fractional and microtonal shifts that are purely the outcome of the flutist's live playing.

3.5 Two keyboard agencies: discrete accumulation and continuous deformation

Within the mediated ecology of *Team CEO*, the two keyboards are more than mere instrumental roles. They are two different models of technological control for how the flute's raw materials are intercepted and redistributed. The first keyboard uses a standard 88-key MIDI keyboard to apply a bureaucratic and additive logic. The logic is bureaucratic because it

treats every input as a discrete, countable unit: each keypress is registered, tallied, and filed by the system, and influence accrues through procedure and accumulated record rather than through gesture. Since it operates in discrete, measurable steps, every key that is pressed is a "unit" of demand that the system counts. This model depends on the sustain pedal to allow those discrete instances to accumulate into dense aggregates, existing across the temporal windows. On the other hand, the second keyboard features the ROLI Seaboard, an MPE controller. Unlike traditional keyboards, it has a tactile silicone surface instead of discrete keys. This interface not only adds notes, but it deforms the pitch field. The first keyboard builds stable structures, while the second keyboard focuses on instability by micro-perturbation. The first keyboard describes the polyphonic structural infrastructure by using accumulation, and the second keyboard describes the gestural detail by using deformation.

3.6 The score as exposed algorithm

The internal structure of this algorithm can be understood using a trigger-action notation featuring colored symbols and arrows. This design generates a dependency field where each agent's actions, including the flutist's breath attack or the keyboardist count of notes, triggers system mapping changes or interventional cycle switching. The players are not developing a narrative in the classical form but are executing a series of processes that are interlinked, much like threads in a program, responding to the outputs of other threads in real time.

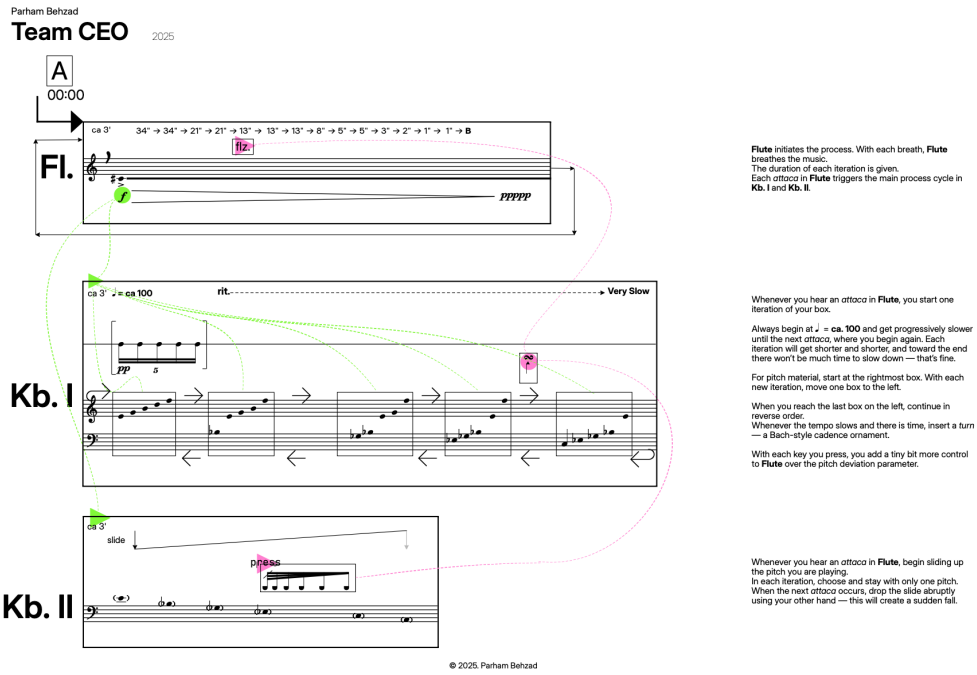


Figure 11: *Team CEO*, score excerpt, first page

The glasses symbol designates, perhaps, the most radical divergence from standard ensemble coordination. At certain junctures, the score compels players to look at one another to coordinate visually. In a conventional ensemble, a shared pulse is the default and togetherness is the ambient condition; here that baseline is reversed. Within the score's corporate ecology, ensemble togetherness is not the assumed setting. The assumed condition is the absence of coordination, and any moment of togetherness must be deliberately triggered rather than presupposed. Coordination, when it occurs, relies on synchronized performance at the same time, at the same interval, and upon the same variable, triggered through the bodily system of the performer. Negating the left and right senses, the score exhibits a hybrid agency in which the assumed condition for performance is nonsocial, and the interlinked processes are themselves the means of performance.

3.7 Form as Control Redistribution

The structure of *Team CEO* is not defined by a succession of musical components, but by a redistribution of control among the components. Rather than the traditional teleological progression, the work develops through a “corporate” hierarchy of resource management, where control will be transferred from the flute to the keyboards. Form begins as a centralized hierarchy where the flutist holds the initiating control. The control hierarchy shifts as the flutist's dynamics become control data rather than markings that express individual artistry. The use of the sustain pedal to build dense harmonic aggregates results in a takeover of the listener's awareness. Consequently, the flutist's authority diminishes. Section E signifies the piece's balance point, as the system's internal mapping inverts completely. The flutist 'supplies' the sound, and with her departure, the system collapses entirely.

3.8 Rehearsal, premiere, and perceptual outcome

The NAMES ensemble's premiere of *Team CEO* in the 2025 LIMINA Festival highlighted the need for performers to learn a platform, not a typical score. The process of preparation for the musicians moved from traditional sonic interpretation of a score to functional operation of the system. Time was measured independently through stopwatches, rather than through a shared central pulse or a conductor. Coordination was triggered by the flutist's breath attacks. The “corporate” ecology defaults to algorithmic isolation rather than ensemble unity. The premiere suggested that this distribution of control is not only an

analytical abstraction but something enacted: the system seems to hold the form, with the players operating inside it more than authoring it.

3.9 What *Team CEO* reveals about hybrid agency

Team CEO theorizes hybrid agency as a non-static complex of source, extraction, control, and dependency, in which the score, the interface, and the performance are continually redistributed through systems of extraction and control. This system demonstrates that agency is not a singular attribute that actants take on, but rather a mesh of dependencies. The performers are not tool users; they are operators in a socio-technical system of which difficulty and resistance are constitutive properties. The first keyboard interacts through discrete accumulation and a normative interface to construct an accreted mass, while the second keyboard actively participates through continuous deformation. The coordination of these agencies is not their natural state, but a temporary relational encounter. In *Team CEO*, agency is not allocated to the computer, the flute, the keyboards, or the performers. It is manifested in the unstable relations between source, extraction, accumulation, reversal, and collapse.

4. Hybrid Agency, in Practice

4.1 Two pieces, one question

The thesis opened with a question and the question can now be restated in its sharpened form. *How can a creative process be understood as hybrid agency rather than as an aggregation of agents? Enough?* and *Team CEO* are two attempts at it, which approach the question from opposite temporalities of mediation, and read together they do something neither piece does on its own. The chapter's claim is what they produce together, and it is articulated in stages: comparison, then synthesis, then position.

What follows is not a recap. The reader has just read the case-study chapters and the pieces are present. This chapter is the synthesis the practice has produced. The comparison gives the ground; the synthesis names what stands on it; the position says what this means for how composition is now to be understood. The asymmetry should be visible from the start. The conclusions are not derived from the theory and tested against the works. They are produced by the works and articulated through the theory.

4.2 Comparison: two models of mediated agency

The two pieces share a single problem and approach it from opposite ends. Four threads are enough to hold the comparison. The first is the temporality of mediation. *Enough?* completes its mediation before performance. The platform logic, the renotation, the grid sampler, the downsampling—all happen in advance. The score the musicians read is the residue of computation. *Team CEO* completes its mediation during performance. The Pure Data system intercepts and redistributes the flute signal in real time. The score is an exposed algorithm. The first locates mediation in the score's history; the second locates mediation in the score's operation.

The second is the economy of agency. *Enough?* operates by subtraction and degradation. Material is selected, stacked, sampled, eroded. The Q-frames extend this logic into the body, where physical effort produces on the edge of sound/silence. *Team CEO* operates by extraction and multiplication. The flute supplies a single signal that is intercepted and redistributed into polyphony. One piece thins out, the other amplifies and redirects. Both refuse the model of the composer as a source generating material.

The third is the threshold of failure. Both pieces operate at thresholds where the system can fail. In *Enough?* the threshold is the body's. The performer must remain at the edge of sound production where any clear pitch counts as overshoot. In *Team CEO* the threshold is the system's. The pitch deviation coefficient and the inversion of control produce instability that neither flutist nor keyboardist can fully predict. Failure is not noise to be filtered. It is the condition through which the work becomes audible.

The fourth is form-as-condition, in two specifications. *Enough?* enacts form as collapse: the source material is pushed toward the point where it can no longer hold itself together. *Team CEO* enacts form as platform: the system's redistribution of control across the duration is the form. Neither piece offers form as architecture or as teleology. Both offer form as a sociotechnical arrangement that produces audible behaviour without prescribing outcomes.

The four threads share a single observation. The pieces are two implementations of the same compositional position. What position is becomes the work of the next section.

4.3 Synthesis: hybrid agency as non-totalizable sum

Hybrid agency is not aggregation. The two pieces, taken together, demonstrate that musical action in mediated systems cannot be cleanly decomposed back into contributions from individual agents. The source material and the patch originate with the composer, but the form is not contained in the score. The performer executes physical actions, but the result is not contained in the body. The computer processes signals, but the music is not contained in the algorithm. The form is in the assemblage, and *only* the assemblage produces effects that exceed what any of its parts could produce alone.

This is where the theoretical sources finally do their full work. Not as citations underwriting the argument but as conceptual peers naming what the practice has shown.

Bennett's "non-totalizable sum" is the most direct formulation. Agency is an effectivity proper to the grouping as such.[49] This effectivity does not absorb its members. It assembles, holds, disassembles. The two pieces are studies in this kind of grouping. The Q-frames in *Enough?* are one such grouping: performer, instrument, threshold, and suppressed sound holding together for the duration of a cycle, then resetting.

Latour's question—how to follow connections without being holistic—is the methodological problem these works solve in practice. *Enough?* and *Team CEO* are two ways of following connections without claiming a totality. The collapse model in *Enough?* refuses

49 Bennett, *Vibrant Matter: A Political Ecology of Things*, 24.

totality from below: the system erodes its own coherence.[50] The platform model in *Team CEO* refuses totality from above: control inverts and redistributes rather than centralising.

Hiendl's "machine other" is the precise formulation for what silicon contributes here.[51] Not a tool. Not a partner. Not a representation of human intention. A third realm. The two pieces are studies in living alongside this realm.

Molitor's framing of compositional practice as hyperobject[52] places this work in a contemporary artistic-research neighbourhood rather than in isolation. Composition exceeds the composer. The piece exceeds the performance. The performance exceeds the moment. Each is a local manifestation of something nonlocal. Four conceptual peers, one refusal. The grouping has its own effectivity, the connections can be followed without a whole, the alterity exceeds its parts, the local manifests something nonlocal. None of these are aggregation.

If hybrid agency is not aggregation, then the composer is not the source. The score is not the work. The performance is not the destination. Each of these reorientations needs to be unpacked, and this is the work of the next section.

4.4 Artistic position: the composer as architect of conditions

The first claim is that composition is the design of conditions. A composer does not produce a fixed musical object; a composer designs the conditions under which musical behaviour can emerge, fail, redistribute. A score is not a representation of intended sound; it is a protocol that channels behaviour. A Pure Data patch is not a sound generator; it is an infrastructure for redistribution. *Enough?*'s grid sampler is a condition for material erosion. *Team CEO*'s pitch deviation coefficient is a condition for live calibration. In each case, the compositional act is the design of the condition, not the prescription of the outcome.

The second claim is that the composer's role is restructured, not dissolved. This claim has to refuse two opposite misreadings. On one side, the misreading that distributed agency means the composer disappears, that everything is collaboration, that authorship is over. On the other side, the misreading that the composer remains the secret author of the system and the language of distribution is merely cosmetic. Neither is right. The composer chooses the source material, designs the algorithm, writes the score, calibrates the system. These are real authorial acts. But once the system is set in motion, the composer cannot determine the

50 Latour and Porter, *Facing Gaia*, 97.

51 Hiendl, *Composition and Digitality Three Meditations on an Entanglement*, 29.

52 Molitor, “Composition as Hyperobject,” 8.

outcome, and this is not a regrettable loss of control. It is the point. The composer has authored a condition, not an object. Authorship is real and partial.

The third claim is that the performer is not an executor. Lewis dismantles the Eurological assumption that the performer fills in colour where outlines are given.[53] In these pieces, the performer does not fill in. The performer operates inside a system whose behaviour they cannot fully predict. In *Enough?* this means inhabiting the threshold of sound production where the instrument resists the body. In *Team CEO* it means operating an exposed algorithm whose internal arithmetic shifts underneath them. The performer is also not improvising in the Afrological sense Lewis describes, because the conditions are composed in advance. The function is determined; the body is the live variable; the audible work is the function's value, computable only in performance. What the performer does is a third role. Neither executor nor improviser. An operator of conditions, whose agency is real but constrained, whose contribution is partial but indispensable.

The position is a description of what the practice has produced, not a defence of what it was meant to produce. It is provisional, located in two pieces, open to being rethought as the practice develops. It is also not arrived alone.

4.5 Lineages and differentials

The position outlined above does not stand alone. It depends on four figures whose work has made it thinkable, and it differs from each in one specific respect. The differentials are small. The dependencies are large.

In relation to Cage, the pieces inherit a structural opening and specify it differently. Cage opens structure to indeterminate sound and to chance; the Cagean composer authors a process and accepts what comes. The indeterminacy I work with is not chance. It is structural and distributed, produced by the entanglement of bodies and computational systems. I am not relinquishing control to chance. I am designing conditions whose behaviour exceeds prediction without being random. A different ontology of the unknown, opened by the same gesture Cage's work first made available.

In relation to Tenney, the pieces depend on a move and specify it further. Tenney moves form from score to perception; form becomes the listener's cognitive activity, the temporal hierarchy of "clangs". Form here is not only perceptual. The grid sampler, the Pure Data patch, the ROLI keyboard, the score-as-protocol all afford specific behaviours and resistances

53 Lewis, "Improvised Music after 1950," 97.

that are constitutive of form before any listener perceives anything. The infrastructural form these pieces work with sits alongside Tenney's listener-centred one, in the relations between objects, scores, bodies, and machines.

Alongside Lewis, the pieces work inside a repositioning and specify a third role inside it. Lewis dismantles the Eurological frame that treats composition as a fixed object communicated through notation, and repositions the performer as agent rather than executor. The performer here is neither the executor of the Eurological score nor the improviser of the Afrological tradition. The performer is an operator of conditions. This is a position that becomes possible when computational mediation enters the compositional system as a co-equal agent.

With Hiendl, the three-realm framework — nature, culture, machine other — is the ontology these pieces work inside. *Enough?* specifies the relation when mediation is pre-performance and the machine acts on the score before it reaches the body. *Team CEO* specifies it when mediation is live and the machine acts on the body's output as it happens. Hiendl gives the ontology; the pieces give the ontology its specific compositional consequences.

4.6 What remains open

The thesis has worked through two pieces, in two specific configurations, at two specific moments in this practice. The findings are real but local. Other configurations, other temporalities, other distributions of agency will produce other findings. The synthesis in 4.3 is a claim about what these two pieces show, not a universal theory of mediated music.

What the practice now wants to test is what comes after. Forms in which mediation operates across longer durations, between performances, across distributed locations. Forms in which the composer's authorial act is itself distributed in time and across collaborators. Forms in which the audience's participation enters the system as a constitutive agency rather than a reception.

The question this thesis began with was how a creative process can be understood as hybrid agency rather than aggregation. Two pieces have shown two ways. The question remains open because the practice continues. The thesis is a stage, not a conclusion.

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Zusammenfassung der Masterarbeit

Silizium, Kohlenstoff und Musik — Hybride Handlungsmacht und die Verflechtung von Komposition und Aufführung

Gegenstand und Fragestellung

Diese Masterarbeit fragt, wer oder was in der Musik eigentlich handelt, sobald Technik im Spiel ist. Normalerweise denken wir so: Der Komponist hat die Ideen, der Musiker spielt sie, Instrument und Computer sind nur Werkzeuge. Die Arbeit dreht diese Sichtweise um. Komponist, Musiker, Computer und Partitur stehen auf derselben Ebene. Keiner ist nur ein Werkzeug, und keiner ist allein der Urheber. Die Musik entsteht aus dem, was zwischen ihnen passiert. Diese Idee nennt man verteilte Handlungsmacht (englisch: *distributed agency*): Das Ergebnis kommt nicht von einer einzigen Person, sondern aus einem Netzwerk von menschlichen und nicht-menschlichen Beteiligten.

Silizium und Kohlenstoff

Der wichtigste Schritt der Arbeit ist eine neue Sprache. Statt von „Mensch" und „Maschine" zu sprechen, benutzt sie zwei chemische Stoffe: Kohlenstoff und Silizium. Warum? Weil die Wörter „Mensch" und „Maschine" uns sofort in zwei feste Schubladen sortieren. Alles Menschliche kommt in die eine, alle Geräte in die andere. Diese Trennung versteckt aber, wie eng beide Seiten verbunden sind.

Kohlenstoff steht für alles Körperliche und Materielle auf der menschlichen Seite: der Atem, das Holz des Instruments, der Filz des Hammers, das Papier der Partitur, der Körper des Spielers. Silizium steht für das Rechnende: den Chip, das Programm, den Computer. Der Schriftsteller Primo Levi ist in *Das periodische System* einem einzigen Kohlenstoff-Atom gefolgt — von einem Stein durch die Luft in eine Pflanze, in Milch, in einen menschlichen Körper, bis ins Gehirn. Das Atom bleibt gleich. Nur die Form, an der es teilnimmt, ändert sich. Genau so funktionieren die beiden Begriffe. Klavier und Pianist sind nicht zwei verschiedene Welten. Sie sind zwei Formen desselben Stoffes, die aufeinander wirken.

Wichtig ist: Silizium meint nicht jedes elektronische Gerät. Ein Lautsprecher ist elektronisch, aber er rechnet nicht. Ein Computer mit einem Pure-Data-Programm rechnet.

Nur das Rechnende ist hier Silizium. Ein rechnendes Gerät hat einen eigenen Zustand und kann diesen nach eigenen Regeln ändern. Es liefert Ergebnisse, die nicht im Voraus festgelegt sind. Gerade deshalb lässt es sich nur schwer ein bloßes Werkzeug nennen.

Hybride Handlungsmacht

Was passiert, wenn Kohlenstoff und Silizium zusammenkommen? Die Arbeit nennt das hybride Handlungsmacht. Donna Haraway hat dafür das Wort Sympoiesis geprägt. Es bedeutet: „Nichts macht sich selbst." Die Dinge entstehen gemeinsam, im Miteinander. Vor der Beziehung gibt es noch keinen klaren Komponisten und keinen klaren Computer. Sie werden erst zusammen zu dem, was sie sind.

Jane Bennett zeigt, dass diese Mischung nicht neu ist. Der Mensch war schon immer mit nicht-menschlichen Dingen verbunden. Sie sagt, wir seien „gehende, sprechende Mineralien". Silizium beginnt diese Geschichte nicht, es setzt sie fort. Das Neue am Silizium ist nur, dass es die Mischung sichtbarer macht.

Diese Verbindung lässt sich auch als Rückkopplungsschleife verstehen. Schon die Kybernetik um Norbert Wiener behandelte Lebewesen und Maschinen als ähnliche Kreisläufe, und Gregory Bateson fügte hinzu, dass auch der Beobachter Teil des Kreises ist. Timothy Morton widerspricht in einem Punkt: Kein Ding geht ganz in seinen Beziehungen auf, ein Rest entzieht sich immer. Die Arbeit nimmt beides auf. Die Schleife bringt Silizium und Kohlenstoff in Kontakt; der Entzug verhindert, dass sie ganz ineinander verschwinden.

Bruno Latour hilft, die Komposition neu zu verstehen: nicht als fertiges Objekt, sondern als das Setzen von Bedingungen, unter denen Musik entstehen, sich verschieben oder scheitern kann. Laure M. Hiendl fügt dem einen dritten Bereich hinzu. Neben Natur und Kultur gibt es das „maschinelle Andere" — etwas, das man weder auf Physik noch auf menschliche Absicht zurückführen kann. Der digitale Klang entsteht erst im Zusammenspiel dieser drei Bereiche.

Zwei Stücke, eine Frage

Die zentrale Frage der Arbeit lautet: Wie funktioniert hybride Handlungsmacht, wenn das Komponieren auf viele verteilt ist — auf Spieler, Computer, Instrumente und Material? Diese Frage wird an zwei eigenen Kompositionen geprüft: *Enough?* und *Team CEO*. Die Methode ist eine reflektierte künstlerische Praxis. Grundlage sind die eigenen Skizzen,

Partituren, Programme und die Proben zu beiden Stücken. Beide stellen dieselbe Frage, aber von entgegengesetzten Seiten.

Enough?

In *Enough?* passiert die technische Arbeit vor dem Konzert. Das Stück ist rein akustisch, es gibt keine Live-Elektronik. Das Material kommt aus dem Internet: Der Komponist suchte auf YouTube nach Sätzen wie „das schönste Flötenstück" oder „das beste Stück für Kontrabass". Die Suchmaschine entscheidet, was „schön" ist — durch Klicks, Aufrufe und Sortierung. Die Ergebnisse waren Ausschnitte von Bach, Wagner, Pink Floyd, Satie und Strauss.

Diese fünf Ausschnitte wurden übereinandergelegt. Jeder hatte seinen eigenen Charakter, doch gestapelt zerfiel dieser Charakter. Melodien verschwanden, Rhythmen stießen zusammen. Danach wurden die Noten in Daten umgewandelt und durch ein selbst geschriebenes Python-Programm bearbeitet, das der Komponist „Grid Sampler" nennt. Dabei wurden Teile der Musik herausgenommen und ausgedünnt. Dieser Vorgang heißt Downsampling — ein Herunterrechnen der Auflösung.

Hier wird ein Gedanke von Hito Steyerl wichtig. Sie schreibt über das „arme Bild": ein Bild, das schlechter wird, je öfter es im Netz kopiert wird. Genauso wird das Material in *Enough?* durch Wiederholung nicht stärker, sondern beschädigt. Die Wiederholung frisst die Identität der Quelle auf, bis man sie kaum noch erkennt.

Der zweite Teil von *Enough?* bringt diesen Verfall in den Körper. In den sogenannten Q-frames sollen die Musiker an der Grenze zwischen Klang und Stille spielen. Sie machen alle Bewegungen eines Tones, aber so leise wie möglich, fast ohne Klang. Sobald doch ein klarer Ton entsteht, gilt das als Fehler, und sie müssen von vorne beginnen. Der Körper wird so selbst zu einer Art Maschine, die eine Schleife aus Anstrengung und Scheitern abspielt. Das Stück hält sich knapp unter dem Punkt, an dem Klang fest würde. Diesen Zustand nennt die Arbeit „unterdrückte Emergenz".

Team CEO

Team CEO geht den umgekehrten Weg: Hier passiert die Vermittlung live, während des Konzerts. Nur die Flöte erzeugt Klang. Zwei MIDI-Keyboards können selbst keinen Ton machen. Stattdessen fangen sie das Flötensignal ab und vervielfältigen es durch ein Pure-

Data-System in viele Stimmen. Aus einem Flötensolo wird so eine dichte, mehrstimmige Textur.

Das Stück benutzt eine Logik aus der Wirtschaft. Die Flöte ist die einzige Ressource: „Nichts existiert ohne sie." Schweigt die Flötistin, schweigt das ganze System. Die Keyboards beuten dieses Signal aus, schichten es und sammeln „Gewicht" an, je mehr Tasten gedrückt werden — ähnlich wie Angestellte, die durch Arbeitsstunden Einfluss gewinnen. Am Anfang steuert die Flöte alles. Doch nach und nach kehrt sich die Kontrolle um. Ab dem Abschnitt E ist die Steuerung verdreht und instabil geworden.

Auch die beiden Keyboards arbeiten unterschiedlich. Das erste ist ein normales 88-Tasten-Keyboard. Es zählt jeden Tastendruck wie eine Behörde und baut stabile, dichte Strukturen auf. Das zweite ist ein ROLI Seaboard mit einer weichen Oberfläche. Es zählt nicht nur Töne, sondern verformt das Tonfeld. Das eine baut auf, das andere verbiegt.

Die Partitur sieht aus wie ein offengelegtes Programm, mit Pfeilen und Symbolen. Ein Brillen-Symbol verlangt sogar, dass die Spieler sich ansehen, um sich abzustimmen. Das ist ungewöhnlich: In einem normalen Ensemble ist das Zusammenspiel selbstverständlich. Hier ist es umgekehrt. Der Normalzustand ist die Trennung, und jedes gemeinsame Spielen muss bewusst ausgelöst werden.

Form als Bedingung

Beide Stücke verstehen Form auf eine neue Weise. Form ist hier kein festes Gehäuse für Töne, sondern ein Zustand, in dem Kontrolle, Verteilung und Scheitern hörbar werden. John Cage hatte Form bereits für den Zufall geöffnet. James Tenney verlegte die Form vom Papier ins Hören des Zuhörers. Beide aber sehen Form als Ergebnis — von Prozess oder von Wahrnehmung. Die Arbeit geht weiter: Mit Anna Kornbluh und Caroline Levine versteht sie Form als das Bauen von Beziehungen selbst. Jedes Werkzeug — ein Algorithmus, eine Partitur, ein Keyboard — erlaubt bestimmte Handlungen und verhindert andere. Wenn Silizium und Kohlenstoff aufeinandertreffen, stoßen diese Möglichkeiten zusammen, und die Form ist die hörbare Spur dieses Zusammenstoßes.

Der Spieler und der Komponist

Was bedeutet das für die Musiker? George Lewis hat gezeigt, dass die europäische Tradition den Spieler nur als Ausführenden sieht, der eine fertige Partitur „ausmalt". In diesen

beiden Stücken ist der Spieler aber weder ein reiner Ausführender noch ein freier Improvisator. Er bedient ein System, dessen Verhalten er nicht ganz vorhersagen kann. Die Arbeit nennt ihn einen „Operator von Bedingungen".

Und der Komponist? Er verschwindet nicht, aber seine Rolle ändert sich. Er wählt das Material, schreibt das Programm und die Partitur. Doch sobald das System läuft, kann er das Ergebnis nicht mehr festlegen. Das ist kein Verlust, sondern der eigentliche Punkt: Der Komponist baut keine fertigen Objekte mehr, sondern Bedingungen. Er ist ein Architekt der Bedingungen.

Fazit

Am Ende argumentiert die Arbeit, dass hybride Handlungsmacht nicht dasselbe ist wie eine einfache Summe von Einzelteilen. Man kann die Musik nicht sauber in die Beiträge der einzelnen Beteiligten zerlegen. Jane Bennett nennt das eine „nicht-totalisierbare Summe": Die Gruppe hat eine eigene Wirkung, die größer ist als ihre Teile, aber sie schluckt die Teile nicht. Claudia Molitor beschreibt das Komponieren sogar als Hyperobjekt — als etwas, das größer ist als das einzelne Stück und das man nie ganz überblicken kann.

Komponieren heißt in dieser Arbeit also: Bedingungen entwerfen, unter denen Musik durch verteilte Handlungsmacht, durch Instabilität und durch Verhandlung entsteht. Die beiden Stücke geben zwei Antworten, doch die Frage bleibt offen. Die Arbeit versteht sich nicht als Schlusspunkt, sondern als eine Etappe in einer Praxis, die weitergeht.

MODEL *MODEL* *MODEL*

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