

Article

Living intermedia: Towards a theory of organism in sound-based material theatre

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Abstract

The following article explores an emerging theoretical framework for ‘sound-based material theatre’, a form of post-instrumental, post-puppetry performance practice. Whitehead’s ‘philosophy of the organism’ is employed as a foundational vocabulary to describe the modes of interaction and synthesis of entities in an intermedial ecology. Drawing on instrument design theory, the discussion connects processes of embodied learning, mediation and distributed agency with a collaborative ‘animist’ approach to composition and performance. Challenges of mediation in intermedial practice are examined in relation to the perceived separation of senses and disciplines. Foucault’s analysis of the pre-classical epistemology of resemblance is used as a model for describing different types of cross-modal relations between materials, applied as a ‘nexus’ method of orchestration towards an ideal of a ‘living’ organism of intermedia.

Keywords: Instrument design; intermedia; material theatre; post-instrumental

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1. Experience

There is a direct connection with the material. My right hand is in a stretchy black-knit glove with crumpled-up black rice paper glued to the fabric, forming a ruffled texture that covers the entire surface. In my left hand is a white feather, roughed up so that its downy barbs shoot out into the air. As I adjust the side lighting and camera aperture, the white feather blades slice through the black of the paper glove. Projected on the screen, the materials fuse together to give the impression of a living creature. Cropped in the macro-lens perspective, the paper forms the body of some kind of unfamiliar bird, or perhaps an insect, white feather spikes exploring the air-like antennae. As I turn the metal wire that holds the feather in my left hand, the antennae probe and turn in the microscope-like environment, peeking out from under the breathing body of the black paper. A synthesised sound moves with the antennae – granular clicks and flutters, micro-rhythms like tiny metallic feet or mechanical joints turning and clasping. The speed and sequences of intertwined rhythms adapt and modulate depending on the speed and distance of the movements. The experience is unified and physical. And yet something is missing. *What does the material want? Does the character feel incomplete? The creature sounds thin, perhaps I should add another layer. Maybe a new mapping to create a sound that connects with the texture and mass of the paper? And a background layer to give more depth to the sonic image?*

To keep track of the progress, I make a short recording of the movements in the scene and put it on loop. Placing the black paper

glove and white feather interface down on the table, I turn back to the screen and watch the movement as an audience member. *What should this sound like? What is the context of this situation? How do the materials interact?* I open my signal processing software and begin coding an implementation for some sounds that could work to connect with the paper. White noise, down-sampling, resonant filter, panning based on x-axis position, which all should be polyphonic – so that means it needs a slightly more developed approach, and so on. After some time, I have a working synth that I can test with the objects. Putting the glove back on I try out the new sound material in context and realise the down-sampling needs to be more dynamic, and the filters should change resonance based on the size of the movements. I take the glove off again, and go back to programming, keeping the memory of the feeling of performance in my mind – remembering the way the paper appears to capture the feather like a pet, or prey, or at other times seems to be the body belonging to the antennae, which explore with a sense of intelligence.

The working method of the ‘video-puppet-instrument’ system I have been developing, like all digital instrument systems, requires a constant shifting between modes of engagement. The experience of the performance is one of holistic gestalt, a fusing of media – but the creation process divides the experience between the whole and the technical development of the parts: the video image, sound, computer vision mappings, puppet/object materials and the mechanics for movement. In hybrid media systems like this, there is a pronounced latency between the idea and the concrete realisation. As a result, there is a danger of getting lost in the minutia of technical issues, forgetting the overarching life of the piece and losing the sense of context and purpose that drives the process.

After spending hours adjusting the computer vision and signal processing code, I look again at the looping sequence. The material

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on the video moves and suddenly the piece comes to life again, the material coalescing into a multifaceted creature. I can predict its next movements, sounds and actions.

2. Sound-based material theatre

Material theatre is a working term for a stream of performance practice based in puppetry and object theatre that decentres the human and figural representation in favour of an open field of possible forms of character, scenography, dramaturgy and meaning (Grazioli 2009). This tradition is closely connected with ideas developed in E. Gordon Craig's *Übermarionette* (1908), Futurist Theatre, Dada, Antonin Artaud's *Theatre of Cruelty* (1958), Fluxus, and Heiner Goebbels' *Aesthetics of Absence* (2015), where the audience, and performers, are confronted with new forms of life and contexts which they must form a relationship with in the shared space of performance. In contemporary music, these streams flow into the vibrant scene of intermedial composer-artists working in 'expanded field' (Ciciliani 2017) and 'post-instrumental' practices (Stene 2016; Devenish 2021; Gottfried 2024).

The synthesis of post-puppetry performance with sound practices works towards an ideal of creating, or discovering life in the movements and combinations of objects, materials, sound and spatial experience. This merging into life echoes the vision of Dick Higgins' Fluxian concept of 'intermedia', where different practices and modalities are so fused together that they cannot be clearly separated (Higgins 1967; Higgins and Higgins 2001). Similarly, the expanded practices of instrument design, and more broadly human-computer interaction studies, focus on the creation of relationships between media and diverse modes of gesture.

In my work with video-puppet-instrument systems (e.g., *Apophanie* (2016), *Scenes from the Plastisphere* (2017/8), *Animism* (2021)), the puppeteer/object-performer/instrumentalists learn to engage with the objects in an *embodied* way. Interacting with the material directly with their hands, they experience their actions through the video camera's macro lens, projected onto a large semi-transparent screen between them and the audience. At the same time they hear the sonic results of their movements via a computer vision system that maps the analysis data to real-time sound synthesis.

The physical materials are often organic forms (crumpled up pieces of paper, tangles of wire, feathers, plants), and in the highly mediated context of the video-puppet system, the performers must learn to *feel* the connection between their physical gestures and the resulting image and sound. Due to the instability of the material form, the behaviour of the perceived character changes quickly, often unpredictably, and so the performance practice requires an ongoing interpretation of the material actions on the screen, to identify what creature is there, how it moves and what possible continuations the material suggests. I think of this sympathetic relation with the material as a kind of *animism*, where the performers, and by extension the audience, discover the *living* nature of things. Through an observational practice focusing on the unique character and presence of material form, the animist approach in performance fosters an increased sensitivity to the ways materials are inclined to move and develop – building empathetic relations with nonhuman entities (Bennett 2010; Stengers 2012; Haraway 2016; Morton 2017).

To assist in conceiving, discussing and forming collaborations to support this evolving practice of sound-based material performance, the emerging theoretical framework presented here focuses

on the ways composers, performers and materials relate to each other as they develop towards collective forms of production. Alfred North Whitehead's 'philosophy of organism' serves as a foundation, providing a vocabulary to describe the way processes perceive and respond to one another as dynamic *entities*, much like those discovered in material theatre performance practice.

3. Characters, interactions, agencies, entities

[...] the actual world is a process, and [...] the process is the becoming of actual entities. Thus actual entities are creatures; they are also termed 'actual occasions'. (Whitehead 1978: 22)

Biology is the study of the larger organisms; whereas physics is the study of the smaller organisms. (Whitehead 1929: 129)

For Whitehead, each individual *thing* in existence is not a solid substance but a composite of processes – basic units of existence that he calls 'actual entities' or 'actual occasions' (used interchangeably). The identity expressed by the actual entity/occasion is formed in a process of 'becoming', in which the entity defines itself through the 'aims' that drive its behaviour and interaction with other entities. Whitehead refers to this interaction as 'prehension', a basic level of 'feeling' by which actual entities digest and respond to data from other entities, in an active 'grasping' of one another (Stengers 2023: 76). Prehension is described as having a 'vector character' operating in dimensions of *emotion, purpose, valuation* and *causation* (Whitehead 1978: 19; O'Shea and Segall 2022, 2023).

Prehension has positive and negative forms. In 'positive prehension', relational data expressed by another entity is experienced as a feeling which harmonises with the aims of the entity, and so is ingested, becoming incorporated into the composition of the entity. In 'negative prehension', the data are felt as an aversion – a dissonance, clashing with its aims, and is rejected, not incorporated.

There is a distinct sense of subjective agency implied in prehension. Isabelle Stengers notes:

As soon as there is prehension, there is involvement in a subjective process, along which the subject is in play as much as prehensions. The aim that prehensions will progressively realize 'animates' them. (Stengers 2023: 77)

This aim that animates the prehension is a form of desire, a magnetic pull – in the way that certain molecules *want*, or are *inclined* to bind together. The actual entity/occasion composes itself through a synthesis of prehensions – a process of becoming which Whitehead calls 'conrescence'.

Conrescence or composition can occur because, as soon as there is togetherness or grasping together, there is a mutual sensitivity. Composition itself is nothing other than the manner in which this sensitivity takes on consistence [...]. (Stengers 2023: 148)

As Stengers writes, the characteristic manner of the actual entity is embodied through *composition*, a process of conrescence, which gives the actual occasion its unique formal consistence, driven by its vector of aims, and aesthetic values which function as a 'lure for feeling' (Whitehead 1978: 25).

Thus, by drawing on Whitehead, and the many theorists who have followed his trajectory, we gain access to a highly developed framework for understanding the intermedial objects of material theatre, not as lifeless matter, but as self-composing *temporal creatures* with their own agencies and tendencies – interacting through prehension, into a conrescence of becoming in a relational ecology of entities.

4. Object–entity relations, *enactive* instruments, ecological composition

How everything is connected *is also a thing*. (Morton 2018: 78)

In practice, the objects used in puppetry and material performance parallel the instruments used in musical performance – artistic tools and technologies which extend our modes of sense, medial articulation and range of expression. The more we use and rely on tools, the more they become *incorporated*¹ into our sense of embodied being and action (McLuhan 2002; Leman 2007). In the process of learning how to use a tool, we gain understanding of the particular agency (Latour 1987), expressed via its affordances and constraints (Gibson 2015) – the way an object suggests how it might be interacted with, or *collaborated* with. In dialog with Whitehead, we can think of Gibson's affordances and constraints as the possibilities and limitations of an interaction, mirroring the entity/occasion's expression of its character through positive and negative prehension.

In his work on instrument design, David Wessel similarly discusses the process of learning to perform with an instrument as an interactive exploration of the affordances and constraints of a system's behavioural character. Referencing embodied cognition theory (Varela et al. 1991), Wessel outlines an 'enactive' process of learning, emphasising the role of collaborative sensory-motor engagement with an instrument system towards the formation of a human-instrument symbiosis (Wessel 2006). An important element he identifies is the act of improvisatory 'babbling', named after the exploratory process of vocal experimentation in infant speech development, through which we learn to connect sounds with distinct physical processes. Then, as we learn to identify reoccurring actions and reactions, causes and effects, we develop the ability to shift into an 'intending' mode of interaction with our vocal system.

Joel Chadabe often expressed a similar contextual approach to performing with interactive systems, which he likened to 'sailing on a stormy sea', where the sailors have to adapt, learning to achieve balance in order to steer the ship as the wind and waves toss and turn around them.² Chadabe referred to the epistemic nature of interactive systems as 'intelligent instruments' (Chadabe 1984), or 'composed instruments' (Battier and Schnell 2002), where the system is designed in order to produce specific types of events, processes, algorithms – affordances and constraints that influence the ways performers interact with the system.

This collaborative perspective is an important principle in the practice of improvisation (Lewis 1999). As Derek Bailey writes, 'to speak of "mastering" the instrument in improvisation is misleading. The instrument is not just a tool but an ally'. (Bailey 1993: 99) Mirroring Whitehead's concept of prehension, a performer *grasps* the affordances of their instrument, learning to harmonise their actions with the inclinations of the tool/ally through enactive interaction, concreating to form a human–nonhuman symbiosis.

We are constantly interacting with the things around us: living, organic, inorganic, soft, rigid, dry, wet – intellectually, emotionally, physically and through a potentially infinite number of other comingled materials and modes of perception. As dynamic entities, we are in a perpetual process of exchange with the other things and

beings that form our environment. An ecology of actors inherently situates all of our actions (Suchman 1985) in a relational network of agencies (Latour 1987). As actors in an ecology of entities and tendencies, we are continually 'sailing the stormy seas' as Chadabe would say – adjusting and shifting balance to maintain stability, or conversely stirring dynamic change among the multiplicity of interwoven processes – at multiple scales, modalities and contexts, from molecular to complex technological, social, biological and cybernetic systems (Di Scipio 2003, 2024). Each system functions as an organism, an entity/occasion characterised by its vector of affordances, its 'desire' to move in one way or another.

An object of any form can be understood as expressive of its unique character and encoded with information (e.g., an instrument, puppet, scenography, software or even a simple piece of thread). Technical objects in particular are designed with an embedding of knowledge and contextual assumptions. Thor Magnusson writes about this epistemic nature of tools:

The objects around us – the technologies that serve as props in our thinking and music making – are stuffed with people and their ideas; in them we find programmes of action, manuals of behaviour, and political and socio-cultural constructions, including aesthetic tendencies. Technological objects are therefore never neutral, they contain scripts that we subscribe to or reject according to our ideological constitution. (Magnusson 2009: 170)

Thus, composing with intelligent systems involves a curation of entity processes interconnected to form an ecology exhibiting a particular behaviour. The non-neutrality of technical objects highlights the pronounced agency of our tools – entities that interact and collaborate with us, *mediating* our actions.

5. Mediation, collaboration, latency, fragmentation

We can think of mediation as an intermediary layer that situates an action: the context the action navigates (e.g., instrument, method, process, media) to produce a desired (or accidental) result. Mediation theory is a way of describing the agencies and relationships between entities in an ecosystem, forming into networks, or 'societies' in Whitehead's terminology, which produce an outcome through their collective interaction.

In the context of intermedia, there are three types of mediation which are particularly useful to consider: nodal (agential), temporal and representational.

Nodal, or *agential mediation*, is the most general form – the mediation of action through an intermediary process. The node is a way of describing the situatedness of each entity as an actor within a network of interconnected agent nodes. A mediating node is one that lies between two other nodes, translating an input action through its own internal process before outputting some other signal. The functional process within the node can be visible, but often is a 'black box' that hides its internal logic (Latour 1994). Agential mediation captures the agency of the node, determined by the epistemic and aesthetic directions embedded into its nature, its characteristic vector of positive and negative prehension. The influence of nodal agency reveals itself in various ways. For example, the affordances and constraints of a tool, the way the shape of a brush changes what types of textures and ways of moving the brush occur to the artist who holds it in their hand. Or the unique way the artist interprets the situation, based on the historical, social and aesthetic contexts that mediate their engagement with the work.

Agential mediation is particularly pronounced in mechanical and digital systems. For example, when we press the key of a piano or organ, the sound we hear is the product of a mechanically

¹From the Latin *in corpus*: into the body.

²This quote is from my memory in attending his courses in 2005–2007. I have found a citation for his 'sailing the stormy seas' metaphor in Chadabe, Joel. "The meaning of interaction, a public talk given at the workshop in interactive systems in performance (WISP)." *Proceedings of the 2005 HCSNet Conference*. 2005. However, I am unable to locate the text for confirmation.

decoupled action. In digital systems, this decoupling is even more extreme, where millions of switches perform abstracted operations – symbolic software logics controlling processes of processes of processes (Kittler 1995).

Temporal mediation describes several forms of *latency* that are encoded in intermedial experience. There is the physical latency of media traveling through space to reach us, followed by a perceptual latency of the eye moving across the image to take in the local and global forms – while in time-based media morphologies are perceived accumulatively over time. Temporal mediation also describes the latency of production. What we see when we encounter a completed painting is the result of a temporal process of actions, marking and layering over time, and the temporal gap between planning and realisation.

This mediating latency of production is a key challenge in all forms of art. In particular, the process of working with new tools creates a complication in the throughput of our interactions (e.g., in the use of software, digital instrument systems, computer vision algorithms and interfaces for puppet articulation). Until we have gained fluidity with the system through free experimentation – *babbling*, as Wessel would say – we are not able to fully realise (communicate) our intentions to a satisfying level. The creation process similarly requires coming to know the ecological system, to form a productive relationship with the tools and material – a symbiosis from which emerges a new synthesised entity.

Similarly, in works that require the design of new tools, there is often an oscillation throughout the duration of the creation process between modes of engagement – the most important poles being: a *top-down*, dramaturgical, macro experience of the piece/system as a whole, versus a *bottom-up*, micro, detail-oriented process of solving technical problems and low-level operations. When one mode outweighs the other, there is a risk of imbalance in the ecosystem, which may trigger an unintended formation.

For example, in artistic projects that require designing a new tool, the development of the tool may subtly begin to take priority over the original artistic intention that required it in the first place, resulting in a ‘demo aesthetic’. For example, spending weeks programming elegant solutions for new software features, to achieve ‘maximum flexibility and possibilities’, while forgetting (neglecting) that it *also* takes time to learn the affordances of the instrument, and to compose for it intelligently. Like many, I learned this the hard way. Abstraction from the top-down angle results in a different type of imbalance, for example, cases where artists have very clear conceptual ideas for the meaning of their work but have not spent the time necessary to find effective expressive means for their ideas, which results in a kind of overloading of intention that fails to communicate. Both are examples of what Whitehead refers to as a ‘misplaced concreteness’ that situates thought in a ‘simple location’ without connecting it to the multiplicity of the ecological whole (Whitehead 1929: 72; Stengers 2014: 83).

Representational mediation is a translation of form through a methodology that mediates presence through abstraction. In the visual arts, the development of linear perspective established a mathematical basis for representing form and projection of light in a homogeneous *perspectiva artificialis* (Panofsky 2012), where illusions of three-dimensionality could be systematically represented on a two-dimensional surface. Photographic techniques of capturing spatial scenes through a fixed-point perspective onto a photosensitive substrate is a mechanical example of representational mediation. The later development of moving image

techniques created the possibility for the representation of spatial action over time.

Up until the twentieth century, the medium of sound in the Western art context was predominantly focused on tonal and rhythmic structures. While this perhaps could be said to represent movement, dance or other abstract processes, tonal music is generally considered a non-representational medium, experienced through various social contexts, sensory perception, analytical and emotive feeling (Clarke 2005). With the advent of recording technologies, the ability to work with concrete, real-world sounds transformed the relationship between sound and representation.³ Like photography, sound recording is an electromechanical technology that mediates the representation of a spatial event. The microphone measures sound pressure waves in the original physical context which is recorded on a substrate (wax, tape, hard drive, etc.) and can then be played back as sound pressure waves via a loudspeaker. Paralleling the development of linear perspective in visual art, sound synthesis technologies created the possibility to render virtual sound scenes utilising techniques of psychoacoustics-informed signal processing, e.g. spatialisation, room impulse responses, artificial reverberation (Barrett 2002, 2021).

In both auditory and visual methods of representation, the physical world is quantified into isolated sensory streams of information, a useful method for analysis and synthetic creation. This analytical isolation is also traceable in the way the specialisation of discourse and techniques in various media has led to a branching of isolated disciplinary kingdoms. From the perspective of intermedial practice, we can observe that the process of analytical isolation, as in temporal mediation, creates the potential for a ‘misplaced concreteness’ between the senses – resulting in unbalanced, fragmentary combinations, where one modality or technique obscures the others. What methods and approaches might help us begin to re-entangle these streams into a living transdisciplinary intermedia? What is intermedial experience?

6. Multimodality, sensory integration, intermedial creatures

The singing bird and the ‘material’ birds are no longer split into two. (Latour 2005: 6)

Walking down the sidewalk thinking about the nature of sensory streams and intermedia, I pick up a leaf and look down at it, wondering, *what does this sound like?* I lean in to listen. All I hear is the sound of cars, bicycles, wind in the branches and far away voices. *Of course*, I think to myself, *it has to be activated*. I rub my finger along the surface of the leaf and hear the particles of my winter gloves gently scrape against the structure of the leaf’s surface. I press harder, and suddenly the leaf releases a crunching sound as it begins to break apart, partly dried from the cold weather.

I look up from the leaf and around at the sounding scene around me: everything I see has the possibility of making sound, everything physical has the affordance of movement, of being picked up and bowed against another surface, hit with a stick, blown with air. And at the same time, I *see* these objects, comprised of microscopic intermedial entities, prehensing vectors of sensory information, concreting into assemblages of experience.

³For example, the theoretical and artistic works of Luigi Russolo (1913), John Cage (1961), Pierre Schaeffer (1966), R. Murray Schafer (1994), Denis Smalley (1997), Michel Chion (1983) and many others.

In this way, all physical objects are inherently multimodal, sonic (when activated), visual (when illuminated), haptic, olfactory and *affective* as Whitehead emphasises. This is perhaps the simplest natural expression of intermedia. The ultimate anti-illusionary ‘non-art reality’ described in the Fluxus Manifesto (Maciunas 1963) is the physical world, where modes of experience are naturally ‘fused’, synthesised as one indivisible expressive entity.

The illusion of medial separation is created by conceptual abstraction and the specialisation of our technical methods – powerful means for working in a specific modality, yet, from an intermedial perspective quickly slips into a fallacy of ‘misplaced concreteness’, pulling the ecosystem out of balance. But when we focus on one node of the sensory network, we are not breaking its intermedial nature, not slicing – we are *weighting that node*, emphasising it. The network’s centre of gravity shifts to that node, the point of focus, but we cannot truly isolate a single sense.

[I]n reality rendering involves perceptions that belong to no sensory channel in particular. [...] In fact, most of our sensory experiences consist of these clumps of agglomerated sensations. (Chion 1994: 122)

When we close our eyes, we still receive visual sensory data, a residue of lights fading slowly into darkness with some kind of granular pattern. When we plug our ears with our fingers, we hear the sound of our fingers in our ears. The full system is still engaged, but these alterations create a negative weighting, blocking outside signals, which changes the way we balance our sensory parsing, emphasising senses with the most salient information.

At a museum of visual art, the customary focus is the content, the artworks on the walls, but we are still there, present in the space physically, and still engaging with our full modal spectrum. The architecture, lighting, acoustics, temperature, our personal interests, curation, spatial and social configurations all have an impact on our experience (Krauss 1979; Bishop 2012). Similarly, at a concert we focus on listening; however, we still *see*. What do we see at an acousmatic concert? Usually a concert hall, an array of speakers, an illuminated exit sign and a person sitting at a computer, a mixing desk, potentially moving sliders or pressing a spacebar. Often they are behind you, so you have to turn your head to see them. As in the art museum, the socio-spatial context situates the experience.

Memory also plays an important role in multisensory integration, for example, watching and listening to traffic outside the window, we can close our eyes and continue to track the sound of cars we saw a moment ago. Similarly, if we plug our ears we can imagine the sound of the cars continuing in our imaginations.

While modern video recorders typically capture audio and video as synchronised sensor data, cinema and acousmatic practices still work heavily with divided sensory layers. In the *musique concrète* tradition, reduced listening focuses on the morphology of sound as a disembodied object, abstracted from its causal origin (Smalley 1997; Kane 2007; Thoresen 2007). Film production relies on a full isolation of visual and auditory streams, which are merged in the final experience of synchronised presentation (Chion 1994). Both practices work deeply with questions of semantic connection and abstracted form.

Early twentieth-century filmmakers like Eisenstein and Pudovkin critically examined the synchronisation of sound and image. Drawing on perceptual theories of Vygotsky and Luria, Eisenstein identified the problem of synchronised dialog as obscuring the perception of the ‘inner speech’ of a character on screen, silently intuited in the audience’s mind, as compared to the direct ‘outer speech’ of synchronised sound, which creates realistic soundscapes and vocal embodiment but produces a less active

engagement of the audience’s imagination (Burke 2007; Olenina 2021).

Heiner Goebbels similarly discusses a ‘theatre of absence’ which leaves space for the imagination of the audience, by intentionally removing aspects of the scene (sound, images, characters, settings) in order to produce an active creation in the viewer.

[W]hen nothing is being shown, then the spectators must discover things themselves. [...] a ‘theatre of absence’ might be able to offer an artistic experience that does not necessarily have to consist in a direct encounter (with the actor), but in an experience through alterity. Alterity is to be understood here not as a direct connection to something, but as an indirect and triangular relationship whereby dramatic identification is being replaced by a rather precarious confrontation with a mediating third party, something we might call the ‘other’. (Goebbels 2015: 5–6)

The shifting of emphasis in a network to a specific node – or as in ‘absence’, an extreme *reduction* of nodal weight – creates an active counterbalancing where we instinctively work to fill in the gaps by imagining the missing elements, or subtly repurposing other existing elements in substitution.

In the early stages of development, the latency of artistic practice also produces an *absence of the work itself*. I have found that one of the most clarifying methods in my practice is to sit in (or study images of) the space where the work will be performed and imagine what will happen, visualising being in the audience and experiencing the work. By connecting to the future ecosystem of the piece, visualisation activates the prehensions of context, the affordances and constraints of the situation, the details spontaneously condescend into life – as if the work is there, drawing itself into existence.

7. Resemblance, prehensions

Material-theatre-based composition is a practice of forming linkages between materials and actions to create coherent intermedial creatures. As in human experience, attributes about the creature are absorbed as sensory and contextual data, which fuse together, synthesising into a perception of the entity/occasion as a unified whole. Towards the development (or discovery) of intermedial creatures, we can think of the process of condescence through positive prehension as a syntax which binds material together, reinforcing the character of the entity through a resonant semblance between the materials.

In *The Order of Things* (1970), Michel Foucault details how until the end of the sixteenth century, knowledge was based on a similar principle of ‘resemblance’ which aimed to read the world through locating correspondences.

To search for a meaning is to bring to light a resemblance. To search for the law governing signs is to discover the things that are alike. The grammar of beings is an exegesis of these things. And what the language they speak has to tell us is quite simply what the syntax is that binds them together. The nature of things, their coexistence, the way in which they are linked together and communicate is nothing other than their resemblance. [...] Everything would be manifest and immediately knowable if the hermeneutics of resemblance and the semiology of signatures coincided without the slightest parallax. (Foucault 2005: 33)

Foucault goes on to describe how at the beginning of the seventeenth century, Descartes led a critique against resemblance as a ‘confused mixture’, emphasising instead that knowledge should be based on quantitative analysis in terms of ‘identity, difference, measurement and order’ (Foucault 2005: 58). However, the experiential epistemology of resemblance did not fully disappear, but became obscured, for example in poetry, subverting the Cartesian

revolution as an ‘allusive [...] living being of language’ (Foucault 2005: 48). Thus, with our focus on living beings of intermedia, the methodology of resemblance provides a useful vocabulary for studying qualitative correspondences between materials.

Foucault identifies four main modes of resemblance: (1) *convenientia* (convenience), a direct connection in space, proximity, conjunction; (2) *aemulatio* (emulation), like ‘convenience’ but at a distance, a mirroring, the reflection of the moon in water, birds calling to each other from afar, imitation without connection; (3) *analogy*, a resemblance of character, or essence, a metaphor, with maximum flexibility and room for subtlety in its definition; (4) *sympathy*, a kind of attraction or affordance that draws things together into a symbiosis, ‘assimilating’ the other (Foucault 2005: 26) as in positive prehension. Like Whitehead, Foucault adds an additional negative prehension of *antipathy*, which ‘maintains the isolation of things’ (Foucault 2005: 27). Foucault uses the term *signature*, to name the underlying connective thread deciphered through resemblances.

Whitehead reminds us that this ‘signature’ is not a static object but a ‘nexus’ or ‘society’ of entities/occasions. He defines ‘nexus’ as a set of entities that create a sense of a unity through a ‘relatedness’ emerging through ‘their prehensions of each other’ (1978: 24). A ‘society’ is defined as a ‘self-sustaining’ nexus of entities characterised by a principle of ‘order’ (1978: 89). As in the epistemology of resemblance, Whitehead emphasises that, a society of entities is more than a simple grouping by type or mathematical order, rather the entities in a society are alike due to their ‘common character’ (ibid.), which we might read as signature of resemblance. Like the vector of relational modes in prehension (emotion, purpose, valuation and causation), resemblances can also be thought of as a vector of different types of relation used to describe a layered multiplicity of correspondences.

From a practitioner perspective, the epistemology of resemblance functions as a qualitative method of producing knowledge through experiential, embodied engagement and interpretation – closely paralleling methodologies of artistic research (Mersch 2015). In addition to psychoacoustics-based gestalt grouping principles, for example, auditory stream segregation (Bregman 1984) and spectromorphology (Smalley 1997), we can draw on the methodology of resemblance to identify modes of linkage between materials that might synthesise into coherent multimodal entities – Whiteheadian societies of entities/occasions acting collectively as *creatures* of intermedial orchestration.

8. Nexus orchestration, palettes of societies

‘To orchestrate is to create, and this is something which cannot be taught’. Rimsky-Korsakov’s famous phrase (1912) gestures towards the inherently experiential, embodied nature of artistic knowledge. This is equally true in the practice of ecological, ‘scenographic composition’. What produces an experience of synthesis or creature-like unity in intermedial orchestration? There is no one-size-fits-all equation.

Classical orchestration manuals illustrate methods for blending, contrasting, highlighting, reinforcing macro articulations of gesture, but as Rimsky-Korsakov points out, these techniques do not teach ‘the art of poetic orchestration’. I would suggest that this poetic sensitivity is rather a product of entering into a collaborative relationship with the materials – to ask, *where does the material lead?*

The vocabulary of resemblance can help to interpret and articulate the relationships between entities – ideas, media, processes – by describing the modes of counterpoint, imitation,

resonances, entrainments between materials integrated in ‘trans-modal perception’ (Smalley 2007).

The principles of connection (*convenientia*) and emulation (*aemulatio*) are the most directly related to traditional music theory and gestalt principles of onset synchrony and semblant motion (Huron 1989) – a description of correspondences between voices in musical time and pitch space.

In composing for human performers, objects and scenographic scenarios, I often focus on the resemblance between sound and gesture as a unified spatial form, through what I have referred to as ‘tactile listening’, a kind of haptic-synaesthesia or *feeling* of sound texture (Gottfried 2024). This mode of listening emphasises the resemblances between physical spatial articulations and the inherent spatial-contrapuntal properties of the sound. While I think I have always listened in this way, I began formally developing the idea in the context of 3D audio research, where I found there was an increased sense of embodiment of the spatial experience when I linked the textural aspects of sound with similar textures of spatial articulation (Carpentier et al. 2016; Gottfried 2012). This grouping of sound and spatial texture is a kind of resemblance by imitative *emulation*, which seems closely related to the ‘kiki-bouba effect’ (Alper and Averbuch-Elor 2023), a phenomenon of ‘sound symbolism’ in which qualitative associations have been shown to be widely consistent in cross-modal groupings of objects into groups of *kiki* (sharp, pointy, rough, short, acidic, dissonant things) and *bouba* (rounded, smooth, legato, consonant things).

Strategies of grouping in this way can help form a multidimensional nexus of material. Just as a flute tone will form a *connective* resemblance with cello harmonics due to their similar spectromorphology, a rapidly changing spatialisation approach might correspond well with fast enveloped granular synthesis due to an *emulation* between the speed or spatial movement and duration of the grains. Through the integration of different ‘societies’ of events, we can create a palette, or qualitative map of entities who share corresponding characteristics within a multidimensional feature space of resemblance (Wessel 1979; Huron 1989).

In an ecological system, each creature ‘harmonises’ in its own way with the environment (Clarke 2005). This harmonising can be thought of as a kind of sympathetic vibration, an entrainment of actions that bend and follow other actions in a causal chain – as in the physical processes of instrumental performance. Recalling our discussion of multimodal perception, we might consider the experience of a leaf being crushed by our fingers as a physical vector of *sympathies* and *antipathies*, actions and reactions joined in a society of events: the haptic pressing, the visual image, the pressure of sound waves moving to our ears. In the highly mediated audio-visual context of cinema, we can similarly view the representational practice of Foley to be a process of *sympathetic* resemblance, linking a visual action with an artificially created sound which could have been physically produced by the object on screen.

And finally, the resemblance of *analogy* is perhaps the most poetic, which like a metaphor, can be evocative and multidirectional – activating connections and meanings uncovered through interpretation. This allegorical, poetic process is the *why* that guides compositional decisions.

9. Conclusion, praxis, animism

Once aware of this language in space, language of sounds, cries, lights, onomatopoeia, the theater must organize it into veritable hieroglyphs, with the help of characters and objects, and make use of their symbolism and interconnections in relation to all organs and on all levels. (Artaud 1958: 90)

It vibrates! In other words, it's like nailing down a butterfly but the damn thing is still moving around. And this seems to be the whole act of art anyway, to nail it down for a minute but not kill it. (Guston 2022: 141)

Zooming out we can view how the ideas we have been exploring interconnect. Whitehead's 'philosophy of the organism' centres on a concept of the entity/occasion as a temporal process. The entity/occasion is an organic or inorganic creature whose vector of 'desires' drive it to incorporate with, or reject other entities, 'feeling' them through prehension. Thus, by following its own nature the entity is in a constant state of becoming, or concrescence. This process of feeling and forming connection between things speaks directly to intermedial composition and performance praxis which functions similarly by bringing materials into dialog.

Wessel's theory of enactive instrument design mirrors this perspective as an embodied relational practice, centring on the process of learning through interaction and collaboration with intelligent systems, using improvisation and memory as methods to map and navigate a system's affordances and constraints. The creative interaction with tools, thus, situates action and agency within a larger relational network of nodes as an interconnected ecology.

In the study of nodal agency, instruments can be thought of as mediating tools, which inject their own agency between an action and its result. Examining mediation as an intermediary gap between cause and effect, concept and execution, we see how technologies of representation are powerful means to render spatial experience but tend to isolate the senses through analytical methods. The mediating latency of production similarly challenges the unified perception of the intermedial whole through the lag of creation, which often requires focus on isolated modalities and disciplines.

Yet the fundamental experience of the world is multimodal. Returning to concrescence, we identify a parallel in the way the multiplicity of sensory information is fused into an intermedial unity as it continually becomes itself through prehension, a process of relational linkages. The formation of intermedial creatures in artistic practice can similarly be conceived as a product of linkage between materials across different media following the pattern of relational gravities in prehension, which concreate into a unified entity. In addition to traditional gestalt principles of grouping, Foucault's discussion of resemblance as an epistemic method offers a useful vocabulary to describe types of relation and linkage, which can be applied as an intermedial, 'nexus' approach to orchestration.

The practice of forming relational linkages in intermedial art practice shifts the focus from single author works towards collaborations between humans and nonhuman entities – a form of animism, based on collective experiential sensitivity, recognising and working with the sense of living character and presence in the materials.

Looking to systems of life as a model for artistic processes is an ancient tradition. In the Romantic era of the nineteenth century, it became particularly important in musical discourse and provided a way to think about motivic and formal structure, often drawing on botanical models (Solie 1980). In the modern era, the 'organicism' view has been lauded and venomously critiqued and recently has gained renewed relevance as a basis for post-human, non-anthropocentric perspectives in music (Watkins 2017, 2024; Li 2023; Blinkhorn and McConaghy 2024; Schorpp and Galliker 2024). In the practice of sound-based material theatre, the focus on the nonhuman is even more pronounced, where the work focuses on the development of intermedial ecosystems, creatures and environments.

In contrast to historical artistic referencing of life processes as objective models for form and content, I think of the creation of intermedial creatures as an embodied relational practice, which embraces the situatedness of the artist within a complex ecosystem of material where conceptual and social processes are inclusive and navigated rather than controlled. Due to the profoundly contextual nature of this understanding of material, there can be no generalised set of rules deciding which elements will link together or not – but rather, as in all artistic practice, these are subjective decisions, driven by a sensitivity to the desires of the entities/occasions that comprise the work, including the composer themselves.

The theoretical framework developed in this article is an assemblage of linkages between ideas from thinkers whose writings resonate with my experience as a practitioner. My practice centres on an ever-evolving form of 'nonhuman theatre', 'scenographic composition' or 'sound-based material theatre' – a transdisciplinary synthesis of composition, signal processing, instrument design, installation, dance, performance art, live-cinema, scenography, puppetry and material theatre – that explores this ecological approach to intermedial creatures, and the dramaturgies that emerge from this context.

The practice of puppetry can teach us many things about intermedial creatures – a fusion of modalities, presence and technical mediation that communicates a sense of life. As in a digital physical model, puppeteers work to create a resemblance of reality, emphasising subtle cues of mass, artificial gestures of gravity that imply a sense of weight; the constant, slight movements that signal evidence of life; the voices and concrete sounds of movement.

Extending the practice of puppetry through the use of real-time motion analysis to control sound synthesis creates a tightly coupled nexus of materials that fuses in the moment of performance through a concrescence shaped by resemblances. For example, drawing on biological processes, multiple threads of mappings between analyses of visual motion and morphologies can be linked to layers of sound synthesis, used to represent different biosystems (respiratory, circulatory, nervous), through *analogous* 'inner speech', *sympathetic* foley and the *emulation* of 'outer speech' in sound-image synchronisation (Burke 2007).

Like an unused puppet, media is dead on the disc but springs to life as soon as the renderer begins playback. This oscillation between the life of the piece and technical work requires a sensitive balance – challenging the artist to maintain connection with the ecosystem in multiple roles simultaneously: programmer, performer, composer, sculptor, puppeteer, audience member, dramaturg, *ad infinitum*. In particular, the amount of time required for programming and tool development can easily tip the balance into a 'demo aesthetic' where the *how* of the technical means obscures the *what* and *why* of the piece.

By thinking of instruments, software, loudspeakers, objects, places, shadows, landscapes and relationships as *performers* and *entities*, we instinctually make room for their agency, allowing them to breathe and giving weight to their contributions.

A 'nexus' approach to intermedial orchestration can be thought of as a process of directing, suggesting and *encouraging* entities, human and nonhuman performers, into joined flows of 'societies' – streams of multilayered depths and contrasting textures. In all cases, the performers bring their own personalities into the concrescence, the ever-becoming synthesis of the transdisciplinary event – an organism of media that lives and communicates with us through prehension in a language of resemblances – continuity, emulation, analogy and sympathy.

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References

- Alper, M. and Averbuch-Elor, H. 2023. Kiki or Bouba? Sound Symbolism in Vision-and-Language Models. *Advances in Neural Information Processing Systems* 36: 78347–59. <https://doi.org/10.48550/arXiv.2310.16781>.
- Artaud, A. 1958. *The Theater and its Double*. New York: Grove Press.
- Bailey, D. 1993. *Improvisation: Its Nature and Practice in Music*. New York: Da Capo Press.
- Barrett, N. 2002. Spatio-Musical Composition Strategies. *Organised Sound* 7(3): 313–23. <https://doi.org/10.1017/S1355771802003114>.
- Barrett, N. 2021. Spatial Music Composition. In J. Paterson and H. Lee (eds.) *3D Audio*. London/New York: Routledge, 175–91.
- Battier, M. and Schnell, N. 2002. Introducing composed instruments, technical and musicological implications. Proceedings of the 2002 *Conference on New Interfaces for Musical Expression*. Dublin: NIME.
- Bennett, J. 2010. *Vibrant Matter: A Political Ecology of Things*. Durham/London: Duke University Press.
- Bishop, C. 2012. *Artificial Hells: Participatory Art and the Politics of Spectatorship*. London: Verso Books.
- Blinkhorn, D. and McConaghy, N. 2024. Biomimicry in Electroacoustic Composition: Conceptual Frameworks and Prototypes. *Organised Sound* 29(3): 254–61. <https://doi.org/10.1017/S1355771824000281>.
- Bregman, A. S. 1984. *Auditory Scene Analysis: The Perceptual Organization of Sound*. Cambridge, MA: MIT Press.
- Burke, M. 2007. Eisenstein and the Challenge of Sound. *Kinema: A Journal for Film and Audiovisual Media* Fall: 1–6. <https://doi.org/10.15353/kinema.vi.1152>.
- Cage, J. 1961. *Silence*. Middletown, CT: Wesleyan University Press.
- Carpentier, T., Barrett, N., Gottfried, R. and Noisternig, M. 2016. Holophonic Sound in IRCAM's Concert Hall: Technological and Aesthetic Practices. *Computer Music Journal* 40(4): 14–34. https://doi.org/10.1162/COMJ_a_00383.
- Chadabe, J. 1984. Interactive Composing: An Overview. *Computer Music Journal* 8(1): 22–7.
- Chion, M. 1983. *Guide des objets sonores: Pierre Schaeffer et la recherche musicale*. Paris: INA/Buchet-Chastel.
- Chion, M. 1994. *Audio-Vision: Sound on Screen*. New York: Columbia University Press.
- Ciciliani, M. 2017. Music in the Expanded Field: On Recent Approaches to Interdisciplinary Composition. *Darmstädter Beiträge zur Neuen Musik* 24: 23–35.
- Clarke, E. F. 2005. *Ways of Listening: An Ecological Approach to the Perception of Musical Meaning*. New York: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780195151947.001.0001>.
- Craig, E. G. 1908. The Actor and the Über-Marionette. *The Mask* 1(2): 3–15.
- Devenish, L. 2021. Instrumental Infrastructure, Instrumental Sculpture and Instrumental Scores: A Post-Instrumental Practice. *Music and Practice* 9: 1–17. <https://doi.org/10.32063/0906>.
- Di Scipio, A. 2003. 'Sound is the Interface': From Interactive to Ecosystemic Signal Processing. *Organised Sound* 8(3): 269–77. <https://doi.org/10.1017/S1355771803000244>.
- Di Scipio, A. 2024. Live Electronics as Posthuman Performance Practice. In G. Toro Pérez, L. Bennett and J.P. Hiekel (eds.) *Performing Live Electronic Music*. Berlin: Wolke, 63–106.
- Foucault, M. 2005. *The Order of Things: An archaeology of the Human Sciences*. London/New York: Routledge.
- Gibson, J. J. 2015. *The Ecological Approach to Visual Perception: Classic Edition*. Hove, East Sussex: Psychology Press.
- Goebbels, H. 2015. *Aesthetics of Absence: Texts on Theatre*. London/New York: Routledge.
- Gottfried, R. 2012. Studies on the Compositional Use of Space: Ircam Composer in Research Report <http://articles.ircam.fr/textes/Gottfried13a/index.pdf> (accessed 15 January 2026).
- Gottfried, R. 2024. Animism and Digital Expression: Thinking Through Human-Object Relations in (Post-)Instrumental Performance Practice. In G. Toro Pérez, L. Bennett and J.P. Hiekel (eds.) *Performing Live Electronic Music*. Berlin: Wolke, 107–35.
- Grazioli, C. 2009. World Encyclopedia of Puppetry Arts: Theatre of Objects. <https://wepa.unima.org/en/theatre-of-objects/> (accessed 15 January 2026).
- Guston, P. 2022. *I Paint What I Want to See*. London: Penguin.
- Haraway, D. 2016. *Staying with the Trouble: Making Kin in the Chthulucene*. Durham, NC: Duke University Press. <https://doi.org/10.1215/9780822373780>.
- Higgins, D. 1967. *Statement on Intermedia*. *Dé-Coll/Age (Décollage)* 6. New York: Something Else Press.
- Higgins, D. and Higgins, H. 2001. Intermedia. *Leonardo* 34(1): 49–54. <https://doi.org/10.1162/002409401300052514>.
- Huron, D. 1989. Characterizing Musical Textures. Proceedings of the 1989 International Computer Music Conference. San Francisco: CMA, 131–4.
- Kane, B. 2007. L'Objet Sonore Maintenant: Pierre Schaeffer, Sound Objects and the Phenomenological Reduction. *Organised Sound* 12(1): 15–24. <https://doi.org/10.1017/S135577180700163X>.
- Kittler, F. 1995. There is No Software. *CTheory: Theory, Technology, Culture* 32. https://web.archive.org/web/20000425050458/http://www.ctheory.com/a32-no_software.html (accessed 19 June 2026).
- Krauss, R. 1979. Sculpture in the Expanded Field. *October* 8: 30–44. <https://doi.org/10.2307/778224>.
- Latour, B. 1987. *Science in Action: How to Follow Scientists and Engineers Through Society*. Cambridge, MA: Harvard University Press.
- Latour, B. 1994. On Technical Mediation. *Common Knowledge* 3(2): 29–64.
- Latour, B. 2005. What is Given in Experience? A Review of Isabelle Stengers 'Penser avec Whitehead' *Boundary 2*. 32(1): 222–37.
- Leman, M. 2007. *Embodied Music Cognition and Mediation Technology*. Cambridge, MA: The MIT Press. <https://doi.org/10.7551/mitpress/7476.001.0001>.
- Lewis, G. E. 1999. Interacting with Latter-Day Musical Automata. *Contemporary Music Review*. 18(3): 99–112. <https://doi.org/10.1080/07494469900640381>.
- Li, M. 2023. Reimagining Organicism: An Ecological Aesthetics of Music and Self-Organizing Structures in the Works of Salvatore Sciarrino. *Music Theory Online* 29(4): 1–24. <https://doi.org/10.30535/mt.29.4.8>.
- Maciunas, G. 1963. Fluxus Manifesto. Offset lithograph distributed during the Festum Fluxorum Fluxus in Düsseldorf. <https://www.moma.org/collection/works/127947> (accessed 15 January 2026).
- Magnusson, T. 2009. Of Epistemic Tools: Musical Instruments as Cognitive Extensions. *Organised Sound* 14(2): 168–76. <https://doi.org/10.1017/S1355771809000272>.
- McLuhan, M. 2002. *Understanding media: The Extensions of Man*. Cambridge, MA: MIT Press.
- Mersch, D. 2015. *Epistemologies of Aesthetics*. Zurich/Berlin: Diaphanes.
- Morton, T. 2017. *Humankind: Solidarity with Nonhuman People*. London: Verso Books.
- Morton, T. 2018. *Being Ecological*. London: Pelican.
- O'Shea, B. and Segall, M. 2022. Process & Reality: Alfred North Whitehead, Process Philosophy, and Organic Realism. *Rev Left Radio*. <https://revolutionaryleftradio.libsyn.com/whitehead> (accessed 15 January 2026).
- O'Shea, B. and Segall, M. 2023. Crossing the Threshold: The Post-Kantian Process Philosophy of Schelling and Whitehead. *Rev Left Radio*. <https://revolutionaryleftradio.libsyn.com/crossing-the-threshold> (accessed 15 January 2026).
- Olenina, A. H. 2021. Sergei Eisenstein, Neurocinematics, and Embodied Cognition: A Reassessment. *Discourse* 43(3): 351–82. <https://doi.org/10.13110/discourse.43.3.0351>.
- Panofsky, E. 2012. *Perspective as a Symbolic Form*. New York: Zone Books.
- Rimsky-Korsakov, N. 1912. *Principles of Orchestration: With Musical Examples Drawn from his Own Works*. New York: Kalmus.
- Russolo, L. 1913. *The Art of Noises: Futurist Manifesto*. Milan, Italy: Governing Group of the Futurist Movement. <https://www.loc.gov/item/2021667112/> (accessed 15 January 2026).

- Schaeffer, P.** 1966. *Traité des objets musicaux: essai interdisciplines*. Paris: Éditions du Seuil.
- Schafer, R. M.** 1994. *The Soundscape: Our Sonic Environment and the Tuning of the World*. Rochester, VT: Destiny Books.
- Schorpp, E. and Galliker, M.** 2024. Other-than-Human Perspectives on *Écosystème(s)*: Towards an Ecosemiatic Approach to Sound and Media Art. *Organised Sound* 29(3): 303–14. <https://doi.org/10.1017/S135577182400030X>.
- Smalley, D.** 1997. Spectromorphology: Explaining Sound-Shapes. *Organised Sound* 2(2): 107–26. <https://doi.org/10.1017/S1355771897009059>.
- Smalley, D.** 2007. Space-form and the Acousmatic Image. *Organised Sound* 12(1): 35–58. <https://doi.org/10.1017/S1355771807001665>.
- Solie, R. A.** 1980. The Living Work: Organicism and Musical Analysis. *Nineteenth-Century Music* 4(2): 147–56. <https://doi.org/10.2307/746712>.
- Stene, H.** 2016. 'This is not a drum'. Towards a Post-Instrumental Practice. <https://www.hakonstene.net/project/artistic-research-not-drum-towards-post-instrumental-practice> (accessed 15 January 2026).
- Stengers, I.** 2012. Reclaiming Animism. *E-Flux Journal* 36: 1–9. <https://www.e-flux.com/journal/36/61245/reclaiming-animism> (accessed 15 January 2026).
- Stengers, I.** 2014. *Thinking with Whitehead: A Free and Wild Creation of Concepts*. Cambridge, MA: Harvard University Press.
- Stengers, I.** 2023. *Making Sense in Common: A Reading of Whitehead in Times of Collapse*. Minneapolis, MN: University of Minnesota Press.
- Suchman, L. A.** 1985. *Plans and Situated Actions: The Problem of Human-Machine Communication*. Palo Alto, CA: Xerox Corporation.
- Thoresen, L.** 2007. Spectromorphological Analysis of Sound Objects: An Adaptation of Pierre Schaeffer's Typomorphology. *Organised Sound* 12(2): 129–41. <https://doi.org/10.1017/S1355771807001793>.
- Varela, F., Rosch, E. and Thomson, E.** 1991. *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge, MA: The MIT Press.
- Watkins, H.** 2017. Toward a Post-Humanist Organicism. *Nineteenth-Century Music Review* 14(1): 93–114. <https://doi.org/10.1017/S1479409816000306>.
- Watkins, H.** 2024. *Musical Vitalities: Ventures in a Biotic Aesthetics of Music*. Chicago: University of Chicago Press.
- Wessel, D.** 1979. Timbre Space as a Musical Control Structure. *Computer Music Journal* 3(2): 45–52.
- Wessel, D.** 2006. An Enactive Approach to Computer Music Performance. In Y. Orlarey (ed.) *Le Feedback Dans La Creation Musical*. Lyon: Studio Grame, 93–98.
- Whitehead, A. N.** 1929. *Science and the Modern World: Lowell lectures, 1925*. London: Cambridge University Press.
- Whitehead, A. N.** 1978. *Process and Reality: An Essay in Cosmology*. Gifford Lectures Delivered in the University of Edinburgh During the Session 1927–28. New York: Free Press.