Performative transactions: worlding compositional ecosystems

Lukawski, A.

Chapter 4. Artists Worlding Ecosystems

Cybernetics and Systems Aesthetics

The system-building impulse in art discussed in the previous chapter aligns closely with the origins of cybernetics, a transdisciplinary field first defined by Norbert Wiener in 1948 as "the science of control and communication in the animal and the machine" (Wiener, 1948, 11). Emerging in the wake of World War II, cybernetics—pioneered by Norber Wiener and expanded by Ross Ashby—offered a radically new way of understanding systems—organic or technical—not by their material composition but by their patterns of behaviour, information exchange, and feedback. Rather than asking "What is this thing?", cybernetics asked, "What does it do?" (Ashby, 1956, 1). As Ross Ashby observes, it "deals with all forms of behaviour in so far as they are regular, or determinate, or reproducible" (1956, 1), but it also ventures into the domain of the possible. "Cybernetics envisages a set of possibilities much wider than the actual", Ashby wrote, "and then asks why the particular case should conform to its usual particular restriction" (3). Ashby's emphasis on "the possible" relates to his concept of variety—the number of possible states a system can occupy—and his Law of Requisite Variety (also known as Ashby's Law), which argues that controlling a system requires matching its complexity, in other words that a system can only effectively control or regulate another system if its own internal variety (or complexity) is at least as great as the variety of the system it is trying to control (1956, 206).

Ashby emphasised that cybernetics took "as its subject-matter the domain of all possible machines", caring little whether those machines have actually been constructed "either by Man or by Nature" (1956, 2). Cybernetics thus proposed an ontological flattening between the biological, the artificial, and the social. As Ashby noted, it was expected "to reveal a great number of interesting and suggestive parallelisms between machine and brain and society", providing "the common language by which discoveries in one branch can readily be made use of in the others" (1956, 4). The significance of this epistemological bridging cannot be overstated: cybernetics was one of the first frameworks to treat cognition, organisation, and feedback as structurally isomorphic across domains, laying the groundwork for system-based thinking in everything from neuroscience and ecology to computation and aesthetics. Cybernetics also positioned itself as a science of complexity before that

term had become a defining keyword in the sciences or the arts. “Science today is taking the first steps towards studying ‘complexity’ as a subject in its own right”, Ashby wrote, adding: “Prominent among the methods for dealing with complexity is cybernetics” (1956, 5).

The influence of cybernetics on the arts began to take hold in the 1960s, particularly through the work of artists and theorists who reimagined art as a system of relations and behaviours rather than a static object. Among the most influential figures in this shift was Jack Burnham, whose 1968 essay “Systems Esthetics” proposed a new way of understanding art that foregrounded the systemic relationships between elements, participants, and environments. Burnham argued that the focus of advanced art was moving away from discrete, self-contained objects and toward systems that evolve over time, shaped by feedback, interaction, and contingency. In this view, the artwork becomes a dynamic field of operations—a structure for inquiry, not a finished artefact (Burnham, 1968). Parallel to Burnham’s theorisation, Roy Ascott was developing a cybernetic model of art practice grounded in feedback, participation, and behavioural transformation. His 1966 essay “Behaviourist Art and the Cybernetic Vision” outlined a framework in which art could be conceived as an open-ended process involving the continual adaptation of systems in response to environmental or human inputs. In works like *Change Painting* (1960–61) and later in his telematic projects, Ascott sought to construct artworks that were fundamentally recursive and performative—defined not by their form but by their capacity to change and be changed. His use of cybernetics was not just metaphorical; it guided the operational logic of his artistic practice, embedding the principles of feedback, adaptation, and transformation into the core of the work (Ascott, 2002). Together, Burnham and Ascott exemplify a moment when cybernetics became a methodological and conceptual resource for artists seeking to build responsive, generative systems—an artistic practice no longer centred on form, medium, or content, but on interaction and the design of relational environments.

Complexity Theory and Second-Order Cybernetics

If system-building reshapes the identity of the artwork around process and generativity, then complexity theory offers a framework for evaluating how these systems behave—particularly in terms of their informational structure and aesthetic

potential. As Philip Galanter argues, generative art is best approached through more than just the lens of medium or technology—it is a practice rooted in the conceptual domain of complexity theory (2003, 1). For Galanter, generative art operates across a continuum between random and fixed material, encompassing a vast historical scope from ancient instruments like the previously mentioned Aeolian harp to contemporary algorithmic systems. What unifies these practices is the use of systems capable of producing multiple outcomes—systems that "exhibit a mix of order and disorder" and thus align with the scientific definition of complexity (Galanter, 2003, 11).

One measure of such complexity is algorithmic complexity—sometimes called algorithmic information content. This measure asks how compressible a given system or signal is: the shorter the algorithm required to generate a given output, the simpler the system. A fractal, for instance, may appear intricate for its outcome, but its generative algorithm may be extremely compact. Conversely, a genuinely random signal resists compression, making its algorithmic description longer and thus apparently more complex—though in practice, it lacks meaningful structure (Galanter, 2003, 9). Here, complexity is not about surface richness or unpredictability alone, but about the relationship between structure and randomness. This is where Galanter introduces the notion of effective complexity, drawing on Murray Gell-Mann's distinction between trivial regularity and total randomness. Effective complexity aims to identify that middle ground: systems that contain enough structure to be meaningful, but enough variability to remain surprising (2003, 10). This has aesthetic implications. Music composed entirely of random notes or composed from a single repeated tone may both be considered as technically "simple" according to this measure, and neither holds sustained aesthetic interest. It is the interplay between order and unpredictability—between constraint and openness—that makes a system artistically generative according to effective complexity.

This observation resonates directly with the aesthetics of generative music and the design of performative systems. When creating a system meant to generate multiple iterations, the composer is calibrating the balance between regularity and deviation. In Galanter's terms, a generative system achieves effective complexity when it encodes a structure robust enough to persist across iterations, while still allowing sufficient variability for each outcome to feel novel. This aligns with Simondon's notion of an open machine, which retains a margin of indeterminacy as a condition of

its technical and creative evolution (2017, 17). Complexity theory helps distinguish between systems that generate variation and those that sustain artistic coherence across it. For the generative artist, the goal is to cultivate a fertile middle ground—structured enough to support coherence, yet open enough to allow for surprise. As Galanter notes, while complex systems may dominate contemporary attention, they are not "better" than simple systems. Both have their place in artistic practice, and the decision to work with one or the other reflects a deeper compositional stance toward form, openness, and structure (2003, 15). In the context of system-building, this complexity-sensitive lens becomes indispensable—not only for interpreting generative systems but for designing them.

Beyond first-order cybernetics, a broader understanding of complexity is further developed in second-order cybernetics, where systems are no longer treated as passive mechanisms observed from the outside, but as self-regulating, self-producing entities that include the observer as part of the system. Pioneered by thinkers such as Heinz von Foerster, Humberto Maturana, and Francisco Varela, second-order cybernetics introduced concepts like autopoiesis and operational closure to describe how systems generate their own identity through recursive interactions. While first-order cybernetics was foundational in modelling systems through feedback and control, it often did so by abstracting systems as trivial machines in von Foerster's later terminology—predictable devices with invariant input-output relations (von Foerster, H., 2003, 208). This abstraction enabled formal rigour but excluded the observer and structural change. Second-order cybernetics emerged in response, foregrounding non-trivial machines whose behaviour depends on internal states, history, and the inclusion of the observer in the system (208). In this framework, complexity is about the system's capacity to adapt, reconfigure, and respond to its own internal states. Crucially, these systems exhibit a kind of reflexive intelligence: they do not simply behave, they respond to how they behave.

Individuation and Allagmatics of Artistic Research

On the philosophical level, a parallel framework can be found in Gilbert Simondon's philosophy of individuation. Rather than viewing identity as a pre-given state or stable essence, Simondon conceives of being as a process—as a continuous becoming that never stops. Individuation, in this view, is the ongoing (and never finished)

resolution of tensions, where entities take shape through operations that continuously restructure the metastable operational field that these entities belong to. Structural identity is thus only a partial expression of a process—one that is always in flux, continuously unfolding through transduction: where each new local resolution changes the conditions for what comes next. For example, Yuk Hui—philosopher of technology—builds on this notion in the context of digital ontology, where HTML properties within a website's structure are best understood not as fixed representations or tools, but as "indexed relations"—material instantiations of relational aesthetics whose logic emerges through interaction (Hui, 2015, 6). The behaviour of such objects cannot be fully explained by their code alone; rather, it arises from the interplay of structural relations, contextual constraints, and feedback loops embedded in their design. For this reason, Hui contends that traditional logics of deduction (from truths to facts) or induction (from facts to truths) are inadequate to account for their operation. Instead, he proposes transduction as a more appropriate logic—one that accounts for transformation, rupture, and the invention of new consistencies (3–4). In this framework, systems are not defined by their fixed properties, but by their capacity to reorganise themselves while maintaining operational coherence.

While Simondon's philosophy of individuation is today widely read through the work of philosopher Gilles Deleuze—particularly in relation to assemblage theory—its relevance to systems thinking invites a different kind of reconstruction. Simondon was not writing from within the cybernetic tradition, nor responding to it directly. Rather, his work on individuation emerged in the early 1950s, contemporaneously with the development of first-order cybernetics by Wiener, Ashby, Shannon, and others. While cybernetics at that time focused on modelling behaviours, communication flows, and feedback mechanisms in organisms and machines, Simondon developed a philosophical ontology of becoming—one that asked how systems and structures come into being through operations immanent to metastable fields. It is within this ontological framework that Simondon proposed the notion of allagmatics, a general theory of operations. Whereas structuralism was concerned with fixed forms and stable configurations, allagmatics sought to understand how operations generate structure from within: how a system individuates itself through transduction, the process by which tensions are resolved through successive structural transformations. Though Simondon never developed a technical science of allagmatics, his philosophy provides the conceptual grounding for what such a theory

could be. In this sense, Simondon's thought can be seen as anticipating key concerns of second-order cybernetics, particularly the shift toward self-producing, reflexive systems that include the observer in the process of transformation.

This link between ontogenetic individuation and operational system-building has reemerged in more recent theoretical articulations of artistic research. Paulo de Assis, drawing on Simondon via Deleuze and Guattari, has proposed the notion of an "allagmatics of artistic research" (2018, 27)—a method that privileges process over form, transformation over representation, and individuation over interpretation. De Assis, when discussing his conceptualisation of musical works as assemblages, suggests that musical works can be conceived not only in terms of systemic, but also in terms of their epistemic complexity, which addresses how systems encode, transform, and generate knowledge over time. As he explains, drawing on the work of biologist Ladislav Kováč and philosopher Subrata Dasgupta, epistemic complexity refers to the richness of knowledge embedded within a technological or artistic artefact—its capacity to generate new knowledge, produce surprising behaviours, and evolve over time (de Assis, 2018, 125–126). In this sense, an artefact is an epistemic entity: a form of embodied understanding, a machine for thinking, and a bearer of invention. As Dasgupta notes, "in the case of true invention, when the artifactual form is original in some significant sense, the operational principles it encodes constitute genuinely new knowledge" (as cited in de Assis, 2018, 125). As de Assis argues, epistemically complex artefacts resemble living organisms in their ability to evolve, adapt, and participate in recursive cycles of transformation (125). They exhibit behaviours rather than simply delivering functions. Artists often engage with artefacts that already contain epistemic complexity: scores, sketches, performance traditions, instrument designs, historical recordings, or theoretical frameworks. These artefacts act as boundary objects whose epistemological status shifts depending on the context in which they are activated (de Assis, 2018, 126). A musical manuscript may function as an archive in one context, a springboard for reinterpretation in another, and a generative template in yet another. The most potent outputs of the artistic research in this understanding are artefacts that actively restructure their own epistemic lineage in the progress of research. "An experimental system becomes a machine for making the future", as de Assis puts it (2018, 28). In artistic research contexts, transduction describes the unfolding of new configurations—not by copying or programming outcomes, but by activating potentialities that emerge through recursive and self-reflexive operations of the artist.

Allagmatic Composition—Composing for Epistemic Complexity

By treating musical artefacts as epistemically complex entities, and performances as experimental systems that reconfigure those artefacts, Paulo de Assis effectively frames artistic research as a practice of creative problematisation. While he does not explicitly theorise this in terms of compositional ontology, his work nonetheless anticipates the possibility of a compositional mode grounded in the design of epistemically active systems. This doctoral research builds directly on this foundation by proposing a formalisation of that mode—what I call allagmatic composition. This distinction can be useful when discussing generative and system-based practices. While an artwork may be composed to be systemically complex—consisting of numerous modules, processes, and data interactions—its epistemic value lies in the originality and extensibility of its operational principles. In generative music, such knowledge is not always transparent or immediately legible; it becomes intelligible through interaction—through the system's capacity to produce outcomes not fully anticipated by its creator. To compose an epistemically complex generative music system might thus be understood not only as to compose a structure of interacting modules, but to enact a knowledge-generating machine—capable of reshaping the very aesthetic, technical, or philosophical contexts into which it is introduced. Here, the generative artist becomes not only a designer of systems, but a constructor of epistemic topologies: someone who maps and remaps relations between histories, operational principles, agents, and their emergent and responsive behaviours. As Simondon writes: "A structure is the result of a construction, and an operation is that which makes a structure appear, or that which modifies a structure" ([1954–58] 2013, as cited in de Assis, 2018, 27). The artwork, then, is not a static form nor even a set of generative procedures, but a metastable machine that continually transforms its own operational relations.

Allagmatic composition, then, is not a compositional style, but a compositional ontology. It defines music not as a sequence of notes or events, nor even as a product of a generative engine, but as a system that performs itself—a system whose mode of being lies in its becoming. Where generative systems may operate within fixed affordances, selecting and varying pre-defined materials, allagmatic systems are capable of transforming their own internal logic. They are machines that not only generate outputs, but modulate their own epistemic topologies of operation in the process of execution. This has far-reaching consequences for how we conceptualise

compositional authorship and agency. In allagmatic composition, the composer configures a space of generative epistemic relations—an assemblage of agential transformations whose internal dynamics give rise to novel individuations. Each execution of the system is a transductive event—an enactment of change that reconfigures not only the output, but the space of possibilities from which future outputs may arise. In allagmatic composition, the "work" is no longer a static object, but an ongoing process or a system that is capable of transforming itself. The composer's role shifts from a traditional author to a metadesigner of systems that can further model their own rules. The identity and existence of the composition are tied to its dynamic behaviour rather than to a fixed form.

This approach may, at first glance, appear to resemble what has been described in recent decades as interactive composition. As Artemi-Maria Gioti notes, interactive compositions typically involve a mutual real-time adaptation between human performers and interactive computer music systems, the design of which is often composition-specific and idiosyncratic (2021, 5). These systems are characterised by their ability to respond dynamically to external inputs, enabling open-ended, co-creative, and contingent performances. Yet while such works allow for considerable variability in performance, the underlying operational logic of the system—the rules, affordances, and generative structures—often remains fixed once designed. Interaction, in this context, unfolds within a pre-established framework. By contrast, the focus of allagmatic composition is on the possibility of transforming that framework itself. It does not merely accommodate variation in outputs, but enables the system to reorganise its own internal logic, modifying the very conditions of future behaviour from inside of the system itself, rather than through its interactions with the external world. In this sense, interaction becomes structurally transductive: each execution reconfigures the system's epistemic space and expands its compositional potential.

Of course, no system comes from nothing. Even self-organising systems require: definitions of components, parameters for change, and an initial logic of operation. Allagmatic composition is not defined by the fact that it changes, but by how change is treated as the compositional object itself. Generative composition focuses on producing output (variations). Interactive composition focuses on input/output relations with the world external to the designed system (adaptation, exchange). Allagmatic composition focuses on modulating the operational space itself—

the configuration of rules, transformability, and epistemic affordances. So it's not that the system isn't designed in advance—it always is. But in allagmatic composition the rules that govern the rules (meta-logic) become part of the composition. The system is built to reconfigure itself structurally, not just behaviourally. The composer's role shifts from designing what the system does to designing how it may become otherwise.

Generative composition creates variation within a fixed system, while allagmatic composition iteratively builds systems that further transform themselves through each act of creation. Generative composition changes the output, while allagmatic composition changes the system that makes the output. In generative composition, the system might be complex in structure (many parts, many outputs), but its epistemic complexity is limited to what was programmed—it doesn't learn or change its way of thinking. It generates content, but it doesn't generate new kinds of knowing. In allagmatic composition, the system can change itself—its rules, logic, and behaviour evolve over time. This means it can produce new knowledge, new forms, and new ways of relating elements. It's epistemically complex because each execution can transform the space of what the system knows and how it knows it.

A musical example that might be considered to align with this concept can be found in *Polyp* by Marek Poliks and Roberto Alonso Trillo, presented at the Musica ex Machina exhibition at EPFL Pavillions in Lausanne (Kenderdine et al., 2024, section 1). *Polyp* consists of three silicone-based AI sculptures that continuously train machine learning models on ambient sounds captured from their environment. As the installation progresses, each device modifies its sonic and luminic behaviours in real time, developing a dynamic and adaptive understanding of its surroundings. These Polyps do not simply replay or reinterpret pre-trained data; they evolve through continuous feedback, upload material to the cloud, and reciprocally adapt in response to one another. Their system thus changes not just what it produces, but how it produces—reshaping its internal logic through exposure, interaction, and mutual transformation. In this sense, *Polyp* exemplifies allagmatic composition: it is not a system that generates variation within fixed parameters, but one that composes through transductive change, expanding its epistemic space with each activation.

Where generative music explores variation within a procedural field, allagmatic composition explores variation of the procedural field itself. It composes with systems rather than simply within them—constructing open machines capable of reorganising

their own topological configuration. The next section discusses some further artistic examples that might exemplify the mode of creation in which to compose is to craft a machine that iteratively extends its own modes of operation.

New Kinds of Strange Agential Assemblages

As artistic systems become increasingly entangled with the blockchain infrastructure, a new category of aesthetic entities can be distinguished—assemblages in which agency is no longer anchored in human intention alone; artworks that are themselves active participants in a machinic assemblage. Described by Martin Zeilinger (2022) as "new kinds of strange agential assemblages", these are not simply artworks executed by machines, nor representations of non-human life, but configurations in which agency itself is performed through code, protocol, and environmental feedback. They exemplify a profound rethinking of authorship, autonomy, and artistic form—one that Zeilinger has aptly described as blockchain vitalism (Zeilinger, 2022).

Zeilinger identifies a slowly growing tendency in contemporary art to design systems that do not merely represent living processes, but participate in them as operative agents. Projects like Primavera De Filippi's *Plantoid* (De Filippi, 2017) and Paul Seidler,'s, Paul Kolling's, and Max Hampshire's *Terra0* (Seidler et al., 2017) are emblematic in this regard.

Plantoid is a robotic sculpture of a plant that receives cryptocurrency donations via a smart contract. Once it collects sufficient funds, the contract automatically initiates a commissioning process for the creation of a new *Plantoid* sculpture—thus enabling procedural reproduction without the oversight of a single author. It is an example of a self-reproducing artwork: a system designed not only to persist, but to propagate its own existence through coded rules and distributed agency. Here, the artwork operates as a self-propagating system, one in which authorship, aesthetics, and reproduction are mediated by code.

Terra0 takes this logic further. It proposes a model by which a physical forest in Germany—monitored by sensors and administered through smart contracts—can gradually become its own legal and economic subject. The system is designed to sell timber according to sustainability constraints, use the revenue to buy back its land, and eventually attain functional autonomy. In this formulation, the forest is not just

metaphorically alive—it is an economic agent embedded within a legal framework. As Zeilinger argues, such works "disentangle agency from subjectivity" by recasting authorship as an emergent property of procedural, distributed systems. The result is not a shift from human to non-human authorship, but a more radical move: the production of agential assemblages in which authorship becomes an emergent feature of machinic and ecological entanglement.

This reframing of authorship finds a more systematic articulation in Zeilinger's 2024 contribution, where he extends the notion of agential assemblages to examine how blockchain and AI technologies, both separately and in tandem, enable new modalities of creative agency. He proposes that each technology contributes distinct conceptual transformations: "AI", he writes, "is helping to shape new perspectives on the nature of creativity as such", while "blockchain is reshaping our understanding of the concepts of originality and authenticity, and of the capacity for aesthetic artifacts to exhibit semi-autonomous behaviors" (Zeilinger, 2024, 61). Artificial intelligence displaces human intention by generating content that exceeds or escapes authorial foresight, destabilising long-standing assumptions about skill, expression, and inspiration. Blockchain, meanwhile, reconfigures the infrastructural conditions under which art is attributed, authenticated, and enacted—shifting focus from authorship as an expressive act to authorship as a programmable logic of ownership, reproduction, and governance.

But it is when these two technologies are combined that more radical possibilities emerge—particularly around the status, and traceability of agency. Zeilinger suggests that when AI-generated artworks are embedded in blockchain-enabled infrastructures, we are forced to confront a set of unsettling questions: What is the nature and locus of the agency underlying the creation of a specific artwork? Who (or what) can be considered the author or artist responsible for creating the work? If no human artist can be meaningfully linked to an aesthetic expression, can such an expression be subject to conventional ownership claims? What are the boundaries of an artwork that is distributed across a decentralised network of computational nodes? (61). These are not abstract philosophical queries but urgent compositional problems, particularly in fields like music, where agency is often already temporal, distributed, and collaborative.

In my contribution to the same edited volume (Łukawski, 2024a), I argued that blockchain infrastructures afford a new kind of temporal composability, especially

through the interoperability of smart contracts. Because each contract can reference, inherit, or activate others across time, blockchain enables layered, time-based works that embed diverse agents—human performers, AI models, procedural logics—within a shared operational framework. This affordance allows for the design of compositional ecologies in which agency emerges through transactional relations and procedural triggers distributed across time and space. In such a system, the artwork is an unfolding process—one that leaves behind a verifiable provenance not only of outputs, but of each transformation, condition, and actant involved in its becoming.

This shift in focus—from the artwork as a finished object to the system as a traceable field of operations—resonates closely with the earlier discussion of allagmatic composition. There, we framed the compositional act as the configuration of metastable systems capable of reorganising themselves through transductive processes. In allagmatic terms, the artwork is not the product of a structure, but the outcome of an operational chain that individuates itself over time. Blockchain, in this context, does not merely serve as a registry or a marketplace, but as a diagrammatic medium: a technical substrate that allows these operational chains to be instantiated, referenced, and recomposed across distributed environments. The significance of this affordance is ontological. By enabling the persistent inscription of each procedural step, blockchain makes it possible to design systems that are self-differentiating and procedurally accountable: assemblages in which every act of transformation is both compositional and composable, as well as allowing agential inputs to such an assemblage to be effectively tracked and incorporated, enabling open systems to adhere to nevertheless structured behaviours.

A musical counterpart to such performative systems can be found in *Hypermusic Experiment 0.9*, a conceptual project developed by composer Einar Torfi Einarsson that envisions combining AI, blockchain, and notation into an open-ended compositional infrastructure. Rather than composing fixed works, the system generates partial scores—inscribed artefacts that function as modular nodes in a distributed, evolving network. The goal of the project is to model an ongoing, relational process in which each interaction—whether a performer's interpretation, an API-triggered data stream, or a blockchain transaction—reshapes the creative field (Einarsson, 2024, 130). Described as an "infinite notation-machine", the system operates across digital and physical domains, fusing inscription, inference, and interaction in a single compositional ecology (130). Inputs to the system range from traditional metadata to

real-time environmental data, all feeding into a multi-piece structure designed to behave as a network of aesthetico-epistemic components (141). By enabling both human and posthuman agents to influence its operation, *Hypermusic Experiment 0.9* suggests composition as a practice and a speculative platform that challenges the boundary between notation, execution, score, system, and composer. It exemplifies how blockchain and AI can be co-articulated to support compositional worlds that evolve across time, infrastructure, and participation.

The described examples are not only generative systems in the classical sense, nor are they interactive installations governed by deterministic scripts. They are recursive, self-modulating assemblages in which agency circulates across layers of code, machine learning inference, environmental data, human participation, and formal logic. They generate the very conditions for their own mutation and recomposition. In this sense, they exemplify what Zeilinger calls "strange agential assemblages": artworks that exceed representational models, operate without fixed centres, and instantiate agency through the entangled execution of technical, legal, and aesthetic protocols. To encounter such a system is to enter its field of becoming—a machinic ecology in which authorship, value, and action are continually redistributed. These works do not ask to be judged or admired; they ask to be activated, enacted, and recombined. And in doing so, they compel us to confront a fundamental inversion: the artist is no longer the originator of form, but the architect of a process that is ontogenetically open—a process through which agency itself is brought into composition. In this way, blockchain and AI do not just augment artistic tools, but together, they enable a new regime of composition: one that is procedural, composable, and fundamentally agential.

Envisioning Abstract Machines

Having examined how system-building practices formalise generative procedures across human and non-human agencies and algorithmic or epistemic complexities, we can now turn to the next threshold: exploring how artists can envision the operational conditions from which such systems emerge. This is the conceptual territory of the abstract machine—a notion developed by Gilles Deleuze and Félix Guattari in *A Thousand Plateaus* (1980) and further elaborated by Félix Guattari in *Chaosmosis* (1995).

In contrast to machines in the traditional sense—devices composed of parts to execute predetermined functions—the abstract machine is not an object at all. It is not something you can point to or build in the conventional sense. Rather, it is a diagram: a non-empirical structure that defines how elements might relate, combine, or transform within a field of potential. It is, as Guattari writes, a "montage capable of relating all the heterogeneous levels that it traverses" (1995, 35).

This shift reorients our understanding of technology itself. Instead of seeing machines as mere expressions of technological progress, Guattari suggests that machinism—the broader conceptual field that includes social, semiotic, psychological and technical elements—must be understood as a prerequisite for technology (1995, 33). That is, machines are not simply tools for doing; they are conditions for becoming. When we speak of abstract machines, "abstract" here also means "extract": the machine extracts and mobilises forces across domains—biological, symbolic, economic—without being reducible to any one of them (Guattari, 1995, 35). In this sense, an abstract machine does not simply organise a system; it conditions what kinds of systems can come into being at all. In practical terms, an abstract machine defines the relations between elements before any of those elements are fixed or instantiated. Thomas Nail—philosopher of movement and new materialism—puts this succinctly: "The condition of an assemblage is the network of specific external relations that holds the elements together. Deleuze and Guattari's name for this set of conditioning relations is the 'abstract machine'" (Nail, 2017, 24). This means that every actual system or assemblage we encounter—a piece of software, a musical work, a performative structure—emerges from an abstract machine that conditions its form, behaviour, and possible variations.

Yet abstract machines alone do not produce concrete effects unless they give rise to what Guattari calls a machinic assemblage. Assemblages are specific configurations of elements (sounds, tools, gestures, agents, algorithms, and musical works) that are swept up by the abstract machine's diagrammatic logic (Guattari, 1995, 35). More than combinations of parts, these assemblages are also dynamic fields composed of material and expressive components, human and non-human agents, technical apparatuses and semiotic flows. As Deleuze and Guattari explain, an assemblage is defined not by its components alone, but by the "lines" that connect them—its patterns of segmentation, intensification, and transformation (Deleuze & Guattari, 2003, 21). It is important to understand that these assemblages include agents, but not

in the traditional humanist sense of autonomous individuals. Deleuze and Guattari call these agents "personae"—mobile operators immanent to the assemblage itself. Personae are roles, functions, or operators that enact transformations within the system without standing outside it. As Nail explains, "personae are not the origin of the assemblage and do not control or program the assemblage in advance. Rather, they are the immanent agents […] like a runner or intercessor" (2017, 27). In many generative artistic systems, such agents might take the form of algorithmic processes, machine learning models, or human performers—each operating within a shared diagram of relations.

This view of immanent agents within assemblages resonates with Alfred Gell's distinction between "primary" and "secondary" agency, as discussed by Artemi-Maria Gioti (2021, 15-16). Drawing on Gell's anthropological theory of art, Gioti notes that a "primary agent" is typically a human being with intentionality, while a "secondary agent" is an object, artefact, or artwork through which that agency is distributed and enacted. Gell defines an agent as "someone or something that causes events to happen in their vicinity" (Gell, 1998, 16 as in Gioti 2021, 15-16), and stresses that artefacts become social agents not through mystical properties, but because they function as fragments or extensions of human intention (21). Importantly, secondary agents can also act upon human actors—shaping perception, triggering decisions, or structuring behaviour. In generative or interactive art, this reframing of agency becomes especially relevant: systems, scores, or tools may not possess consciousness, but they nonetheless operate within assemblages as agents capable of shaping creative outcomes. As such, they function analogously to Deleuze and Guattari's personae—operators that enact transformations without standing outside the systems they participate in.

Guattari, drawing on Francisco Varela's work, differentiates between two types of machines: allopoietic and autopoietic. Allopoietic machines produce something other than themselves (e.g. a factory machine producing widgets), while autopoietic machines generate and sustain their own organisation (Guattari, 1995, 39–40). Biological organisms are classically autopoietic: they regulate their internal processes and maintain their boundaries in relation to the environment. Guattari extends this idea to complex social or technical assemblages—suggesting that when machines, humans, and semiotic systems are sufficiently entangled, they may collectively exhibit autopoietic behaviour. These assemblages do not simply carry out instructions; they

adapt, evolve, and reorganise their own internal relations.

This ontogenetic capacity is perhaps best captured by Deleuze and Guattari's notion of the rhizome. Unlike hierarchical models of thought (the "tree" or "root" structure), a rhizome is a decentralised, non-linear system where "any point can be connected to any other" (Deleuze & Guattari, 2003, 7). A rhizome grows in the middle, not from a singular origin or toward a final goal. It has no fixed subject or object, but instead operates through multiplicities, connections, and intensities. Rhizomes do not mimic established models; they proliferate difference. They are made of "lines of flight", directions of escape from pre-given categories and forms (21). In artistic practice, thinking rhizomatically means resisting rigid genres, forms, or authorial hierarchies. It means creating systems that allow for distributed agency, divergent outcomes, and emergent meaning. As Edward Campbell—scholar of contemporary European art music—notes, postwar musical practices such as graphic scores, impulsion texts, and gesture-theatre exemplify this shift. These works no longer define a musical object to be realised, but a space of potential relations—a rhizome of gestures, sounds, and interactions that unfold differently with each instantiation (Campbell, 2013, 42–44). In such practices, composition becomes the crafting of a machinic diagram: a set of open-ended conditions under which performance, interpretation, and transformation can occur.

This orientation toward ontogenetic openness finds resonant expression in a variety of compositional strategies that challenge the idea of the work as a fixed, autonomous object. As Paulo de Assis notes, Klaus Huber's concept of polyworks—elaborated in pieces such as *Schattenblätter* (1975)—designates musical objects composed of several self-contained works that may be performed either together (superposed) or independently in various configurations (de Assis, 2024, 24). Claus-Steffen Mahnkopf defines the poly-work as a compositional strategy grounded in complexity, where internal differentiation unfolds through principles such as polymorphy, polyprocessuality, and polyconceptuality. According to Mahnkopf, "the specific however [poly-work] is that within the (organically devised) work there are other (similarly organic) pieces as excorporable, which can stand for themselves and are to be performed independently" (Mahnkopf as emphasised in Ulus, 2021, 24). This notion of organically devised material—where autonomous works are embedded within a larger formal entity—aligns with the idea of an assemblage that resists unity and closure. Hakan Ulus lists several compositions exemplifying this principle,

including Richard Barrett's *Opening of the Mouth* for ensemble, Mahnkopf's own *Medusa* for oboe and chamber orchestra, Simon Steen-Andersen's *Next To Beside Besides,* and Chaya Czernowin's *Anea Crystal* cycle for two string quartets, among others (Ulus, 2021, 31). These works offer models for compositional systems that remain open, stratified, and capable of individuating new configurations from within their own structural logic. A related concept appears in Einar Torfi Einarsson's idea of multipieces, or multiplicity compositions, which are built from a modular structure of interrelated parts that can be combined in thousands of ways. As Einarsson writes, such works never appear as fixed entities, but only through partial, situated performances—each one an "open window onto that ever incomplete 'whole-less' activity" that constitutes the identity of the piece (Einarsson, 2024, 132).

Thus, more than building closed machinic systems, the artist can envision abstract machines that cross the boundaries between various types of entities—by structuring diagrammatic constellations of relations as higher-level operations giving shape to various assemblages. These abstract machines remain virtual; they imagined by the artist as configurations of potentiality across technical, social, institutional, aesthetic, and conceptual dimensions. The artist's task is then to first envision such abstract machine, and then operationalise this vision—not by translating it into a static blueprint, but by setting it in motion through the construction of a machinic assemblage (such as a set of scores, generative systems, social mechanisms, events, and other entitites dependent on the defined operations). The artist creates a set of relations—a machinic infrastructure—that makes possible a range of aesthetic processes, some of which may not even be enacted by the artist themselves. Others may instantiate, remix, or extend the machine. In this sense, the abstract machine becomes a compositional space and a generative ecology.

Worlding

The conceptual leap from creating systems to constructing the conditions for systems to emerge marks the threshold into what has recently been termed worlding. As observed in Future Art Ecosystems 1, the term "worlding" has increasingly been adopted by artists to describe practices that were previously framed in terms of "networks", but which now emphasise autonomy, generativity, and systemic

continuity beyond the originating artist (Serpentine Arts Technologies, 2020, 20). Where networks imply connection, worlds imply condition: a topology within which relations unfold and new entities are born. Future Art Ecosystems 3 further characterises worlding as a mode of practice concerned not merely with producing artefacts, but with "shaping how worlds are built" (Serpentine Arts Technologies, 2022, 140).

The philosophical origin of the term lies in the work of Martin Heidegger, for whom "worlding" (German: das Welten) referred to the ontological unfolding of being-in-the-world. In this view, worlding is not something done by a subject to an object, but an ongoing process of disclosure—how things come into presence and meaning through our situated engagement with them. However, recent critical appropriations of the term have distanced it from Heidegger's anthropocentric and human-exceptionalist framing. As Donna Haraway insists, she is "finished once and for all with Kantian globalizing cosmopolitics and grumpy human-exceptionalist Heideggerian worlding" (Haraway, 2016, 11). Instead, Haraway redefines worlding as a speculative process through which humans and non-humans co-compose one another. In her formulation, worlding becomes a practice of committing to the complexity and unfinishedness of relational becoming (Haraway, 2016, 31). Worlding, then, is not the construction of a singular world but an ongoing, ontogenetic process of co-articulation across domains of matter, meaning, and narrative.

Thomas Rickert and Michael Salvo—scholars of rhetoric and media—propose worlding as a key conceptual strategy for understanding how aesthetic experience in new media is no longer bound to isolated works but emerges through immersive, distributed, and technologically entangled environments (2006). In their analysis of contemporary sound practices—from Jimi Hendrix's feedback to Brian Eno's ambient systems—worlding names a compositional mode wherein sonic, visual, technological, and social dimensions coalesce to generate situated, participatory worlds. This distributed gesamtkunstwerk dissolves the binary between production and reception, casting the artist as a node within evolving machinic ecologies of composition and experience.

A striking example of immersive world-building can be found in the work of Refik Anadol Studio, which has developed a series of large-scale installations that construct what Anadol and Kivrak (2023) describe as "data-driven dream spaces". These works generate self-sustaining aesthetic ecologies through the processing and

transformation of vast datasets. Projects such as *Archive Dreaming* (2016), *WDCH Dreams* (2018), and *Quantum Memories* (2021) demonstrate how AI models trained on cultural and environmental data can produce continuously shifting perceptual environments. In *Living Architecture: Casa Batlló* (2022), for instance, machine learning was used to respond in real time to environmental inputs, thereby transforming a heritage building into a living, adaptive interface. These works exemplify how AI can be integrated into worlding practices as an agent in the co-creation of responsive, ontogenetic environments that blur the boundary between data, space, and subjectivity.

Another example of such world-building is the practice of the art collective teamLab, for instance their *Borderless* exhibition. The exhibition constructed a continuous, immersive environment in which boundaries between artworks, viewers, architecture, and technology dissolved entirely. Digital flowers bloom and scatter in response to one's motion; waterfalls shift their flow depending on the contours of bodies in the space. Works move across rooms, merged with others, or vanish altogether—all creative elements acting as agents within a larger dynamic ecology. Withing the exhibition's logic the artworks become components of a responsive machinic environment. "[T]he visitor is admitted into the art collective's vision of a 'borderless world' awash in a kaleidoscope of colours and imagery, comprised of artworks which seem to possess a life of their own as they transform and react to the visitor" (Grassi, 2022, 1-2). While clearly designed to appeal to a broad public, the exhibition—conceived by an interdisciplinary collective of artists, designers, engineers, and programmers—stands as an impressive large-scale undertaking that integrates all layers of the contemporary art-technology stack.

Projects as the ones described above are often the result of large, interdisciplinary teams with access to significant technological and institutional resources. However, the conceptual orientation they embody—toward worlding as a mode of composition—need not be limited to monumental scale. Rather than dismiss these practices as out of reach, they invite a critical question: how might the individual artist, composer, or researcher begin to think in terms of worlding? What does it mean to design the conditions for emergence within one's own practice, and how might this be operationalised in music? The following section turns to these questions, exploring how the logic of worlding can be enacted through modest, yet conceptually rigorous, compositional systems.

Organising Free-Range Creativity

While worlding practices need not rely on monumental scale or institutional support, they nonetheless underscore a fundamental fact: contemporary artistic production involving advanced technologies is rarely the work of an isolated individual. The technical complexity and informational density of such systems typically exceed the capacity of any single practitioner, necessitating collaboration with specialists—whether as part of informal constellations or as embedded members of an artist's studio (Serpentine Arts Technologies, 2020, 21). High-barrier technologies—complex, expensive, or highly specialised—demand not only access but fluency, often compelling artists to acquire new skill sets or to build relationships with those who possess them (52). In this context, composing within networks becomes an epistemologically generative alternative: it enables the integration of distributed expertise, diverse motivations, and varying modes of value production into a single operational ecology (23). Today's most ambitious art-tech projects already operate within such ecosystems, depending on small, agile networks of technically fluent artists, independent technologists, and commercially conversant agents (Serpentine Arts Technologies, 2022, 133). In such cases, collective dependence becomes a compositional resource; a means of assembling aesthetic systems from intersubjective and interdisciplinary entanglements.

One conceptual framework that offers a compelling response to these conditions is Olga Goriunova's notion of the art platform. The art platform is a concrete organisational form—an assemblage of human and technical relations that enables creative production through distributed agency, network logic, and infrastructural responsiveness. Goriunova—cultural theorist of digital media—defines it as "a network platform that produces art, here understood broadly as a process of creative living with networks" (2012, 2). Art platforms emerge as practical and conceptual solutions to the increasing need for artists to coordinate diverse actors, systems, and knowledge domains into adaptive ecologies of production. In contrast to centralised institutions, they function as self-organising systems—crossroads that assemble actors of various scales, capable of co-developing processes and enabling collective aesthetic power. What distinguishes the art platform from other organisational models is its reflexivity: it operates in awareness of its own processual composition, engaging with what Goriunova calls "organizational aesthetics"—a mode of aesthetic production that is itself concerned with how creative processes are structured, amplified, and

sustained over time (13). As a model for composing with collectives, art platforms provide a way of organising what Goriunova calls "free-range creativity" (21). In this sense, an art platform enacts an aesthetic state in which new forms of knowledge, perception, and relation can individuate themselves, rather then just hosting or distributing works (18). They are engines of aesthetic becoming. This makes it particularly relevant to worlding practices: art platforms do not generate singular outputs, but—through the designed limits of the operations that they enable for their users—condition the emergence of multiplicities.

Goriunova describes aesthetics itself as "a machine generating material variants of reality to enable knowledges, practices, and perceptions to constitute and affirm themselves" (2012, 18). Art platforms thrive on such processual openness. This framing situates artistic practice within an ongoing negotiation of the real—where the platform acts less as a container of finished works and more as a dynamic infrastructure for individuating aesthetic potential. Art platforms are engines of transformation, capable of amplifying aesthetic force through their very mode of organisation. They are structurally attuned to fluctuation and modularity, supporting practices that are experimental, collective, and fluid. In this way, art platforms point to a broader ambition: to create systems that enable not just individual expression, but the "empowerment of massive groups of people" through the "large-scale involvement of creative capacities into innovative practices" (Goriunova, 2012, 22). Rather than privileging the singular author or the closed artwork, art platforms embrace a logic of collective emergence. They articulate a politics of composition grounded in openness and flexibility, aligned with a networked ontology in which participation is not an afterthought but a generative condition. Importantly, this mode of organisation is not only aesthetic but infrastructural. It positions the user not merely as a consumer of services but as an agent in the system's self-organisation—a shift that Irina Kaldrack and Martina Leeker—scholars of digital culture and media theory—identify as a new "form of governmentality", wherein users both invoke and structure their own modes of participation and control (2015, 18). What emerges, then, is what Goriunova describes as "a complex assemblage of art, networks, technologies, politics, autocreativity, publics, humour—all amalgamated, related, but not frozen together in their operation" (2012, 97). These assemblages are structured yet open-ended, governed by databases, modular toolsets, and user-led interaction models that privilege iteration, contribution, and exchange (9). Such platforms often begin as modest digital tools but evolve into expansive ecologies of aesthetic production. They

are sites where collective knowledge, technical systems, and aesthetic sensibilities intersect—spaces not only for the distribution of artworks, but for the invention of compositional worlds.

Seen through this lens, art platforms are autopoietic systems in the Guattarian sense (Goriunova, 2012, 34-37). They emerge through the dynamic co-constitution of human agents, technical infrastructures, and aesthetic processes, forming what Goriunova calls "a system of human-technical assemblages and arrangements that produce a common aesthetic, political, and creative horizon" (2012, 11). These assemblages evolve through a logic of aesthetic self-organisation—a drive toward emergence that cannot be reduced to either mechanical procedure or human authorship (39). This self-organising character is not simply about distributed participation; it is a mode of cultural individuation, wherein taxonomies, digital objects, scripts, recordings, or user contributions become operative components within a recursively modulating system (12). In this way, art platforms enact what Guattari described as autopoietic formations: assemblages that produce their own consistency through transversality, singularity, and machinic alterity (2012, 37).

Autopoiesis, in this expanded cultural and aesthetic register, ceases to be a model of closed biological self-replication and becomes instead a framework for understanding how collective creativity configures itself across heterogeneous domains. As Goriunova notes, when humans, machines, institutions, and "fields of the possible" are drawn together into relational processes of individuation, they may constitute autopoietic forms (37). These formations operate beyond the control of any singular agent; they do not obey a fixed grammar, but generate their own modes of coherence by modulating across structures, components, and machinic relations. In this sense, art platforms are not representational systems but transductive ecologies—systems that actively produce the conditions under which new assemblages can emerge and sustain themselves. The culmination of this framework lies in Goriunova's concept of autocreativity. Defined as a machinic, self-organising force of aesthetic emergence, autocreativity is "autopoietic, autonomous, and 'automatic' creativity that propels aesthetic emergence in the constitution of the human, the cultural, and the social" (2012, 42). Crucially, autocreativity is not reducible to novelty, nor does it seek to explain or imitate human creative faculties. It operates pre-subjectively—not as an act of individual expression but as a transversal force that passes through technical, natural, and pre-individual domains. It is not aligned with artificial intelligence in the

conventional sense, nor with authorship or intentionality, but with a deeper machinic vitality that organises itself by advancing.

As Goriunova puts it, "autocreativity has the energy to cross thresholds, to effectuate a change, and to divorce itself from the plane of any current stratum" (42–43). It does not produce finished artworks so much as it configures the conditions from which new forms of art, subjectivity, and sociality may arise. This framing allows us to reconceptualise creativity not as a trait of individuals or the output of machines, but as a processual force that emerges between the human, the technical, and the infrastructural. Autocreativity "lies between the human, the technical, and the social", and reveals how each of these domains can perform creative operations through their integration in dynamic assemblages (43). The role of the art platform, then, is to work autocreativity—to provide the relational milieu through which this force can become operative. Rather than being programmed or assigned, the mechanisms of creativity on art platforms "develop themselves to be passed on to the environment", producing "a moment of difference" (43).

Platforms condition the emergence of new social formations. In art platforms, this emergence is the core of their aesthetic operation. What is produced is a collective process of subjectivation in which participation becomes a constitutive act. These platforms give rise to complex ecologies of interaction, identification, and organisation, wherein digital objects become "performative enactments of social aspirations and cultural identifications for the communities that gather around them" (Serpentine Arts Technologies, 2022, 51). Their networked and computable qualities thus blur the line between technical projects and cultural worlds, embedding each aesthetic gesture within a larger diagram of social potential. "An art platform is never simply a technocultural object", writes Goriunova, "but a resonance, a movement, an operation" (2012, 3).

Aesthetic emergence in these platforms is tethered to the operational capacities of software as an active agent of cultural transformation. As Seth Erickson and Christopher M. Kelty—information studies researcher, and anthropologist and science and technology studies (STS) scholar—argue, software is neither material nor immaterial, but "durable, entrenched and scaffolded", possessing distinct modes of existence (2015, 39, 44). These modes underpin the infrastructural affordances of art platforms, enabling recursive participation, versioning, and dynamic recomposition. In this context, software art becomes a machinic strata of artistic production—an

"aesthetic current" whose agency bypasses traditional cultural gatekeeping by constructing new forms of symbolic and material expression through code (Goriunova, 2012, 74).

Crucially, AI—often regarded as the emblem of individualised machinic creativity—must be understood differently within such systems. As Barbara Bolt argues, AI is not a subject but an actant—a component within an ensemble of co-constituting agencies, no more or less central than any other participant in a distributed field (2023, 115). Within art platforms, AI does not supplant human authorship, nor does it autonomously generate meaning. Instead, it functions as one element within an intra-active system—a machinic participant in an ecology of autocreativity. This decentering of agency is essential. Rather than asking whether machines can be creative, art platforms allow us to investigate how creativity is constituted through the entangled performance of code, users, databases, and infrastructures. These are systems of collective individuation, not simulations of cognition. Their intelligence is distributed, their creativity emergent.

This leads to a broader strategic insight. As practices in the intersection of art and advanced technologies continue to evolve, artists are increasingly shifting from making artworks to building ecosystems. These ecosystems are defined by their affordances—by the conditions they make possible for others (Serpentine Arts Technologies, 2022, 77). Their power lies in what they enable, not what they contain. Rather than designing isolated objects or narratives, these artists construct environments—technical, social, aesthetic—in which others may experiment, contribute, or find their own mode of participation. These environments, often built from the ground up by artists themselves, reflect a deeper compositional logic: the design of relations within a system. In this light, the most consequential aesthetic act is not the production of a form, but the construction of a network—a platform, in Goriunova's sense, through which emergent forms of aesthetic, social, and infrastructural life can take shape.

Worlding Compositional Ecosystems

The notion that the art world functions as an ecosystem—comprising interconnected artists, institutions, collectors, technologies, and publics—is hardly new. Indeed,

sociologists, art theorists, and cultural critics have long employed ecological metaphors to describe how artistic practices are embedded in broader social, economic, and technical networks. However, recent conceptualisations, such as the ones by Future Art Ecosystems initiative developed by the Serpentine Galleries (Serpentine Arts Technologies, 2020), foreground a crucial shift from merely describing art as an ecosystem toward actively envisioning and operationalising future ecosystems. For Future Art Ecosystems, contemporary artistic practices increasingly revolve around deliberately designing, constructing, and sustaining such ecosystems, especially in response to emerging technological infrastructures. Artists and institutions are now explicitly engaged in creating "series of ecosystems" (5), moving beyond traditional notions of discrete artworks or isolated events towards more comprehensive, relational, and operational frameworks.

What distinguishes this recent approach—and where it resonates most strongly with the arguments presented in this chapter—is its emphasis on artists as active ecosystem builders. Rather than merely contributing artworks to pre-existing institutions or networks, artists increasingly adopt roles as architects of the very infrastructures and relational configurations that sustain artistic, social, and technological practices. This ecological and operational perspective aligns closely with the shift toward compositional thinking outlined previously: from interactive and generative systems toward machinic assemblages and worlding. In this emerging paradigm, artists consciously compose ecosystems, actively worlding conditions that enable the emergence, transformation, and ongoing reconfiguration of creative and agential relations. This ecological perspective aligns closely with the compositional strategies explored throughout this chapter. Artists increasingly adopt roles as active builders of relational environments. They organise conditions that support dynamic interactions among diverse agencies—human performers, machine processes, data streams, or institutional frameworks. The artistic practice expands to encompass configuring these broader conditions and processes of emergence. In this way, composition itself evolves. Artists now craft meta-level infrastructures, actively shaping the fields in which creativity, technology, and social engagement continuously interact. Their compositional thinking is thus inherently relational, operational, and open-ended, designed precisely to accommodate change, collaboration, and ongoing individuation.

To effectively world their compositional ecosystems, artists must take two crucial conceptual and practical steps:

1) First, they must envision an abstract machine. This abstract machine is not a specific technology or physical device; it is a conceptual diagram—a topological structure that maps potential relationships, interactions, and transformations. Abstract machines precede concrete realisations by providing the relational logic and conditions that guide how ecosystems might emerge and evolve.
2) Second, artists must explicitly design the operational dynamics of the machinic assemblage itself. This involves determining specific actions, transformations, and interactions that occur within the ecosystem. Artists define how components such as agents, materials, technologies, and institutions interact, influence each other, and change over time. These operational rules form a compositional framework designed precisely for openness, adaptivity, and emergent outcomes.

Taken together, these two steps—envisioning abstract machines and defining operational dynamics—represent a fundamental method by which artists can actively world ecosystems. This method positions the artist as the architect of relational and operational possibilities, enabling the conditions under which creative and collaborative processes continuously unfold.

While the act of worlding compositional ecosystems often involves technological infrastructures or digital platforms, this is only one possibility among many. Artists can equally world ecosystems through social structures, institutional strategies, conceptual frameworks, or novel methods of notation and performance. For instance, artists might compose ecosystems involving exclusively human interactions and cultural practices, relying on rules, scores, or rituals rather than software or hardware. This underscores an essential distinction: the process of worlding is medium-agnostic. Its defining quality is the compositional approach, not the technological implementation. Artists actively create relational and operational conditions that allow new possibilities and interactions to emerge. Whether realised through digital technologies or entirely analogue means, these ecosystems share a common compositional logic: designing environments capable of sustaining ongoing processes of transformation and creativity.

Central to this compositional approach is the logic of allagmatic composition, drawn from Gilbert Simondon's philosophy and Paulo de Assis's Assemblage Theory for Music. Allagmatics provides artists with a theoretical framework, which focuses explicitly on how relationships, transformations, and processes produce ongoing structural change. By adopting an allagmatic perspective, artists conceive of ecosystems as inherently open, metastable entities, continuously reorganising themselves through processes of individuation. In practical terms, allagmatics equips artists with a compositional strategy that precedes and conditions technological realisations. Using this strategy, artists diagram potentialities—compositional possibilities from which technologies and practices can later emerge. By defining machinic assemblages, they set these potentials into concrete processes of individuation. In this context, composition becomes the active configuration of dynamic, metastable environments in which creativity, interaction, and transformation can further perpetually unfold. Through this approach, artists participate directly in shaping how future artistic practices, technologies, and social interactions emerge and recombine—continuously performing the becoming of their ecosystems.