Becoming Space: Exploring Agential Materiality through AI-Generated Metamorphosis in Artistic Practice

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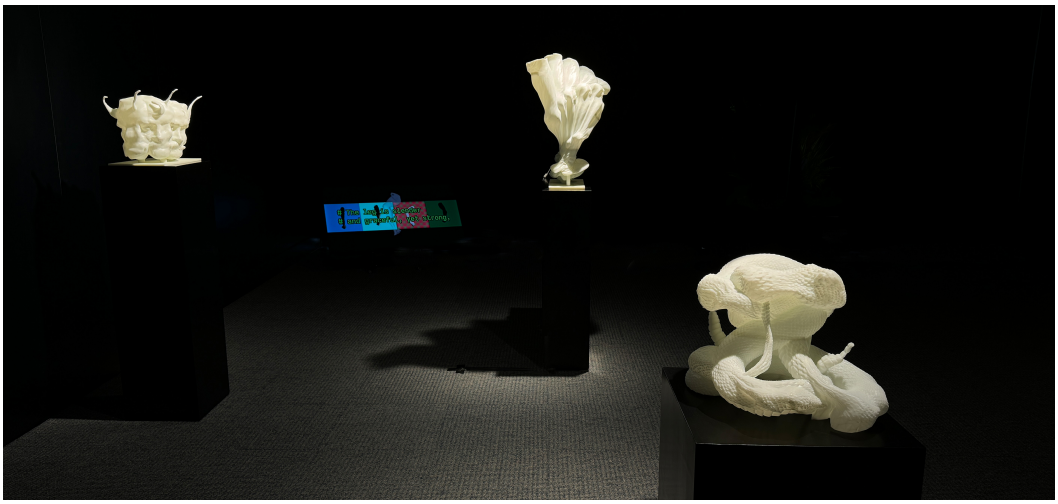

Fig. 1. *Becoming Space*, Installation view in exhibition "Altering Nature: Exploring Life in Computational Art," 2024. © Xinyu Ma.

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This paper examines the intersection of materiality, agency, and transformation in AI-assisted artistic practice through *Becoming Space*, an installation of 3D printed sculptures and video. Drawing from Ovid's *Metamorphoses*, the work investigates states of transformation between human and animal forms using generative AI and additive manufacturing. Through a theoretical investigation, this paper tries to analyze how material-discursive practices emerge in the convergence of language and physical materials. The work demonstrates how agency distributes across human and nonhuman actors in creative processes, challenging traditional notions of artistic authorship and subjectivity. This investigation contributes to understanding how generative AI technologies participate in artistic practices, revealing creativity as an entangled phenomenon where multiple agencies converge and transform.

CCS Concepts: • **Applied computing** → **Arts and humanities**; **Fine arts**; **Media arts**; • **Computing methodologies** → **Computer graphics**; **Mesh geometry models**.

Additional Key Words and Phrases: Materiality, Agency, Becoming-animal, Metamorphoses, Generative AI, 3D Printing, Sculpture, Nonhuman

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1 Introduction

The emergence of artificial intelligence (AI) and digital fabrication technologies has changed creative practices, particularly through text-guided generative AI techniques that mediate the creator's perceptual engagement with materials. This technological shift necessitates reconsidering not only human agency but also the role of nonhuman actors in the creative process. The traditional understanding of artistic materiality faces new challenges as AI systems increasingly participate in material manipulation and transformation.

Contemporary philosophical frameworks offer crucial insights for examining these changes. Deleuze and Guattari's concept of "becoming" [Deleuze and Guattari 1987] challenges fixed, or passive subjectivity in the process of transformation in creative activities. Karen Barad's conception of "agential realism" provides a foundation for understanding how material and discursive elements "intra-action" within technological contexts [Barad 2003]. These perspectives help to reflect on how generative AI systems play a crucial role that have recently participated in material-discursive practices, challenging conventional notions of artistic authorship and creative agency.

Under this concern, this paper introduces *Becoming Space*, an installation exploring metamorphosis through AI-generated forms and 3D printing technologies. Drawing inspiration from Ovid's *Metamorphoses* [Ovid 1995], the work investigates how computational processes and material practices manifest states of transformation between human and animal forms. Through CLIP-guided diffusion models and 3D printing in stereolithography, the work creates a dialogue between the digital generation and physical materialization. This process reveals how agency emerges through the entanglement of language, algorithms, machines, and matter.

The investigation examines three key aspects: a) the fluid nature of subjectivity in technological contexts, b) the role of language as material-discursive practice in AI systems, and c) the emergence of agential materiality through artistic practice. Following this analysis, the work contributes to understanding how generative AI technologies participate in contemporary artistic practice, revealing creativity as an entangled phenomenon where multiple agencies converge and transform.

2 Related Work

This section examines a series of artistic and theoretical works that inform the conceptual context of *Becoming Space*. By analyzing significant contributions in duration and movement, animality

and becoming, and AI-assisted creation, the contextual framework of the work can be understood and evaluated.

Duration, Movement, and Materiality.

Deleuze and Guattari's concept of "becoming-" intersects with Henri Bergson's theories of duration [Bergson 2001], demonstrating the temporal and fluid properties essential to sculptural works. Bergson conceptualized time not as a mechanical, divisible measurement but as an indivisible internal flow—what he termed *la durée*. According to Bergson, authentic time exists as a subjective, internal experience, which constitutes the core meaning of his duration concept. Duchamp's *Nude Descending a Staircase, No. 2* exemplified this understanding by representing motion through sequential overlays. This approach continues in Cragg's abstract sculptures, where twisting forms explore the relationship between material and movement. Cragg positions himself as an "agent" who facilitates the material's inherent potential, asserting that material possesses "self-generating energy" [Minighetti 2017], as demonstrated in his work *In No Time* (2019) [Cragg 2019].

Animality, Artificial, and Becoming.

The idea of "becoming" challenges traditional concepts of human subjectivity, particularly in relation to the nonhuman. Researchers reconsider how materiality influences the understanding of selfhood regarding animal relations. Ovid's *Metamorphoses* demonstrates ancient human-animal relationships, often portraying transformation as punishment or entrapment. Rosi Braidotti extends this through her exploration of "metamorphoses" [Braidotti 2002] as a process questioning fixed notions of body and identity. Contemporary art practices increasingly examine agency beyond human intention through works where nonhuman elements display autonomy. Matthew Barney's *Redoubt* (2018) explores relationships between animals, myths, and landscapes across various media [Barney 2018]. Ian Cheng's *Bag of Beliefs* (2018) investigates artificial entities as autonomous life forms with distinct behavioral patterns [Cheng 2018]. In *Surface Breeding* (2015), Belén Zahera uses selective breeding as a metaphor to examine how digital and physical surfaces transform through image recognition and 3D modeling [Zahera 2015].

AI Model and Language.

Artists increasingly incorporate AI technology into their creative processes as these capabilities advance. In Cole and Petrikovič's "Me vs. You," depth map networks and generative video pipelines reveal how machine vision systems interpret intimate human wrestling interaction, notably failing to distinguish between entangled subjects [Cole et al. 2024]. This technical limitation transforms into an artistic feature, generating novel visual interpretations of human relationships. Cole's another work, "Kiss/Crash," uses diffusion-based image translation to study kissing gestures between human figures alongside car crashes [Cole and Grierson 2023]. These works deliberately provoke AI's visual misinterpretations when processing ambiguous human connections. Similarly, Jiayang Huang and collaborators' "Ephemera" installation employs AI models to transform censored speech into visual representations, investigating the intersection of language taboos and technology [Huang et al. 2024].

Building on these diverse artworks and theories spanning movement, animality, and AI, *Becoming Space* examines the metamorphosis of human and animal identities while considering how nonhuman agential materials interact within artistic relationships, revealing underlying forces that operate beneath language-dominant practices in generative AI models.

3 Becoming Space

Becoming Space is an installation of 3D-printed sculptures and a single-channel video investigating the metamorphosis between human and animal body forms (Fig. 1). Through the transformation of body parts—head, leg, and torso—the installation discusses agency through material and digital processes.

The work draws from Ovid's *Metamorphoses*, specifically its narratives of bodily transformation that challenge fixed notions of identity. *Becoming Space* extends this concept of metamorphosis to explore the space between human and animal forms. The sculptures employ generative algorithmic processes to explore morphologies and converse on classical transformation narratives.

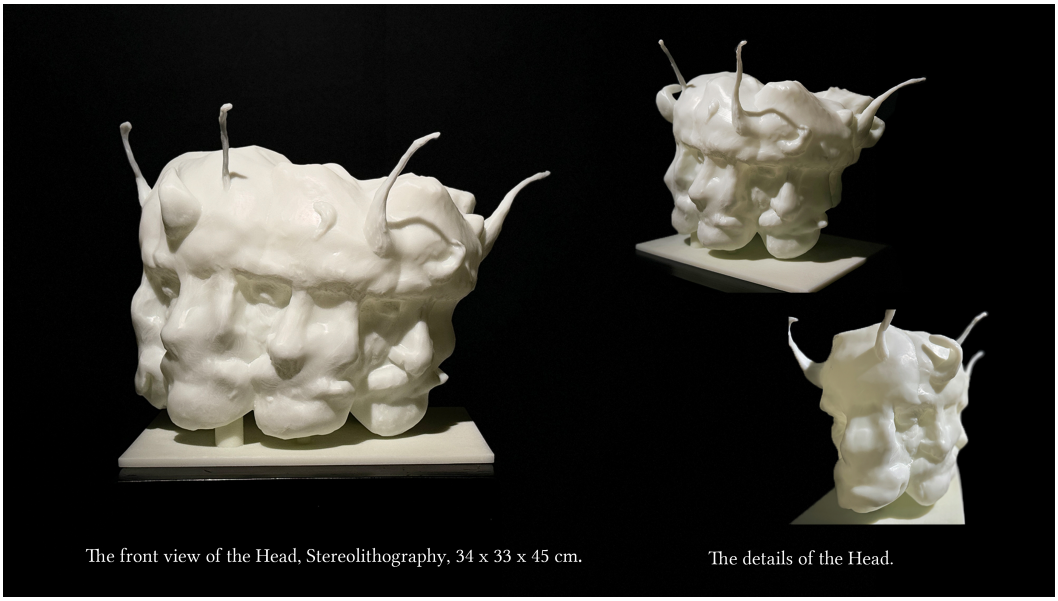

Fig. 2. The Head sculpture of transformation of Jove and Bull, 2024. © Xinyu Ma.

The Head: Jove—Bull. The sculpture "The Head" depicts a head form transformation between a god and a bull, drawing from the myth of "Europa and Jove," where Jove deliberately assumes bovine form to pursue Europa (Fig. 2). This metamorphosis tries to demonstrate divine power and intention. The piece merges subtle bovine features with the characteristics of an elder man, creating a synthesis of Jove's transformation. This synthetic head form explores the intersection of divinity and animality, where transformation serves as an agent of desire and authority. The use of AI in generating this form introduces a novel perspective on mythological shape-shifting, while the visible layers of 3D printing materialize this metamorphosis process.

The Leg: Ocyrhoe—Mare. The next work, "The Leg," explores the transformation of leg morphology, drawing from the myth of Ocyrhoe's involuntary metamorphosis into a mare (Fig. 3). Unlike Jove's deliberate transformation, Ocyrhoe's change represents divine punishment for revealing forbidden prophecies. This piece manifests her physical and emotional transformation, where the merging of human and equine forms embodies the tension between fate and individual agency. The sculpture's surface articulates the struggle between human leg structure and equine musculature, creating a form that exists in an ontological movement. The generative AI processes introduce algorithmic interpretations of this biological transition, adding another layer to the exploration of agency in transformation.

The Torso: Cadmus and Harmonia—Snakes. The third sculpture examines the metamorphosis of the human torso, inspired by the myth of Cadmus and Harmonia's transformation into serpents (Fig. 4). Unlike Jove's exhibition of power through metamorphosis, Cadmus and Harmonia's transformation represents a final reconciliation with their destiny after a life of tragedy. The

Fig. 3. The Leg sculpture of transformation of Ocyrhoe and Mare, 2024. © Xinyu Ma.

Fig. 4. The Torso sculpture of transformation of Cadmus and Harmonia and Snakes, 2024. © Xinyu Ma.

work captures this moment of acceptance where human anatomical features yield to serpentine characteristics, manifesting in subtle undulations and modified skeletal structures. Their joint transformation, represented in the intertwining forms, speaks to the interconnected nature of their

fate. This piece suggests forms for understanding corporeal plasticity. The layered materiality of the 3D-printed structure physically embodies this state of transformation.

The separation of distinct body parts examines how transformation occurs across different states simultaneously. This approach draws on the concept of "Body without Organs" [Deleuze and Guattari 1987], which describes a body's unrestricted potential when freed from organizational structures. By disrupting conventional organ-function relationships, these separate body parts freely entangle, metaphorically representing the agency potential of nonhuman matter.

The installation's spatial design encourages viewers to enter the "becoming" space and interact with the sculptures. The non-hierarchical arrangement prevents any single viewing angle from capturing the entire installation, emphasizing the importance of entangled "space" over individual objects. This deliberate positioning avoids privileging any body part as more significant than others. The flat connections between sculptures highlight their interrelationships, allowing material agency to emerge.

Through these three sculptures, *Becoming Space* examines the dissolution of boundaries between human and animal identities while highlighting the agency of machines in both material and discursive practices. Section 4 details the technical implementation of generative AI algorithms in creating these forms.

4 Technical Implementation

Model Transformation Guided by Stable Diffusion. We develop a novel framework for mesh deformation based on stable diffusion supervision to explore the transformation in *Becoming Space*. In the framework, there are two input signals: the model to be deformed, and the textual information. The object is to deform the model in the direction indicated by the concept described in the text (Fig. 5 a).

In traditional computer graphics, the guiding signals for mesh deformation typically come from user-defined anchor points that manipulate the mesh in three dimensions. In the framework, the aim is to achieve this guidance using natural language as the guiding signal. Furthermore, ensuring that the entire framework remains fully differentiable is essential, enabling the pre-trained diffusion model to guide the mesh deformation process effectively. Finally, the resulting deformed mesh must be of high quality to support subsequent processing and 3D printing.

The development of devices and datasets has led to the emergence of numerous text-guided generative AI tools, with CLIP [Radford et al. 2021] and Stable Diffusion [Rombach et al. 2022] being the most critical. CLIP connects text and images using contrastive learning, while Stable Diffusion enables text-guided image generation by injecting text features into the denoising training process. The framework employs Score-Distillation Sampling (SDS) as the supervisory signal to guide mesh deformation according to the text prompts. SDS, proposed in DreamFusion [Poole et al. 2022], is a technique for extracting 3D priors from Stable Diffusion. Compared to CLIP-based supervision, it offers richer semantic guidance. To maintain the differentiability of the framework, the Nvdiffrast [Laine et al. 2020] was adopted for differentiable rendering, ensuring that the semantic guidance from SDS effectively drives the mesh deformation process. During development, the most advanced differentiable mesh deformation methods were surveyed, and Neural Jacobian Fields [Aigerman et al. 2022] were selected as the representation method for the mesh model. Unlike direct vertex position optimization for mesh deformation, Neural Jacobian Fields optimizes the Jacobian matrix of triangular faces, resulting in higher-quality meshes that are suitable for 3D printing.

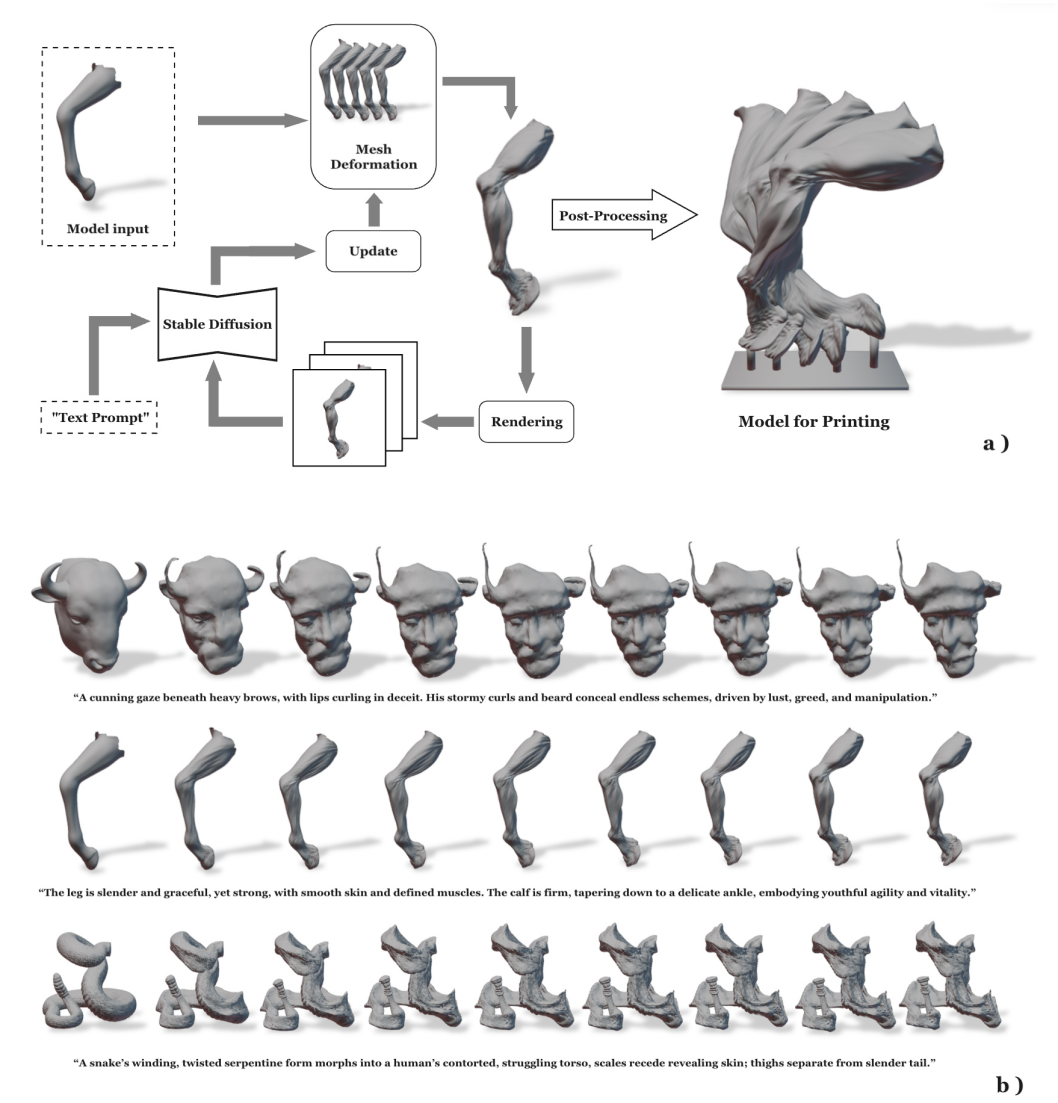

Fig. 5. The presence of the mesh deformation framework and the three sequences of generation of meshes with text prompts.

Post-Processing. The artistic process involves selecting meshes from generated sequences for post-processing into three distinct forms (Fig. 5 b). These forms are materialized through stereolithography using UnionTech's Lite600 and Lite800 printers. After printing separate components, the process requires assembly, adhesion, and surface refinement through sanding.

5 Discussion

This work examines the transformation of subjectivity through computational synthesis and material practice, investigating how the becoming of subjectivity, and agential materiality emerge through the "intra-action" of humans, animals, machines, and matter in the practice.

5.1 Becoming Subjectivity

Heidegger's ontological framework categorizes the stone as "worldless," the animal as "poor in world," and humans as "world-forming." His concept of animal "captivation" suggests a distinct mode of relating to beings, anticipating posthumanist perspectives while exploring non-anthropocentric ethics and ontology [Heidegger 1995]. However, critics like Michel Haar argues that Heidegger's focus on human *Dasein* overshadows his discussion of animality, suggesting his work ultimately reveals more about humans than about non-human life [Calarco 2004].

In contrast to Heidegger's transcendent human subject, Deleuze and Guattari's concept of "becoming-animal" describes processes without fixed subjects or endpoints, prioritizing transformation over static identity, which challenges human-animal boundaries. As Urpeth further discussed, this leads to "double deterritorialization" [Urpeth 2004], where humans and animals enter reciprocal movement, as "becoming is always double" [Deleuze and Guattari 1987]. *Becoming Space* manifests this theory through its three models' non-linear transformations, where each element changes in relation to others, dissolving rigid categorical distinctions.

Braidotti frames becoming an affective and expressive process beyond representation, involving the creation of shared territory between heterogeneous elements. Drawing on Ovid's *Metamorphoses*, she connects transformative narratives to her "nomadic subject" concept, emphasizing identity's fluidity in a posthuman context. This materialist perspective challenges humanist notions of fixed selfhood, revealing the interconnections between bodies, technologies, and environments [Braidotti 2002].

5.2 Material–Discursive Practices

Barad challenges the representationalist view that language mediates all understanding of reality, questioning the presumed separation between words and things [Barad 2003]. In *Becoming Space*, language functions both through Ovid's *Metamorphoses* and as AI model prompts, where its role shifts from representation to prediction. The CLIP model demonstrates language's ambiguous power as a co-creative force, performing rather than merely representing.

Performativity and Material–Discursive Practices. Barad positions performativity against pure representativity, framing it as an ontological process where material-discursive practices produce reality through "iterative intra-activity" [Barad 2003]. This process reveals how material phenomena and discursive practices emerge through specific causal interactions that define boundaries, properties, and meanings. Material and discursive elements thus interweave in world-making, as discursive practices, functions as material (re)configurations shaping reality's definition.

The 3D Additivist Manifesto. In *Becoming Space*, the 3D printer operates within a broader material-discursive network. Crawford emphasizes AI's embodied nature, revealing its dependence on physical infrastructure, natural resources, human labor, and historical classification systems [Crawford and Joler 2019]. The *3D Additivist Manifesto* extends this perspective, positioning humanity as a biological medium and technology as a catalyst for material speculation. The 3D printing material itself embodies transformation—derived from petrochemical processes where ancient bacterial matter becomes oil, and then reformed through digital and physical processes. This material history resonates with the work's themes of metamorphosis even before its artistic shaping [Rourke and Allahyari 2015]. It advocates for the awakening of matter toward posthuman

forms, aligning with Barad's concept of "intra-action" in showing how material and discursive forces jointly enable new forms of embodiment and transformation. Through this theoretical framework, *Becoming Space* emerges as a performative entanglement of machines, language, bodies, and environment in the creative process.

5.3 Agential Materiality and Intra-action

The intersection of becoming subjectivity, material-discursive practice, and technological entanglement reveals agency as distributed across human and non-human actors. These technologies actively participate in creative and material-discursive processes rather than functioning as passive tools.

Agential Realism. Barad proposes that reality's fundamental units are not static objects but "phenomena" emerging from specific "intra-actions" [Barad 2003]. This framework replaces the concept of independent entities acting upon each other with a model of co-constitution through entanglement.

In *Becoming Space*, this manifests as the entangled phenomenon of language, generative AI, artistic decisions, and 3D printing processes. Based on the theoretical discussion, this paper proposed an "agential materiality" where machines, matter, discourse, and human subjectivity are inseparable in the practical process.

5.4 Limitations and Future Work

Although the technical framework supports high-quality generation and post-processing, *Becoming space* faces several technical limitations. Mesh deformation with fixed topology constrains artistic expressiveness in the generated results. Additionally, relying solely on Stable Diffusion for text guidance provides limited semantic information, potentially omitting key elements described in prompts. Future implementations could address these challenges by adopting more flexible implicit representations (e.g., DMTet [Shen et al. 2021]) and incorporating supplementary semantic signals such as images alongside text prompts.

Ethical considerations also guided the approach to AI-assisted creation. This work deliberately avoided prompts containing references to specific artists' styles or intellectual properties that could pose infringement risks. This careful curation ensured the work maintained originality.

The future development will try to explore generative AI as an agential tool participating in material entanglements within complex ecologies. Integrating 3D scanning technologies would enhance engagement with physical forms, enriching material reality.

6 Conclusion

This essay has explored how artistic practice and technology converge to examine materiality, agency, and metamorphosis. Through *Becoming Space*, the essay discusses how fluid transformations challenge fixed concepts of subjectivity, revealing the complex relationships between humans and animals. Furthermore, the nonhuman turn emphasizes that matter, including digital and mechanical systems, exerts its agency in shaping realities. The work materializes theoretical frameworks through AI generation and 3D printing, showing how agency distributes across language, algorithms, machines, and materials.

The limitations and potential directions suggest how the work's theoretical framework might expand to complex ecologies and technological participation. The continued investigation aims to advance the understanding of creative practice in an era of systematic entanglement.

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