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Material Agency in Systems of Art: Reflections on Theatricality, System Aesthetics, and Nonhuman Turn

This article explores materiality within contemporary art practices, focusing on its historical and theoretical significance in the 1960s and 1970s, particularly in Minimalism and System Aesthetics. It examines Michael Fried's critique of theatricality in Minimal Art, Rosalind Krauss's response emphasizing phenomenological presence, and Hal Foster's focus on institutional critique. These critiques, along with System Aesthetics as developed by Jake Burnham, are analyzed in relation to the technological, ecological, and social context of the time frame in artworks. The study also considers how materiality is embodied in the work of Hans Haacke and Pierre Huyghe, whose practices engage with physical, biological, and social systems. Drawing on Francis Halsall's interpretation of Latour's "Quasi-Objects" and Flat Ontology, the article discusses how material agency in art reflects dynamic interrelations between human and nonhuman elements. It further explores how this engagement with materiality aligns with nonhuman turn theory, addressing the philosophical reflections of the human subject's role within political ecological systems. The article argues that material agency in contemporary art provides a critical force in understanding system-based practices, challenging traditional human-centrerd perspectives.

1. Introduction

This article examines the evolving role of materiality in contemporary art practice through the lens of system aesthetics, focusing on the theoretical and practical developments that emerged from Western Minimalism and systemic art practice in the 1960s and 1970s. During this period, significant shifts occurred in understanding the relationship between material objects, technological systems, and artistic practice. These changes reflected broader transformations in how artists and theorists conceived of the interaction between artworks, viewers, and their environmental contexts.

The investigation begins with a critical examination of the debates surrounding minimalism and theatricality. Michael Fried's seminal critique of minimalist art identified a fundamental shift away from modernist aesthetics, particularly the Greenbergian emphasis on

Xinyu Ma
The Hong Kong University of Science and Technology, Guangzhou, China
xma796@connect.hkust-gz.edu.cn

Clea von Chamier-Waite
The Hong Kong University of Science and Technology, Guangzhou, China
The Hong Kong University of Science and Technology, Hong Kong, China
cleavcw@hkust-gz.edu.cn

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medium specificity. This departure, which Fried characterized as a problematic turn toward theatricality, sparked important theoretical responses. Rosalind Krauss's counterargument emphasized the phenomenological aspects of artistic presence, suggesting that the viewer's temporal and spatial experience constitutes a crucial element of the artwork's materiality. Hal Foster further expanded this discourse by connecting these formal considerations to institutional critique, arguing for a return to social and political engagement in artistic practice.

These theoretical frameworks provide a foundation for understanding the emergence of system aesthetics, as articulated by Jack Burnham. Burnham's perspective, developed against the backdrop of cybernetic theory and technological advancement, offers insights into how artists began to conceive of their work in terms of systems rather than isolated objects. This systemic approach to art-making finds contemporary expression in the works of artists like Hans Haacke and Pierre Huyghe, whose practices engage with physical, biological, and social systems. Their work demonstrates how material agency operates within complex networks of human and non-human elements.

The article extends this analysis by examining how material agency manifests in contemporary art practices that integrate technological and ecological systems. Drawing on Francis Halsall's interpretation of Bruno Latour's concept of the quasi-object and flat ontology, we consider how these artistic practices challenge traditional understandings of materiality and objecthood. This theoretical framework helps illuminate the ways in which contemporary artworks function as sites where material, technological, and social systems intersect and interact.

Through this investigation, the article argues that material agency in contemporary art practice serves as a critical force that questions conventional assumptions about human subjectivity and technological systems. This perspective not only builds upon earlier critiques of theatricality but also engages with current discussions in the Nonhuman turn (Grusin 2015) and political ecology. The temporal dimension of material agency, as revealed through artistic practice, suggests new ways of understanding the relationship between human perception, technological systems, and environmental processes.

2. Theatricality and Objecthood

The 1960s and 1970s marked a shift in contemporary art, with Minimalism challenging traditional notions of objecthood and materiality. Michael Fried's critique of Minimalist art centered on its theatricality, arguing that the movement's focus on the viewer and space undermined the purity of the object. However, this perspective was questioned by critics like Rosalind Krauss and Hal Foster. Krauss argued that theatricality in the work emphasizes the role of context and viewer interaction in understanding art. Foster contended that art should destabilize belief and question institutional norms rather than affirming them. This section explores the debates between Fried, Krauss, and Foster, illustrating how theatricality became a crucial tool in rethinking the relationship between art, the viewer, and broader socio-cultural contexts.

2.1. Theatricality by Michael Fried

It was against this backdrop of artistic transformation that Michael Fried wrote his seminal essay "Art and Objecthood" (1967) (Fried 1998a), which critically examined the relationship between art and objecthood at a moment when art was breaking free from its traditional material constraints. Building upon Clement Greenberg's formalist aesthetics, Fried developed a critique of Minimalism "aspires not to defeat or suspend its own objecthood, but on the contrary to discover and project objecthood as such (151)." While Minimalist art (or "literalist art" in Fried's terminology) seemingly aligned with Greenberg's modernist logic of medium specificity, Fried argued that it fundamentally deviated from this trajectory. Where modernist art sought to overcome the limitations of its medium while maintaining medium specificity, Minimalist sculpture, in Fried's view, lacked the requisite "seriousness" by directly emphasizing its physical form and attempting to become purely object, thereby negating its medium specificity (155).

Fried acknowledged Minimalist sculpture as an outgrowth of modernist painting but considered it a misguided development. He argued that Minimalist works not only compromised their medium specificity through an emphasis on objecthood but also achieved a kind of "non-art" presence through their scale and structural relationship to exhibition spaces. Fried termed this presence "theatricality," describing theater as "the common denominator that binds together a large and seemingly disparate variety of activities, and that distinguishes those activities from the radically different enterprises of the modernist arts (164)." This theatricality mani-

fested in two crucial ways: first, in Minimalism's theatrical mode of presentation, with its acute attention to the viewer's encounter with works in actual space and its pursuit of *mise-en-scene* effects (Fried 1998b, 40); and second, in its demand for a new mode of reception analogous to theatrical experience.

Fried countered this theatricality with the concept of "presentness" in modernist art. He argued that while Minimalist Art demanded an experience of "endless duration," modernist works achieved a state of complete manifestation "at every moment (Fried 1998a, 166)." This distinction between temporal duration and instantaneous presence became central to his critique. As Fried articulated, "the experience in question persists in time, and the presentment of endlessness that is central to literalist art and theory is essentially a presentment of endless or indefinite duration." This temporal aspect of Minimalist art, in Fried's view, fundamentally opposed modernist art, because they are "at every moment the work itself is wholly manifest." He further claims,

> It (modernist art) is this continuous and entire presentness, amounting, as it were, to the perpetual creation of itself, that one experiences as a kind of instantaneousness, as though if only one were infinitely more acute, a single infinitely brief instant would be long enough to see everything, to experience the work in all its depth and fullness, to be forever convinced by it[...]it is by virtue of their presentness and instantaneousness that modernist painting and sculpture defeat theater...the condition, that is, of existing in, indeed of evoking or constituting, a continuous and perpetual present[...]. (167)

This notion of instantaneousness can be seen as an idealized conception of time, with Fried's critique of theatricality appearing to defend a Greenbergian idea of "purity" (Greenberg 1982). By insisting that each artistic medium should adhere to its inherent properties, this perspective seeks to establish artistic quality through formal autonomy. However, this framework was soon challenged by emerging artistic practices and theoretical discourses, particularly those theatricality practices and performance art centered on the experience of duration.

2.2. Critiques by Krauss and Foster

The theoretical landscape of the 1970s, characterized by new avant-garde movements and critical discourses, rendered Fried's position increasingly untenable. Rosalind Krauss, in her text "Mechanical Ballets," directly challenged Fried's assertion that theatricality

necessarily undermined sculptural integrity (Krauss 1981). She developed an understanding of how theatrical elements in contemporary sculptural practice, arguing that theatricality served as a critical tool for investigating and reconstructing the fundamental nature of sculptural enterprise:

> But the sculpture I have just been talking about is predicated on the feeling that what sculpture was is insufficient because founded on an idealist myth. And in trying to find out what sculpture is, or what it can be, it has used theater and its relation to the context of the viewer as a tool to destroy, to investigate, and to reconstruct. (242)

More specifically, Krauss proposed the idealist assumptions underlying traditional sculptural practice emerge from position and perspective, arguing against the possibility of prior or absolute knowledge.[1] She emphasized how theatrical elements in sculpture could practically disrupt classical conventions that persisted in twentieth-century variants, including futurism, constructivism, and their technological extensions.[2] With the discussion by Krauss, this reconceptualization of theatricality is found in the works of artists like Claes Oldenburg, Robert Morris, and Bruce Nauman. Their practices demonstrated how theatrical elements could serve to investigate fundamental questions about the nature of sculptural objects and our modes of knowing them.

2.2.1. The Phenomenological Turn

Theoretically, the phenomenological perspective illuminates how the artistic practices argument by Krauss transformed the aesthetic object from a self-contained artwork into a catalyst for the embodied spatial experience.[3] The viewing space became an activated field where the observer's bodily presence and movement were essential to the work's completion. This shift represented a fundamental reconceptualization of the artwork's materiality: rather than existing as an autonomous object, the sculpture functioned as a site of perceptual engagement that demanded bodily presence for its full realization.

The apparent paradox of Minimalist sculpture lies in how its extreme emphasis on objecthood ultimately necessitated the viewer's physical presence for its completion, thereby elevating the role of perceptual experience.[4] This transformation marked a decisive shift from the traditional subject-object dichotomy of art appreciation toward a phenomenologically grounded bodily experience.

2.2.2. Institutional Critique by Foster

Hal Foster's subsequent analysis further developed this critique of Friedian modernism. Writing in 1987, Foster identified a fundamental shift in artistic motivation away from Fried's insistence that art must "compel conviction (Fried 1998b, 43–44)." Instead, Foster argued that the innovative art of his generation sought specifically to trouble conviction and demystify belief. This shift marked a crucial transition in artistic practice and critical discourse.

Foster characterized this postmodern impulse by relating it to Marcel Duchamp's original exposure of art's institutional nature. He argued that "quality," once exposed as an imposition of normative standards, had been displaced by "interest" as a criterion for artistic evaluation. This shift fundamentally altered how artistic development was understood: rather than pursuing formal refinement toward pure essence, artists increasingly engaged in structural historical negation, questioning and expanding the received paradigms of artistic practice. As Foster states:

> ...the object of critical investigation becomes less the essence of a medium than "the social effect (function) of a work" in the present, and, perhaps most important, the intent of artistic intervention becomes less to secure a transcendental "conviction" in art and its institutions than to undertake an immanent critique of its rules and regulations. (Foster 1996, 57)

This transformation entailed a shift in critical focus from investigating the essence of artistic media to examining the social function and effect of artwork in its present context. Most significantly, this distinction between formalist-modernist and postmodernist art could be characterized as a movement from "seeking the essential" to "revealing the conditional." (57)

The debates surrounding Minimalism in the 1960s and 1970s highlight a key shift in artistic and critical thought. Fried's critique of theatricality as a threat to object purity was challenged by Krauss and Foster, who saw theatricality as a means to reframe sculpture's relationship to the viewer and to institutional critique. Through artists like Oldenburg, Morris, and Nauman, theatricality became a method for questioning established norms and rethinking the nature of objecthood. These discussions not only redefined sculpture but also paved the way for future explorations of materiality, perception, and social context in contemporary art.

3. Systems Aesthetics and Materiality

The emergence of systems aesthetics in the late 1960s represented more than just another artistic movement; it marked a fundamental epistemological shift in how art engaged with reality. While Fried viewed the theatrical aspects of Minimalism as a departure from modernist autonomy, Jake Burnham recognized these changes as a broader paradigm shift. Burnham's essay "Systems Esthetics" (Burnham 1968b) emerged as a critical response to the minimalist object-based art. He viewed this very theatricality as indicative of a more significant cultural transformation—a shift away from the notion of fixed objects towards an emphasis on relational systems.

The 1960s marked a pivotal transformation in modernist formal aesthetics, characterized by artistic experiments that transcended traditional boundaries of painting and sculpture. During this period, various artistic practices—including Happenings, Minimalism, kinetic art, environmental art, and Art and Technology initiatives—began to emphasize process, event, occurrence, and theatricality over object-based art. This shift coincided with significant developments in the intersection of art and technology.[5]

3.1. Systems Aesthetics, Real-Time Art, and Objects

Burnham's conceptualization of "systems" draws heavily on Ludwig von Bertalanffy's theory of General Systems Theory, (Bertalanffy 2003) which posits that systems are "'complex of components in interaction,' comprised of material, energy, and information in various degrees of organization." (Burnham 1968b, 32) According to Burnham, the term "system" offered the most appropriate lens through which to interpret the emerging practices in contemporary art. He defines a system as a dynamic network of components in interaction, suggesting that the boundaries traditionally associated with art—such as the frame of a painting or the proscenium of a stage—are dissolved in favor of systems that are contingent and ever-changing. This shift towards systems thinking parallels Thomas Kuhn's idea of scientific revolutions,[6] where he describes how scientific paradigms undergo shifts that fundamentally alter the way knowledge is understood (Kuhn 2012).

Burnham argues that this historical moment was pivotal for art.[7] In practical terms, this conceptual shift manifested as a focus on process rather than form. Whereas traditional artworks emphasized fixed shapes and visual metaphors, Burnham's concepts on "systems" suggested that art could be understood as an ongoing, reconfiguring process. The artworks, rather than being fixed, could be seen as

always in a state of reorganization, mirroring natural systems. This move from objecthood to process meant that artworks, instead of being passive objects, became active participants in an ongoing process of change.

One of the key principles of systems thinking, introduced in the 1940s, was the concept of "homeostasis"—the ability of systems to self-regulate and maintain balance through feedback mechanisms (Hayles 1999). These feedback loops were integral not only in biological systems but also in cybernetic systems (Wiener 2019), where the flow of information allowed for the regulation and adaptation of processes. As Burnham integrated these ideas into art, he proposed that contemporary artworks could function as autonomous systems, interacting with their environments in "real time" (Fiske 2016). For instance, in his discussion of artists such as Gianni Colombo, Les Levine, and Hans Haacke, Burnham emphasizes artwork, rather than being a fixed object, became an ever-changing, self-organizing system. This art form operated through continuous variation, defying the static definitions of material or form typically ascribed to Minimalism Art. Haacke's Condensation Cube (1963–1967) (Fig.1.), for example, exemplifies this shift. In this piece, environmental factors like light and temperature continuously change the state of the water within the cube, creating a piece of art that operates autonomously, independent of the viewer's perception or participation. Haacke's work positions the artwork as an open system that evolves over time rather than a static object to be passively consumed.

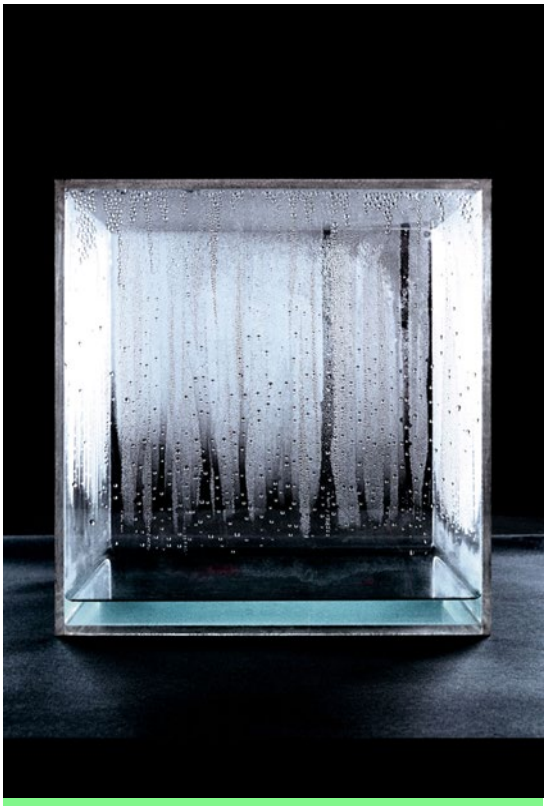

Fig. 1. *Condensation Cube*, Hans Haccke, 1963-67. © Hans Haacke, VEGAP, Barcelona.

By adopting the principles of cybernetics and systems theory, Burnham and these artists transformed the nature of what art could be. The systemic approach practices active processes that reflect the ongoing feedback loops inherent in natural, biological, and technological systems. In this sense, art became a continuous process of variation and transformation, challenging the static definitions of material and form that had previously defined Minimalism.

3.2. Systems Aesthetics and Social and Political Changes

While the concept of Systems Aesthetics emerged as a theoretical shift in art, it is crucial to acknowledge the historical and political forces that shaped its development. At the core of systems theory lies the assumption of technological neutrality; however, this neutrality is difficult to sustain when we consider its origins. Systems theory was not simply a product of academic curiosity but was deeply tied to military needs during World War II.[8]

This militaristic background casts a shadow over the seemingly neutral application of systems theory to art.[9] As Krauss argues, technology is never neutral; it is shaped by the social and economic structures within which it is deployed.[10] She critiques the mechanistic worldview embodied in much of contemporary sculpture, which was often produced in service of such technological and social control mechanisms (Krauss 1981, 221). For Krauss, the aesthetic of technological systems, while compelling, reflects and perpetuates a vision of the world as governed by impersonal forces, a view that much of contemporary art—especially in its postmodern form—actively sought to challenge.

Art movements of the 1960s, particularly conceptual and minimalist art, engaged with technology, yet their practitioners were often wary of its associations with control and coercion. The ideological shift during this period, particularly the countercultural and anti-authoritarian movements, meant that systems—once seen as neutral and objective—came to be viewed as instruments of social and institutional power.

This rejection of technological art practices was also influenced by the growing recognition of the role of social systems in shaping political life. As mentioned by Francis Halsall,

> [...]general social and political changes also raised interest in the notion of systems. Such civil disobedience often directed its anti-establishment and anti-authoritarian rhetoric against the 'system.' Hence systems became associated with institutional power or a prevailing social order. (Halsall 2008, 101)

In art practice, states by Halsall, "this is led to the belief that the social system could be changed by active artistic participation in it," and especially refers to the concept of time of traditional artworks "exist in 'mythical time', that is, in an ideal historical timeframe separated from the day-to-day events of the real world." Some artists, such as Haacke, attempt to "integrate their works in the actual events of the 'real world,' that is the world of politics, money making, ecology and other pursuits (102)."

The relationship between theatrical experience and systemic engagement reveals different conceptualizations of artistic time. Krauss's analysis of theatrical and performance art emphasizes a kind of phenomenological time, focusing on the immediate, embodied experience between viewer and artwork. In contrast, Burnham's concept of "real time" addresses art's engagement with

ongoing social, political, and ecological processes that function independently of human perception. This distinction is exemplified in Haacke's Condensation Cube, where physical processes continue regardless of observation, demonstrating how systemic art operates beyond the confined temporal experience of traditional viewer engagement. The temporal framework in artworks becomes essential in distinguishing between Fried's and Krauss's debate on the notion of "instantaneousness" (ideal time) and "endless duration"—where the theatrical experience creates a suspended duration—and Burnham's "real time," which engages with the actual temporal unfolding of social and ecological systems.

4. Social and Ecological Systems in Artworks of Hans Haacke and Pierre Huyghe

4.1. Systems Aesthetics and Haacke

Aligned with Burnham's "systems aesthetic", Haacke's work emphasizes interconnected systems—biological, ecological, social, or technological—as central to the creation and interpretation of art. This approach foregrounds the relationships and processes within these systems.

However, in critiquing systems aesthetics, depends on an opposition of natural and social, Benjamin H.D. Buchloh argued that Haacke's adoption of Burnham's approach could not escape charges of "techno-scientific reductivism" (Burnham 1968b, 35). In his view, systems aesthetics detaches art from its historical and political roots by positioning it within an ahistorical, rationalist framework. This detachment, according to Buchloh, represses historical memory and displaces art's critical engagement with the sociopolitical contexts in which it operates (Buchloh 2003). Buchloh's critique underscores the danger of systems aesthetics falling into a formalist trap where technology and systems become ends in themselves, detached from the material conditions that shape them.

Central to Buchloh's critique is his insistence on a clear distinction between natural and social systems, a division he argues is ideologically undetermined and immutable. For Buchloh, Haacke's work remains insufficiently political unless it explicitly addresses social systems rather than biological or physical ones. This perspective suggests that Haacke's engagement with systems theory—while innovative in its application of feedback mechanisms and dynamic models to art—does not adequately foreground the political implications of his practice (Buchloh 1995, 49). For instance, his works *MoMA Poll* (1970), *Shapolsky et al. Manhattan Real Estate Holdings,*

a Real-Time Social System, as of May 1, 1971 and *Sol Goldman and Alex DiLorenzo Manhattan Real Estate Holdings, a Real-Time Social System, as of May 1, 1971* engage with the real social context. However, this critique is contested by contemporary thinkers like Bruno Latour, whose work challenges the rigid separation between nature and society. Latour, introduced by Luke Skrebowski, in his advocacy for a "political ecology" (Latour 2004, 231), argues that the natural world is itself politically constructed and deeply intertwined with social systems (Skrebowski 2008, 75). In this view, the binary opposition between nature and society, which Buchloh upholds, needs to be rethinking. Rather than treating the natural world as a neutral backdrop against which social dynamics unfold, Latour proposes that the ecological and social realms are co-constitutive, with each influencing and reshaping the other.

Haacke's practice, then, offers a compelling response to the dichotomy between natural and social systems that has been a longstanding feature of modernist thought. By applying systems theory to both biological and social phenomena, Haacke's work illustrates how the formal and dynamic models of systems theory can be used to understand the overlap and interconnection between these traditionally discrete domains.[11] Haacke's art traces an increasing scale of systemic complexity, from physical and biological systems to social systems, demonstrating how these domains are entangled rather than separate and hierarchical structured in operational systems. This is not just a theoretical intervention but a practical one, as Haacke's artworks refuse to recognize the boundaries that have been established between nature and society. His ecological pieces like *Chickens Hatching* (1969), and *Rhine Water Purification Plant* (1972) (Fig. 2.) merge natural and social elements to critique dominant systems. In doing so, his work pushes against the modernist myth that these realms should remain distinct and untouched by one another, and differentiate with the theatricality practices that emphasize the experience of duration.

Skrebowski importantly argued Haacke's work avoids reducing technology and systems to either purely optimistic or purely dystopian visions, a binary often employed in critiques of technophilia and technophobia (Skrebowski 2008, 58). Rather than embracing or rejecting technology outright, Haacke uses technological resources—such as feedback loops, sensors, and other mechanistic devices—to critically engage with and expose the social and cultural systems that underlie technological applications. His approach refuses to take technology at face value, instead investigating its role in shaping human be-

havior, power dynamics, and ecological relationships. In this way, Haacke's work becomes an active inquiry into how technology and social structures are mutually constitutive, rather than presupposing a separation between the two. His use of systems theory does not function as a neutral, scientific tool but as a method of exposing and critiquing the ideological structures that govern both natural and social systems.

Further states by Skrebowski, this refusal to adhere to the binary division between nature and society is central to Haacke's political engagement. As his works increasingly reflect on the environmental and industrial systems that shape human existence, they also point to the limitations of systems thinking when applied to art without a critical awareness of the power dynamics embedded within those systems. Haacke's work, far from representing a break between a pre-political and post-political phase, is consistently political.

His entire oeuvre reflects a critical stance toward both the systems of art production and the broader societal systems they reflect and uphold. By interrogating systems, whether they are biological, ecological, or social, Haacke's work brings material agency into focus—showing how systems, with their inherent dynamics and feedback loops, can reveal and potentially alter the socio-political realities they inhabit.

Fig. 2. *Rhine Water Purification Plant*, Hans Haacke, 2017. ©Hans Haacke.

4.2. Pierre Huyghe and the Ecological Materialism of Systems

Pierre Huyghe's *After ALife Ahead* (2017) and *UUmwelt* (2018) exemplify a shift in contemporary art toward systems aesthetics grounded in ecological materialism. Huyghe dissolves the viewer's privileged position, integrating them into a dynamic system where human agency is but one variable among many. As Skrebowski notes, this reflects a broader "ecological turn" that collapses the modern divide between nature and society, challenging both Fried's human-centric formalism and Hal Foster's model of institutional critique, which presumes a stable boundary between art and its sociopolitical context (Skrebowski 2019, 67).

In *After ALife Ahead* (Fig. 3.), Huyghe constructs an ecosystem where algorithms, living organisms, and environmental factors interact unpredictably. Flora Katz emphasizes that the essence of *After ALife Ahead* lies in its constant state of change, which is not under the artist's direct control.[12] The artwork signals a shift towards material realism, situating human extinction within the broader narrative of the planet's sixth mass extinction—a phenomenon distinct from previous, naturally occurring extinctions.[13] Katz further states that the

artwork does not adhere to a clear, predictable path but instead allows all elements to change continuously, influenced by their internal properties and the external space they occupy. She suggests the concepts of "randomness/determinacy" (*laisser être/déterminé*) play a crucial role in understanding the work's nature. Interestingly, Katz also argues that in Huyghe's work, the elements are not entirely free to evolve without limits; they are constrained by their inherent material properties, the external space, and the network of interactions set up by the artist (Katz 2019). This interplay between randomness and determinism reveals the intricate complexity of the ecosystem, where change is both driven by random events and structured by the internal logic of the system.

Fig. 3. *After Alife Ahead*, Pierre Huyghe, Installation view, 2017. ©Pierre Huyghe.

In this perspective, the viewer's experience of the duration is different in Haacke's and Huyghe's art. Haacke's control of social and ecosystem focuses on the "real time" which Huyghe here, followed by Katz, the work invites viewers to envision a world beyond destruction, where thoughts of extinction provoke a disconnection from the familiar and forge new connections with the future. This concept could be understood as an emphasis on a critique of historical time that, far from merely critiquing ecological catastrophes, the work challenges viewers to contemplate humanity's role and place within the grander scheme of history. This aligns with Freid's argument of "presentment of endlessness" of the Minimalist and Krauss's critique of prior or absolute knowledge about the object and viewer themselves that is preconceived by viewers in modernist art, but whereas Krauss emphasized the viewer's experience relationship to the work, Huyghe subordinates human experience to the system's emergent agencement (Skrebowski 2019, 72).

Based on his previous practice, in *UUmwelt* (Fig. 4.), Huyghe keeps exploring an ecosystemic approach that prioritizes change, complexity, and relational dynamics. While rooted in his previous works, this evolutionary step achieves new heights in *UUmwelt* through collaboration with Japanese neuroscientists (Shen et al. 2019). Utilizing Artificial Intelligence (AI), this collaboration facilitates transforming human brain activities into visual displays. The exhibition's central feature is large LED walls that exhibit thousands of AI-generated images. These images are uniquely responsive to environmental stimuli, such as changes in light, temperature, and humidity, detected by sensors within the gallery. In addition to its digital components, *UUmwelt* integrates living biological elements.[14] As Huyghe himself reflects, the exhibition does not aim to present a fixed narrative or aesthetic for the viewer but rather seeks to exhibit the viewer within the ev-

er-changing conditions of the work itself. Referenced by Skrebowski, Huyghe describes, "You set conditions, but you cannot define the outcome...there is a set of elements, the way they collide, confront and respond to each other is unpredictable." This idea of "exhibiting someone to something," rather than "exhibiting something to someone," is emblematic of Huyghe's rejection of anthropocentrism and his exploration of the material agency of nonhuman entities within the artwork (Skrebowski 2019, 70).

Fig. 4. *UUmwelt*, Pierre Huyghe, Installation view, 2018. ©Pierre Huyghe.

Skrebowski frames Huyghe's art as a rejection of the "modern constitution": the work's refusal to separate natural and social sciences. He states as,

> Rather, Huyghe's work can be more productively understood to participate (as indeed does Latour's own more recent work) in a general ecological turn in the humanities that is consequent on the refusal of the (modern) separation between the Naturwissenschaften and the Geisteswissenschaften (and for which work undertaken in Medienwissenschaft is an essential reference point). (72-73)

In this context, it seems that a kind of ecology materialism is central to Huyghe's practice, which emphasizes the material agency in the systemic art approach. Huyghe's works are not just a representation of life, matter, and machine, nor a mere critique of ecological issues, but a material engagement with the forces of change, emergence, and transformation. It challenges viewers to reconsider the place of human agency within the broader ecological and systemic networks on Earth. Skrebowski further connects Guattari's notion of a "new aesthetic paradigm" to broader ecological thinking. It contrasts this new paradigm with modern aesthetic practices, which are often institutionalized, and draws from more fluid, pre-modern societies (78). By weaving together concepts of randomness, determinism, and material agency, Huyghe offers a speculative view of the world that transcends traditional artistic forms and invites a more complex understanding of the relationships between art, nature, and technology.

In examining the works of Hans Haacke and Pierre Huyghe, this section explores the dynamics of systems and the material agency inherent in their interactions. Both artists embrace a complex, interconnected view of the world, where boundaries between the natural, social, and technological are dissolved, giving rise to artworks that are as much about process and transformation as they are about fixed forms. Haacke's art demonstrates the potential of systemic practices

to reveal the forces that shape our social and political realities. His application of systems theory—whether through biological processes, social structures, or technological networks—illuminates the ways in which power and control are embedded in the very systems that govern our lives.

Similarly, Huyghe's ambitious project *After ALife Ahead* and *UUmwelt* push the boundaries of artistic practice by embracing ecological complexity and material agency. Huyghe's works are dynamic systems in constant flux, where the interactions between living organisms, technology, and environmental factors produce unpredictable and emergent outcomes.

Importantly, the artworks of Hans Haacke and Pierre Huyghe introduce a "duration" that challenges the static time frameworks proposed by Michael Fried and Rosalind Krauss. Fried emphasizes the viewer's perception of instantaneousness, critiquing Minimalism for disrupting the autonomy of the artwork by involving the viewer. Krauss extends this critique, suggesting that time in artworks is governed by resistance to the viewer's temporal passage.

In contrast, Haacke and Huyghe create systems where time is not fixed or measured but unfolds "real" and unpredictably through interactions within the artwork. For Haacke, works like *Chickens Hatching* (1969), and *Rhine Water Purification Plant* (1972) emphasize time as a "real time" process driven by environmental feedback rather than viewer participation. Similarly, in *After ALife Ahead* (2017) and *UUmwelt* (2018), Huyghe's work intertwines time with the cycles of living organisms, AI, and environmental factors, where the system evolves through continuous change. In these works, time and material agency are inseparable. Time is not a static, self-contained moment but an ongoing, relational process, emerging through the interdependent functioning of biological, technological, and environmental systems. The presentness in these artworks is an evolving transformation, shaped by the agency of the materials and systems themselves.

5. Material Agency in Systems

This final section builds upon the previous discussions of theatricality, objecthood, and system aesthetics to analyze the perceptual experiences within different artistic contexts and the internal relationships of the artworks. It further explores the implications of material agency within these systems, especially from the perspective of the expanding technological systems in contemporary practice and complex ecologies. The discussion emphasizes how artistic practic-

es, particularly those engaged with system aesthetics, contribute to a broader material thinking that challenges traditional notions of objectivity, which relate to the nonhuman turn in thinking.

The exploration of material agency in art has long involved the relationship between natural objects, mechanical objects (machines), and humans. One way to consider this relationship is through the framework of "Quasi-Objects", a concept quoted by Halsall, a term Latour adopts from Michel Serres to describe entities that emerge from the interplay between human and nonhuman activities (Halsall 2016, 449-450). Quasi-objects emerge from the interplay between human and nonhuman elements, where identity and function are not inherent but relational. They exist as "strange new hybrids" between things and situations, acquiring meaning only within specific contexts or relational networks. This understanding of material agency challenges the idea of fixed identities, particularly within system aesthetics. Latour's flat ontology extends this argument, suggesting that all entities—whether social, cultural, or physical—are part of a network of relations and do not occupy a privileged ontological position. This relational understanding positions objects and systems as part of an interconnected whole, rejecting the traditional hierarchical view where human perception holds a dominant position over nonhuman entities (451).

This material consideration of art practices raises philosophical reflections about the position of the human subject in relation to technological systems and complex ecologies. In particular, the integration of natural and social systems in technological systems necessitates a reflection on the limitations and constructions inherent in human perception. Burnham's reflections on the cognitive dimensions of art underscore this point, particularly his assertion that art, like technology, is deceptive in that it "holds out the possibility of human transcendence," aimed at overcoming natural forces. However, Burnham cautions that both art and technology ultimately expose the illusion of transcendence, revealing that humans are governed by their "perceptual illusions" rather than possessing absolute control over their environments (Burnham 1983, 211). Burnham's critique intersects directly with the core issue of system aesthetics: the tendency to overlook the constructed nature and limitations of the observer's perspective. Whether observing biological, human-machine, artistic, or social systems, the act of observation itself can foster a false sense of objectivity. This detached, mechanistic view fails to account for the interconnectedness of systems, leading to a disconnection between the information observed and the entities that ob-

serving. Burnham's critique also resonates with Krauss's argument presented earlier in this article. Krauss states that when observing an object, "one to think of oneself as capable of reconstituting the object, from all around itself, regardless of one's own position, or its, is a notion that wants to forget that meaning arises only from *this* position, and *this* perspective" (Krauss 1981, 240). The parallel critiques of "perceptual illusion" and "reconstituting the object" both highlight how relations between humans and objects within spaces or environments are inherently complex, with no singular viewpoint capable of capturing these relations comprehensively. More importantly, the positional and spatial relations must be analyzed dynamically, particularly in complex systems, to reveal the agency of materials that are technically and ecologically connected from nonhuman perspectives.

Beyond the positional relations between observers and objects, the challenge to traditional notions of time is central to contemporary practices that engage with system aesthetics. Artists like Haacke and Huyghe highlight their practices as a dynamic, evolving process rather than a static framework. Haacke's works illustrate how time in art is driven by "real time" processes. Huyghe's more recent works further intertwine time with biological cycles, AI, and environmental systems, creating works that evolve continuously. In these works, time and material agency are inseparable, as the evolving transformation of the artwork is driven by the agency of the materials and systems themselves. This shift in understanding challenges traditional concepts of artistic temporality. While conventional frameworks often position time as fixed or measured against human perception, Haacke's and Huyghe's works emphasize time as relational and contingent upon the interactions between biological, technological, and environmental components. These works reveal a re-conception of "presentness" that is not a fixed moment but a variation and ongoing, evolving process shaped by the material agency of the systems involved.

The discussion of the relation of human and nonhuman and the time frame in ecological and technical systems leads to the consideration of material agency, raising critical questions about the role of nonhuman perspective in contemporary art history. Specifically, materiality critiques traditional human-centered viewpoints when examined through ecological and technical systems. It challenges the idea of an objective, stable viewpoint that can be detached from the static relations being observed. Material agency in artistic practices thus offers a form of critique that extends beyond representation, presenting a counterpoint to the idealized notions of objectivity that

have dominated Western thought. This critique aligns with the notion of "agential realism" (Barad 2003, 824), which posits that reality is constituted through the interactions of various agents—human and nonhuman—and that these interactions cannot be understood through the detached observation of isolated systems. In "Agential Realism," Barad proposes that reality's fundamental units are not static objects but "phenomena" emerging from specific "intra-actions" (822). This framework replaces the concept of independent entities acting upon each other with a model of co-constitution through entanglement. The agency of materials in art helps reveal the complex, entangled realities that emerge from these interactions. Through analyses of position, relation, and temporality based on system aesthetics and objecthood, this article tries to offer a more interconnected and ecological view of reality where humans, matter, and machines are systemically entangled both in historical art contexts and contemporary practice.

Notes

1. She critiqued the notion of "axiomatic coordinates" that presumed the possibility of comprehending an object in its totality, independent of the viewer's position. As she noted, "The meaning of depth is nowhere to be found in this suspension." This critique targeted the modernist presumption that artwork could achieve a kind of transcendental presence, existing independently of temporal and spatial contingencies.

2. By the mid-1960s, she argued, theatricality and performance had created an "operational divide" between the sculptural object and preconceived notions about knowledge that viewers might hold about both the object and themselves (Krauss 1981, 240).

3. The movement's development in the 1960s was significantly influenced by Maurice Merleau-Ponty's phenomenology of perception, marking what some scholars have termed a "phenomenological turn" in sculpture. Merleau-Ponty's assertion that bodily engagement forms the foundation of human perception offered a theoretical framework that helped explain the experiential nature of Minimalist works. According to his philosophy, visual perception cannot be separated from bodily existence; kinesthetic and tactile experiences are inherently embedded in the act of seeing. This understanding suggests that comprehension of an object's essence requires physical engagement through movement and touch (Merleau-Ponty 2002).

4. As Claire Bishop notes in "Installation Art: A Critical History," sculpture in this context transcended its traditional status as a closed form, becoming instead a perceptual field requiring the viewer's bodily presence (Bishop 2006).

5. In 1966, Robert Rauschenberg collaborated with Robert Whitman, Fred Waldhauer, and Billy Klüver from Bell Laboratories to establish Experiments in Art and Technology (E.A.T.), culminating in the technological art performance "9 Evenings: Theatre and Engineering" at the New York Armory. This technological turn in artistic practice was further institutionalized through exhibitions such as "The Machine as Seen at the End of the Mechanical Age" at the Museum of Modern Art and "Cybernetic Serendipity" at the Institute of Contemporary Arts, London, both in 1968. As seen in Edward Shanken's "Art in the Information Age: Technology and Conceptual Art" (Shanken 2002).

6. For Burnham, the transition in art practices mirrored the transition in science: the move from classical physics to atomic theory at the turn of the 20th century, which began to decenter the concept of matter and emphasize relational processes.

7. He draws on the scientific advances of the early 20th century, such as Planck's quantum theory and Einstein's theory of relativity, which revealed that material reality, whether biological or non-biological, could be understood as a series of interconnected energy states rather than as fixed, static entities. The implications for art were profound: artists could no longer be content with creating works that merely mimicked the tangible world; instead, they could create works that embodied systems of interaction—systems that, like the physical world itself, were in constant flux (Burnham 1968a, 113).

8. The principles of cybernetics, for example, were initially developed to address complex control systems, such as the tracking mechanisms for anti-aircraft guns. Norbert Wiener's application of feedback loops to automatic control systems, leading to the invention of the air defense warning system, epitomizes the fusion of military technology and systems thinking that set the stage for later developments in cybernetics and systems theory.

9. The post-World War II era saw an increased awareness of the ways in which technology, military-industrial complexes, and capitalist systems were intertwined. The global upheavals of the 1960s, particularly the May 1968 protests in France, the Vietnam War, and growing environmental concerns, led to widespread skepticism about the role of technology in modern life. Artists, philosophers, and political theorists began to question the implications of technology in a world increasingly dominated by surveillance, control, and mechanization. Burnham's systems theory, with its roots in the military-industrial complex, faced substantial ideological resistance in this climate. In particular, the critique of "technological determinism" became a central theme in art and political discourse.

10. She mentioned, "But many liberal and Marxist historians and social philosophers have labored to show us that these technocratic goals are not value-free but are products of a social and economic system for which 'control' of that kind is the logical corollary. Burnham's book is one of the most extensively and closely argued presentations of sculpture made in the service of a mechanistic view of the world. But that view — far from being necessary — is precisely what much of contemporary sculpture (and art in general) wishes to overturn." (Krauss 1981, 221)

11. Introduced by Skrebowski, As William Rasch and Cary Wolfe have noted, systems theory applies the same set of formal models to both organic (biological) and mechanical (technological) systems, thus challenging the ideological divide between what is considered natural and what is deemed social (Rasch and Wolfe 2000, 17).

12. As Katz points out, the second key dimension of Huyghe's system is its continuous change, which makes the outcomes of the system unpredictable. The work's unfolding trajectory, like that of a complex system, is open and characterized by uncertainty—traits that are central to the system's potential for entropy. In *After ALife Ahead*, some elements, like the flight paths of bees, exhibit discernible patterns, while others, like the behavior of cancer cells, are entirely unpredictable. These interactions introduce an element of randomness within the system, producing outcomes that persist until the next change occurs.

13. Katz states that the artist situating human extinction within Earth's sixth mass extinction, the work destabilizes anthropocentric narratives, rendering viewers incidental to a system that operates independently of their perception (Katz 2019).

14. Emphasized by Skrebowski, a notable inclusion is a community of blue bottle flies, which experience their entire life cycle within the exhibition space. Accompanying these biological elements are various environmental prompts — visual, auditory, and olfactory — as well as distinct computer-generated sounds. Huyghe's deliberate decision to leave layers of paint and dust on the gallery wall's surfaces allows for their natural displacement and alteration throughout the exhibition, further contributing to its dynamic ecosystemic ambiance. (Skrebowski 2019)

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