



## Cognitive Assemblages in Ecological / Digital Art

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## Abstract

This essay considers cognitive assemblages, as represented in several recent works of digital and ecological art, which themselves reflect upon contemporary environmental crises. The investigation is framed by the work of theorists N. Katherine Hayles and Timothy Morton in considering ideas of assemblages of cognition distributed between humans, non-human lifeforms, and machines, and the hyperobjects thematized by the works. The essay explores how these concepts can be read through installation artworks by artists including Phillipe Parreno, Kobie Nel, and Pierre Huyghe. How are digital artworks helping us to think through ecologies of distributed cognition during the contemporary period of planetary crisis in which they operate?

## Keywords

cognitive assemblage, distributed cognition, ecological art, ecology, nature, cyber-semiotics, metaphor, installation, immersion, machine learning

## Introduction: Immersion in an Uncanny Cognitive Assemblage

The Martin-Gropius-Bau museum in Kreuzberg, Berlin seems a waystation between worlds. The building was originally constructed in 1881 as an Arts and Crafts museum. During World War II, the Nazi SS headquarters were located directly next to the museum, and the building was severely damaged during Allied bombing in 1945. When the Berlin Wall was erected in the early 1960s, it was built directly adjacent to the museum, blocking off its front doors. During the late 1970s the building was reconstructed and restored. One set of windows now overlooks the Topography of Terror documentation center, an archive documenting the atrocities of Nazi Germany during WWII. The Gropius-Bau is constructed in an elegant neo-Renaissance style, and with all of these discordant historical currents flowing through it, the space inside seems somehow out-of-time, an alien in-between place.

Phillipe Parreno's "Immersion—Exhibition 4," [1] exhibited at the Gropius-Bau during the summer of 2018, is an assemblage of different elements which could be discussed as discrete objects and events but are better understood as a collective whole, an immersive ecology.



Figure 1. Photo by Scott Rettberg. Atrium space of Phillipe Parreno's Gropius-Bau exhibition, July 2018.

As I entered the imposing open atrium space of the Gropius-Bau, I felt a strange sense of entering another world with uncanny rhythms of its own. A large, rectangular, recessed reflecting pool was laid out directly in front of the entrance. The room was quite still aside from some distant music from off in alcoves all around the central space. In the pool at occasional intervals, barely perceptible bursts of water plopped up from beneath, creating reverberating circles in the water. As they rippled, the reflection of the geometric patterns of the window panes of the glass roof above warped and curved with the movement of water. The documentation of the exhibition explains that these patterns are actually sounds from elsewhere in the exhibition space "transduced into visual patterns of water lilies." On the other side of the pool, a large sculptural cluster of triangular sofa sections rotated slowly on a circular turntable before two black steel grids. After a few moments I heard a sudden surge of raw voltage. The grids lit with electricity, and as they charged, an image seemed to flash briefly in arcing bolts of light. As I settled onto the rotating furniture and watched the grids as they charged up again, I saw that this was indeed a kind of



picture, imprinted as a retinal afterimage when I closed my eyes: an electric insect, a flickering dragonfly.

The other rooms of the exhibition featured both objects, such as drawings of these same dragonflies, framed bits of asemic writing, and aleatory events. Dozens of polystyrene fish balloons floated in one room, driven by small fans that created shifting air currents so that the air above our heads seemed to become a kind of organic stream as a docent with a net struggled to catch some strays moving into other rooms.

Strange videos played in two dark rooms, including one of a crowd of people reacting to some sort of unexplained presence or rapture on an auditorium stage as flashes of light occasionally lit their confused faces as they wandered. The video redirected our attention as an audience not only to the reactions of the people on the screen, reacting to an unseen presence in a darkened room, but to our own reactions to the video and to each other, watching in a similar room. In two other spaces, player pianos stood in the center of the room. In one of these rooms, very little seemed to be happening as I was waiting, but shades covering two high vertical windows moved slowly up and down at intervals. I spent several minutes waiting for something to happen with the piano when I heard a nearly-imperceptible voice coming from an air vent on one side of the room. As I bent my ear to the vent, I could just make out bits of a monologue: a woman whispering about machines and computers, asking whether we were controlling the machines, or if they were controlling us. On the other side of the building, the player piano did in fact occasionally play a tune, but not consistently. Sometimes it would strike only a chord or two, other times it would play a full bar.



Figure 2. Photo by Scott Rettberg. Laboratory space of Phillippe Parreno's Gropius-Bau exhibition, July 2018.

In one of the alcoves off the main atrium, there was a small laboratory enclosed in a plexiglass case including beakers, scientific measurement equipment, and computers.

The exhibition brochure described this as a bioreactor “in which micro-organisms multiply, mutate, and adapt to their environment.” Monitored and transcoded, the yeast cultures in the beakers are connected to computers that are in fact the engine driving and “orchestrating the contingent events” elsewhere in the exhibition. The documentation claims that over time “these yeast cultures develop a memory—a collective intelligence—that learns the changing rhythms of the show and evolves to anticipate future variations.” Parreno describes the micro-organisms’ interactions with each other and with the conditions of their environment as “neural circuitry” that “sets a complex non-deterministic, non-linear mise-en-scène in motion through a series of non-periodic cycles.”

In her *Unthought: The Power of the Cognitive Nonconscious*, N. Katherine Hayles articulates a relationship between human and non-human cognition that is distributed between three types of actors: human beings engaged in the types of cognitive activity we typically characterize as “thought,” non-human life forms (from whales to micro-organisms to plants) that also clearly engage in acts of individual and distributed cognition, and AI and other forms of machine cognition. Hayles argues that it no longer makes sense to consider human thought as a process that occurs in isolation from the cognitive processes of these other cognizers with whom humans co-evolve in various forms of symbiotic and sometimes agonistic relations. Human semiotics must encounter bio-semiotics and cyber-semiotics. Hayles describes the position of homo sapiens within this network of cognitive associations as “...open to and curious about the interpretative capacities of non-human others, including non-biological life forms and technical systems; she respects and interacts with material forces, recognizing them as the foundation from which life springs; most of all, she wants to use her capabilities, conscious and unconscious, to preserve, enhance, and evolve the planetary ecology as it continues to transform, grow, and flourish” [2].

Parreno’s exhibition comprises what Hayles has described as a “cognitive assemblage.” The exhibition itself is a literal assemblage, composed not only of a variety of types of artistic objects, materials, texts, video, and events, but also an assemblage of different agents cognizing, processing, and influencing each other and the participants’ experience of the work. Moving through the exhibition is not so much an experience of “viewing” an artwork as an outside observer, but one of a kind of immersion within a cognitive assemblage. Audience members are not outside of the experience, nor are they simply surrounded by it. Instead, upon entering the exhibition they become an element within a cognitive assemblage in flux, cognizing agents within an assemblage that is itself cognizing. The micro-organisms, the transcoding computers, and the visitors themselves are all feeding into a variable system that produces the collective experience of the work as a gestalt. Numerous feedback loops between different elements of the work process information provided by systems that themselves are processing information provided by the elements they affect. For example, in the laboratory, information transcoded from the

observations of the micro-organisms becomes a variable affecting the rise and fall of the shades over the windows of the room of the laboratory itself. The micro-organisms' exposure to light affects the growth and movements of the micro-organisms in turn. The sounds the visitors to the exhibition make while moving through the space influences the production of the water lily patterns in the water, which might in turn affect the visitors' movements. The affect is that of an unavoidable, immersive ecology.

The visitors to the exhibition also impacted the experience of the other visitors. Because everyone was immersed in the exhibition, the artwork was in effect coterminous with the whole floor of the Gropius-Bau. We watched not only the strange furniture rotating on the turntable, but the movement of the other humans on that furniture. We experienced not only the fish balloons floating in the air currents above us, but the smiles and laughter of the other visitors playing with the fish and redirecting them in the air streams. As we processed, cognized, and reacted to the artwork, we became elements of the artwork itself. The work as a whole presents a cognitive assemblage which is non-anthropocentric in the sense that human agents are not the sole cognizers in the environment. In Hayles's view, "*Cognition is a process that interprets information within contexts that connect it with meaning.*" [3] When the growth of the micro-organisms in the lab is registered by the computers, that represents a process of cognition that connects that growth with meaning, which is then interpreted computationally, launching events which are connected with meaning by the humans interpreting the artwork, and their movements and actions within the space further represent interpreted acts of cognition, in a continuous cycle of feedback loops between micro-organism, computation, and human cognition.

### **A Canary in a Meat Packing Plant: Ecology After the End of the World**

Bergen Kjøtt is a curious exhibition venue north of the center of Bergen, Norway. From the 1960s until the early 2000s, the 2000-square-meter, four-floor building was a meat-packing plant. In recent years it has been converted in a cultural venue, including studios occupied by some 300 artists and musicians and a large exhibition space on the first floor—an open space large enough for livestock to be unloaded from trucks and prepared for slaughter. While this space has been thoroughly repurposed and is now a buzzing hive of artistic activity, it remains a clearly post-industrial site, with a different rawness and edge than typical white cube gallery spaces.

In April 2018 I visited Bergen Kjøtt to see the "Apple Puma" exhibition by South African artist, Kobie Nel [4]. Not knowing what to expect, I walked up the stairs to the second-floor exhibition space. Thick plastic curtains hung over the entry. After I pushed through them and entered the space, I jumped, startled, as something brushed by my head. As I turned the corner, I heard the sounds of clouds rumbling in the distance. I heard birdsongs and, as I looked up to the high ceilings, saw that a number of canaries were perched on ropes hanging overhead. Others were flying in the space,

nibbling at heaps of birdseed on the floor, strutting across bales of hay, or hopping from dowel to dowel on a custom-made bright green wall. Initially fighting a kind of panic, perhaps borne of my memories of Hitchcock's *The Birds* or a traumatic childhood encounter with a sharp-beaked parrot, I walked further into the space and saw that two armchairs were set amidst a kind of three-dimensional post-industrial tableau. The canaries were artificially bright, brilliantly yellow and flamingo pink-orange. Scattered on the floor were chunks of bricks that looked as if they had been gathered from a site of a recent demolition. A few wine glasses filled with water were perched precariously among the bricks, and the odd dish was scattered here and there. A number of clear plastic two-liter soft drink bottles filled with water and rose blooms of different colors inside them were placed amidst the scene. Some neon light sculptures in abstract patterns that called to mind jellyfish or beetles were mounted on the walls.



Figure 3. Photo by Scott Rettberg of Kobie Nel's "Apple Puma" installation at Bergen Kjøtt, April 2018.

Several high-resolution photographs hung on the walls of the exhibition: one was of a cactus into which the words "Apple Puma" had been carved, another was a Type-C print of a bright green serpent coiled up on a rope inside a wire mesh cage. The "Apple Puma" images were difficult for me to decode. They represented a process of human inscription on the living tissue of the cactus. Someone (probably the artist) had taken a knife to the cactus, and the cactus, thus scarred, would continue to grow bearing those words (readable only by humans) for the rest of its lifespan. The choice of words was also strange: "Apple" and "Puma" are both words that denote non-human life forms, neither of which have anything in common with cacti or the desert landscape. They are also words that have been appropriated and trademarked as corporate names, one for the world's most-valued computer company, the other for a pair of running shoes. The image presented a complex kind of signification. On the one



hand, the plant, this hardy, spiny life form in the desert, had been appropriated, carved into, literally branded with symbols that represented ideas of nature that had also been appropriated by corporate brands. On the other hand, the plant would continue to grow in its environment in spite of the carving. Modified and changed, it would adapt to the scars and continue to develop around them.



Figure 4. "Apple Puma" © 2018 by Kobie Nel.

The pattern of the wire mesh in the photo of the serpent was similar to the pattern of the scales on the snake's skin. The title of the photo "Marpat" suggests the connection between the two patterns. Marpat is short for "Marine patterning"—a multi-scale camouflage pattern formed of rectangular pixels of color that is also known as "digital camou." The pattern match between the wire mesh and the snake's skin in the image were indeed so close that at first, I thought the image must have been modified. Because the resolution was so high and the colors of the print so bright, the image took on an almost three-dimensional character. As I looked at the image, it was impossible for me to distinguish what was "real" and what was the product of a digital process. The ambiguity in the image highlighted one of the themes of the exhibition as a whole: is there ultimately any difference between a serpent in the garden and our invention of a serpent in the garden? The serpent, like climate change, remains regardless of whether or not we created it.

I settled into one of the armchairs and tried to process the scene of which I was now a part. Alone in this space with perhaps two or three dozen birds, I felt that I was no longer the observer. My sensation was not similar to that of a man looking into a bird cage, nor was it that of walking into one of the immersive rainforest exhibits you sometimes find in zoos—this was not a meticulously detailed rendering of a natural environment. This was not the canaries' "natural" environment. And yet, as the canaries chirped and nibbled and hopped and flitted across the factory floor, offering the

me the occasional sideways glance, it felt much more like I was the creature under bemused observation than the canaries were. It would be too much to say that I had stepped inside a bird cage, or that I had come to take the place of the bird, but the exhibition represented a clear disruption in "the order of things" and in our presumptions of "nature." The human was not at the center of things here, but an aspect of an ecology of an environment after the human.

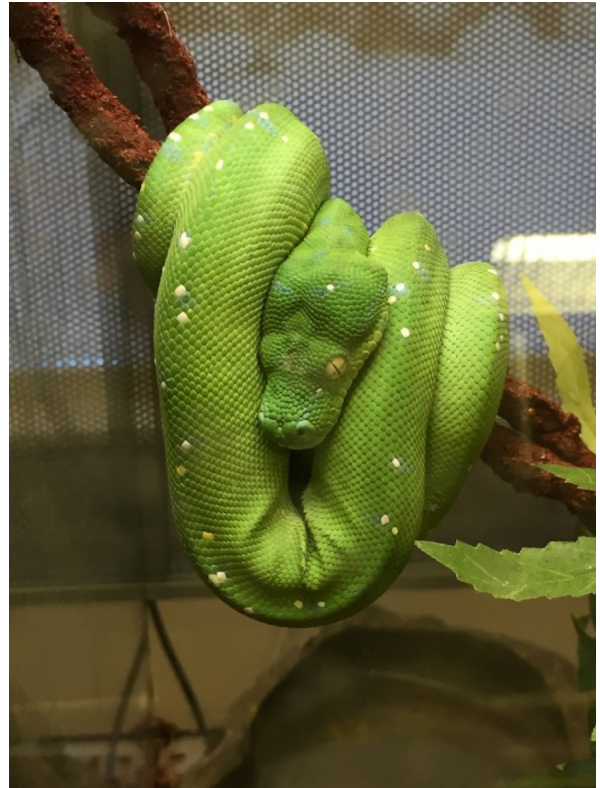


Figure 5. "Marpat" © 2018 by Kobie Nel.

The canaries in the room were not colored in the hues they were born with. The "true color" of the canary is white, but its color can be modified by dietary additives in a process known as 'colour feeding'—the colored birds fetch more at the market than plain white ones [5]. Although this strange space, this former slaughterhouse, had in some sense been temporarily given over to the birds, the birds themselves had been modified in a process of Anthropocene intervention. The birds and I were coequal parts of an ecology, as Timothy Morton has described, "after the end of the world" [6].

Morton highlights the fact that the concept of "the world," in fact the whole practice of "worlding" poses problems for the situation of the human within a planetary ecology. Following Heideggerian phenomenology, Morton explains that "different sentient life forms have different experiences of their surroundings, and hence phenomenologically [...] different worlds" [7]. When we speak of "the world" we inevitably speak of "our world" because our process of

understanding the world is inevitably based on our phenomenological experience of it. As soon as we begin to imagine a world, we therefore situate the human in its center. We could imagine that there are other worlds operating at any given time: the worlds of the dog or the cat, the worlds of the canaries or the serpent. It is difficult to think in terms of both my world and those other worlds simultaneously, as my world is the only one that I have direct experiential access to. Morton identifies the “fundamental problem with worlds: they do not exist” [8]. A world is always a construct, and when the world that I construct is in conflict with your world or the worlds of the serpent or canary, we have no basis for shared understanding. Yet we must base any proactive approach to the environment on the presupposition that a shared objective reality exists. By placing the human observer within a space that could no more be said to be the domain of human than it could be said to be the domain of the canary, Nel highlights this fact that any conception of a world centered exclusively on the human is an artificial construct.

The discourse of nature has always been a discourse of distancing. When we speak of “getting back to nature” or “natural ingredients” or “nature preserves” we do so by positing nature as something at some distance from the human, or outside of ordinary human experience. Because this positions nature as outside of “our world,” it also enables us to think of nature as something that can act upon without personal consequence. To think of nature is therefore always also to think of nature as “natural resources.” Nature might be the source of a pastoral idyll, but it is also a repository, for example, of fossil fuels. Nature is alternatively posited as an ideal (an Edenic state before the fall) or as a threat (that which is in conflict with the human, e.g. Jack London trying to build a fire in the snow). Nature is a construct in the sense that we posit it as something a priori to and distant from the human. The trouble with the concept of nature is that “Just when it brings us into proximity with the nonhuman ‘other,’ nature reestablishes a comfortable distance between ‘us’ and ‘them’” [9]. In this sense nature is a dangerous concept, as in distancing the human from a wider ecology of life forms we also posit a state in which we are apart from nature or can somehow exist without it. Morton argues that one consequence of the Anthropocene is that we no longer make such assertions. We can no longer imagine a nature apart from us. The environment that surrounds us is always already impacted by our presence in it.

There is no point in imagining the white canaries in their natural environment when I am surrounded by brightly colored canaries in a meat packing plant. The room in which the exhibition took place was not the only part of it that was post-industrial. All the lifeforms within it, human and bird, were post-industrial as well.

Morton argues for a form of “deep ecology” that would entail a shift from our view of “anthropocentrism to ecocentrism” [8]. There is nothing inherently anti-human about this perspective, but it does entail a realization that the planet is not a “world” uniquely shaped by human needs and human perspectives, but a complex ecology shaped by many forces,

and we can further say by many different types of cognizers. In Morton’s view, the understanding of the human as the steward of nature is at the core of the catastrophe of anthropocentrism that has already occurred. The catastrophe calls for a conception of the human that is not to be understood as a steward of that which it has already altered and damaged, but an element within it. Morton asserts that “what is called human is more like a clump or assemblage of things that are not strictly humans—without human DNA for instance—and things that are—things that do have human DNA. Humans did it [climate change], not jellyfish and not computers. But humans did it with the aid of beings that they treated as prostheses: nonhumans such as engines, factories, cows, and computers [...] The reduction of lifeforms to prosthesis and the machination of agricultural logistics is hubristic, and tragedy [...] is at least the initial mode of ecological awareness” [10].

The artworks discussed here share in common the element of reiterating this fundamental point: the type of ecological awareness that is necessary to mitigate the effects of climate change will require an understanding of the human as a cognitive assemblage that is enmeshed within a broader cognitive assemblage that humans impact continuously and are continuously impacted by. The fact that machine learning systems are playing and will play an increasingly omnipresent role in shaping human culture and society is only one of the more obvious ways in which we are part of a distributed cognitive ecology. And we must acknowledge our participation in this ecology as if our lives depended upon it, because they do.

### **Machine Learning in the Realm of the Flies: Pierre Huyghe’s “Umwelt”**

The Serpentine Gallery in London is housed in a former tea pavilion built in 1933 and nestled on the banks of the Thames. In November 2018, I visited Pierre Huyghe’s “Umwelt” exhibition there [11].

Just as in the Kobie Nel exhibition, I had to enter the space by pushing through plastic curtains (a feature which I now anticipate indicates the presence of non-human lifeforms). There are two central elements to “Umwelt”: a series of large screens flashing rapidly sequenced videos of machine-learning-generated imagery in separate rooms of the gallery space, and a colony of flies buzzing around the room. The images were generated by a neural network that uses human brain activity measured by fMRI data. The images produced are the result of a “reconstruction algorithm” developed at Yukiya Kamitani’s lab at Kyoto University [12]. Pierre Huyghe describes the process as follows: “They [Kamitani Lab / Kyoto University and ATR] are doing an MRI of someone who is thinking about an image and they take a brain wave at the moment that person is thinking about the image and this wave becomes a pattern and this pattern goes through multi-neural networks which have a databank of millions of images. To me it was fascinating that in a lazy, poetic way I could say ‘I just need to think and it prints.’” [13] The neural network had been

trained on images of animals such as birds, owls, and dogs and a corresponding set of patterns of fMRI data from humans who had looked at these images previously. The images shown in the exhibition were generated by the neural net in response to new observations of fMRI data from human participants who looked at the same set of images. The images the system generates are the best guess of its predictive algorithm of the shape and features of the animal the human was thinking of. The system is not showing the images it was trained on but the new images it struggles to produce in a live response to the human subject's thoughts. The results, like many neural-net-generated images, are uncanny forms of almost-parrots and pig-dogs that shift into almost-human skulls.



Figure 6. Photo by Scott Rettberg of Pierre Huyghe's "Uumwelt" installation at the Serpentine Gallery, November 2018.

The flickering imagery was extremely liminal in nature. As I watched it, I had the feeling that I was watching *something* think, almost forming an image, grappling to give a thought material form, but I could not say whether I was watching a neural network cognize or watching a human think. The images are of course simultaneously a representation of both human and non-human cognition and of the tenuous space in between. The fact that the images almost taking form were images of animals added another layer to the experience. The images of the neural net that (I think) was trained on pictures of dogs were particularly striking; in addition to the struggles of human and machine cognition represented, I was also witnessing animals trying to emerge, to surface, to be seen. Eyes struggling to take form in hollow sockets: a kind of pathetic and uncanny process that I could neither turn away from nor refuse to feel a sense of identification with.

"Uumwelt" is the German word for "environment" with an extra U. Like many aspects of this piece, we could speculate about what the extra U means: is it meant to suggest a personal "you" inseparable from the environment? Is it intended to suggest a negation, an "un-environment"? The artist does not explain this, nor to what extent Huyghe modified the imagery vs. simply appropriating imagery provided by the research lab.

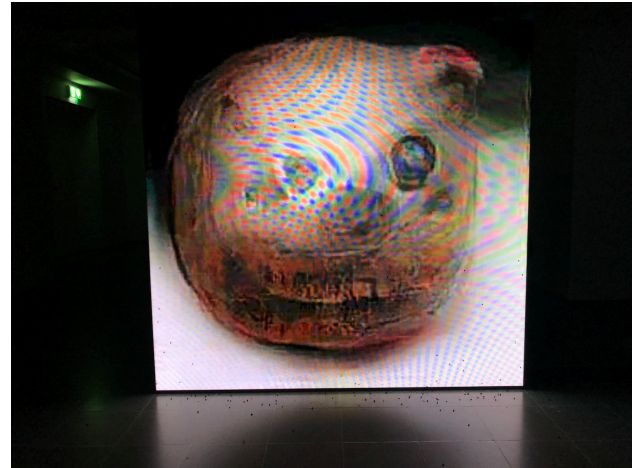


Figure 7. Photo by Scott Rettberg of Pierre Huyghe's "Uumwelt" installation at the Serpentine Gallery, November 2018.

The flies in the space played an important role in my experience of the piece, though the extent of their impact on the technical production of the work was unclear. While I was in the space the docent explained that the movement of the flies in the space was somehow filtering or modifying the presentation of the piece. She did not know how precisely, but there were sensors within the gallery space. The movement of the insects or their infrared concentration were somehow affecting the way that the images were presented: my guess is via the speed at which the system moved through the image-set, though it was difficult to tell.

The more important effect of the flies in the space was metaphorical. These flies were specifically bred from a strain of a species common in the park outside of the gallery space. The lifespan of the flies was a matter of perhaps fifteen to twenty days. The flies were nourished by feeders placed in a circle the ceiling at the center of the Serpentine Gallery. The paint on the walls of this room had been partially stripped, revealing layers of paint from previous exhibitions stretching back to the 1970s, and reiterating a sense of environmental memory.

All of the flies had been born in this gallery and would die in this gallery. Because they were all well-fed and because they were attracted to the bright screens that dominated each room of the gallery, the flies, if initially unsettling, were not particularly bothersome to the human visitors. They seemed not pests, but a kind of co-existent being.



In addition to the flies in the air, the floor was littered with the bodies of the flies that had died that day in the space. You had to walk carefully to avoid crunching their bodies underfoot. Every night the bodies of these dead flies were swept from the floors of the gallery, even as new flies were born to take their place.



Figure 8. Photo by Scott Rettberg of Pierre Huyghe's "Umwelt" installation at the Serpentine Gallery, November 2018.

I was forced to contemplate the nature of these flies' existence: their entire world consisted of this strange gallery environment, surrounded by images representing machines trying to represent human thoughts about animals. Although I rarely think about the thoughts of flies, in this situation I could not help but wonder about fly cognition. In a way it might seem cruel to breed creatures only for this purpose: to buzz around a dark gallery space and to crawl across flashing screens. The world of the gallery was their world-as-such, they would never know any other. They were literally created for these rooms alone. Yet in that moment in the room they were a co-equal part of a cognitive assemblage, a cognizing element of an enclosed system from which they would never escape. Their situation was not so different, in a way, from that of the human within the planetary ecology. The difference, of course, is that with consciousness and efforts, humans might at least be able to recognize their situation within this ecology and confront the hyperobjects, like climate change, which are difficult to comprehend discretely because they operate on a different time scale than, for instance, weather does, or even than our lifetime does, but might potentially be better understood and somehow mitigated over cycles of generations.

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## Author Biography

Scott Rettberg is a professor of digital culture in the department of linguistic, literary, and aesthetic studies at the University of Bergen, Norway. Rettberg is the author and coauthor of novel-length works of electronic literature such as *The Unknown*, *Kind of Blue*, and *Implementation* and combinatory films such as *Toxi•City: A Climate Change Narrative* and *Penelope*. His work has been exhibited both online and at art venues such as the Venice Biennale, Beall Center in Irvine California, The Chemical Heritage Foundation Museum, Arts Santa Mònica, the Slought Foundation in Philadelphia, and The Krannert Art Museum. Rettberg is the cofounder and served as the first executive director of the nonprofit Electronic Literature Organization. Rettberg and his coauthors were winners of the 2016 Robert Coover Award for a Work of Electronic Literature for *Hearts and Minds*, *The Interrogations Project*. He recently published the book *Electronic Literature* (Polity, 2019), a comprehensive introduction to the history of genres of electronic literature.