

When Do We Stop Being Human?

Prefiguring Nonanthropocentric Thinking

LUCY HG SOLOMON, CESAR BAIO, AND CESAR & LOIS

ABSTRACT

The art collective Cesar & Lois (artists Lucy HG Solomon and Cesar Baio) discuss their artworks that explore networked growth as a logical system and form of thinking, incorporating living organisms such as *Physarum polycephalum* (slime mold) and fruiting mushrooms. Their artworks imagine a technological network built on a microbiological framework. The hybrid computational model they envision is linked to the ecosystemic logic of living systems; the living network's decisions are ecologically responsive. The artists seek to obtain knowledge across species and disciplines as they reconsider the nature of thought.

ART THAT IMAGINES NONANTHROPOCENTRIC THINKING

Through art that straddles multiple disciplines, we attempt to orient the networked processing of information to living networks. In our artworks, we contemplate an ecosystemic intelligence, an artificial intelligence (AI) that processes information on behalf of and in the form of ecosystems [1]. By engaging with living and nonliving systems in our art, we invite viewers to consider the potential for connections across artificial and living nonhuman intelligences. We look at different understandings of human societies that consider humans as part of a web of life, and we ask what it will take for the rest of humanity to stop being human centered. Our work asks viewers to contemplate what that integration would look like and what the results might be for societal systems and for ecosystems.

Degenerative Cultures [2] and *Thinking Like a Mushroom* [3] are artworks with multidisciplinary inputs that propose a merging of microbiological networks and other forms of intelligence, and a radical reorganization of how most modern sociotechnical systems interact with nature [4,5]. In both artworks, we ponder social structures and networks (e.g. the

ways we exchange information) and how their architecture reflects and reinforces anthropocentric thinking and the positioning of nature as commodity. Jason W. Moore's accounting of nature's relationship to human social politics and of the destructive force of capitalism undergird our critique of anthropocentric machines [6]. Against the backdrop of late capitalism, Macarena Gómez-Barris identifies intangibility in "the capacity of life otherwise to reroute commodification and scientific classification." Gómez-Barris continues, "The intangibility of the forest metabolizes, grows, multiplies, and escapes the condition of monoculture, whose complexity forces consideration, as Eduardo Kohn asks, can forests think?" [7]

We pivot technology toward the intangibility of life forms. In our artworks, we propose hybrid technologies that see and listen to the complexity of living networks, challenging speciesism in technology and anthropocentric modes of thinking. In various experiments, as in Fig. 1, we layer microorganisms



Fig. 1. Workshop output, growth of *Physarum polycephalum* layered with text as part of *A Collaborative Writing Workshop with Nonhuman Entities*, Cesar & Lois, Coalesce Center for Biological Arts, University at Buffalo, NY, 2020. (© Cesar & Lois)

Lucy HG Solomon (artist, educator), California State University San Marcos, AMD Dept, ARTS 337, 441 La Moree Road, San Marcos, CA 92078-5017, U.S.A. Email: cesarandloiscollective@gmail.com. ORCID: 0000-0001-6369-9363.

Cesar Baio (artist, educator), Rua Elis Regina, 50 Cidade Universitária—Zeferino Vaz, Campinas, SP, 13083-854, Brazil. Email: cesarandloiscollective@gmail.com. ORCID: 0000-0002-1174-3526.

Cesar & Lois (art collective).

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with human thinking to see what overlaps and outcomes may occur. In doing so, we interrogate the human-serving vision of nature that extends from intellectual strands originating in modernity [8], a legacy that contrasts with the many ancestral traditions of living with nature in a communal (nonhierarchical) way [9]. This anthropocentric thinking rooted in modernity and spread through colonial capitalism persists even in the logic models at the base of our most prevalent technologies, networks, and social structures; these logic models prioritize human beings (or, rather, specific sectors of privileged human beings), generate incomplete datasets (in which groups of humans, other species, and entire ecosystems are disenfranchised), and deplete nature (via extractive manufacturing, energy consumption, and carbon output). Our biodigital hybrids, which we call *bhiobrids*, include fungi and protists that overwrite this human-centered logic, with books and Internet texts as the substrates for growth and colonization. These living artworks posit a web of human and nonhuman entities, with conduits among nodes that are living and others that are computational and electronic.

Advancing artworks that are also interspecies networks and living technologies necessitates working in laboratories and collaboration with scientists as we ponder how relational networks, consisting of living and nonliving, human and nonhuman nodes, might allow for different constellations of ecosystemic relationships. In an exchange with biologist Paul Cullen, we learned that communication for yeast cells takes place through a cell's metabolic pathways, in coordinated processes across cells, between groups of cells, and in cellular responses to external stimuli [10]. In a conversation with biologist Solon Morse during our residency at Coalesce Center for Biological Arts (see Fig. 2), we learned how environment and species are together involved in co-creation, as with the interconnected bacteria, fly, bat, and cave responsible for establishing a particular environment conducive to them all [11]. The ideas that flow from such exchanges catalyze our artworks, through which we imagine hybrid networks that require the type of cooperation present in nonhierarchical living systems, systems that manifest collaborative thinking.



Fig. 2. Lucy HG Solomon (Lois) and biologist Solon Morse prepare to extract DNA from the gut microbiomes of Cesar & Lois in the lab at Coalesce Center for Biological Arts, University at Buffalo, NY, 2021. (© Cesar & Lois)



Fig. 3. Colonized book from *Degenerative Cultures*, detail of growth of *Physarum polycephalum* over text of Jacques Boyceau and the French Formal Garden in *Sentient States*, Porto, Portugal, 2019. (© Cesar & Lois)

Our vision of an expansive form of network proposes the integration of technological and biological circuitry in order to construct new possibilities for thinking together [12]. We are conducting poetic and artistic experiments that allow us to imagine a nonanthropocentric future, which for us entails a society that does not privilege humans over nonhumans, or specific humans over other humans, and that weighs environmental impacts against desired outcomes, such as speed of delivery and cost to the end user, because this technology would rely on various inputs into its decision-making.

Thinking together—in various collaborative configurations, in ways observed in networked ecologies, as well as in new ways that we have yet to understand—has implications for human and nonhuman entities, for microclimates within bodies, and for environments at all scales. This requires that human beings—and eventually machines—think beyond the intellectual and political trajectory of the individual as carved out by modernity and perpetuated by global capitalism.

Within our living artworks that incorporate the technological and biological colonization of human texts, books that isolate thinking as a discrete and individualized process and that contextualize human logic as isolated and elevated become the substrate for microorganisms' growth. Others might see these books as "contaminated" by an external entity (see Fig. 3 for one example of a colonized book). We see these living books as conceptual leaps into a layering of logics and a critique of speciesism. Our artworks place human logic not at the top of a hierarchical chain of decisions but as part of the web of life [13]. Such a heterarchical perspective has cultural and creative antecedents and corollaries in a host of ancestral traditions and finds contemporaneous support in post-anthropocentric theorists' thinking.

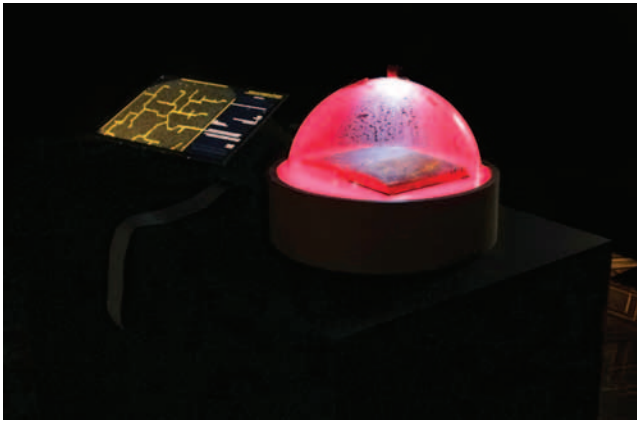


Fig. 4. *Degenerative Cultures*, documentation of installation with living artwork in *Edital CoMciência—Ocupação em Arte, Ciência e Tecnologia*, Belo Horizonte, Brazil, 2019–2020. (© Cesar & Lois)

DEGENERATIVE CULTURES

Degenerative Cultures, a series of artworks that responds to various local climate concerns (as shown in Fig. 4), includes a slime mold (*Physarum polycephalum*) that “tweets” and an AI that mirrors the growth of the *Physarum polycephalum*, with both the living organism and the machine consuming texts about human dominion over other living beings.

In the *Degenerative Cultures* series, slime mold, a networking protist, grows alongside airborne fungi across a book asserting human control over nature. The cultures advance across the text, excising words as they grow. Although *Physarum polycephalum* is not a fungus, it was previously misclassified as such. Human classification of the nonhuman is a fascination for us as artists, and it is also a central occupation of those who study the living world: a coding of living and nonliving entities that leads to greater understanding and the superimposition of human logic. In our artworks, human texts are revised as slime mold and collaborating fungi grow over the characters.

In the installation, the organisms’ growth is tracked and parameterized by a computer vision program, with images of that growth translated through optical character recognition and compared with the original text: The increasingly

jumbled text is then tweeted [14]. User interaction with the @HelloFungus Twitter feed spurs the AI to consume Internet texts about human rationalizations of climate change and plans for climate interventions, with the AI focusing in on the geolocation of the artwork and that place’s contemporaneous climate issues. The AI algorithm, based in natural language processing and informed by organic data, is trained to recognize texts that assert humanity’s dominance over nature—texts which are relevant to the site of the installation. The biological and digital agents’ revised texts make up an archive that reshapes those historical and contemporary expressions of human-centered ideologies that espouse human control over the living world [15].

Our artworks are the product of thinking across disciplines in ways that respond critically to the restrictive frameworks that extend from human-driven innovations like Cartesian perspective, extractivist capitalism, and artificial mind. Although thoroughly scrutinized and critiqued in academia, residues of Descartes’s prioritization of human perception endure, and his elevation of human reason over nature has echoes in efforts at geoengineering and climate fixes. In the Singapore edition of *Degenerative Cultures*, we grew slime mold over this passage by Descartes (see Fig. 5).

I perceived it to be possible to arrive at knowledge highly useful in life; and in room of the Speculative Philosophy usually taught in the Schools, to discover a Practical, by means of which, knowing the force and action of fire, water, air, the stars, the heavens, and all the other bodies that surround us, as distinctly as we know the various crafts of our artizans, we might also apply them in the same way to all the uses to which they are adapted, and thus render ourselves the lords and possessors of nature [16].

In the installation *Degenerative Cultures*, living organisms grow over books, moving according to microbiological logic. The books contain texts that champion human reason and claim the right of human beings to control the planet, including living beings and landscapes. Humanity’s reorganization of the planet, which has arguably led to the climate crisis, provides the backdrop for our thinking around human-centered technologies and the possibility for alternative forms of AI



Fig. 5. *Degenerative Cultures*, documentation of *Physarum polycephalum*’s growth over Descartes, resulting in tweets at the handle @HelloFungus, growth cycle and documentation from Global Digital Art Prize Biennial exhibition, Singapore, 2019. (© Cesar & Lois)

[17]. Responding to the Capitalocene as articulated by Jason W. Moore [18] and to “Integrated World Capitalism” as described by Félix Guattari [19], we consider the challenges to local and global ecosystems when global consumption moves minerals and bodies and redefines relationships to the living world. At a time when scientific literature intimates that mycelia communicate [20], when anthropology considers the ways in which forests organize themselves and “think” [21], and plant physiology experiments reveal that certain plants retain memories [22], thinking across species seems plausible, even promising, while AI based on human neurology, human language, and human-specific datasets seems exceptionally limiting and distinctly Cartesian.

In our artworks, we contemplate the kinds of decisions an AI based on environmentally responsive organisms and the complex trans-species chemical communication networks of the protist and fungal worlds might make. By working speculatively with hybrid networks, we obscure human logic with the logics that are embodied in microorganisms [23]. That does not mean that we postulate that these are the same or comparable (human and nonhuman logic); rather, we postulate that humanity can learn from these beings, whose survival on the scale of billions of individuals requires mutually beneficial and community-responsive decisions.

THINKING LIKE A MUSHROOM

Our ongoing artwork *Thinking Like a Mushroom* (Color Plate A and Fig. 6) offers an opportunity to reflect on another entity’s logical growth patterns and communication strategies. This artwork includes a meditation and a challenge: to think like a mushroom. We nurture the growth of mycelia and mushroom within philosophy, landscape design, botany, and language texts, posing conceptual questions about intelligence and how different logical systems might reorganize the knowledge represented by the books. After growing mushrooms within books and observing the conduits of mycelia through the pages, we began to develop a mycelial AI that examines books and attempts to alter them by removing their human focus. In an interdisciplinary panel on this work hosted by Yes We Cannibal in Baton Rouge, the panelists imagined which texts might be interesting for the mycelial AI to consume, with Meeting Ground artist Susan Main suggesting the fungal colonization of homeowner covenants written to protect profit rather than habitat [24].

It is our hope that by acknowledging and potentially accessing the logic of these nonhuman systems, we will become capable of more expansive thinking—thinking that is nonanthropocentric and that can make environmentally responsible and community-responsive decisions. Expansive nonanthropocentric thinking has real-world corollaries and antecedents in ancestral communities that espouse environmentally integrated thinking. In our development of *Thinking Like a Mushroom*, Robin Wall Kimmerer’s revelation of the Anishinaabe word *puhpowee*, “the force which causes mushrooms to push from the earth overnight,” was propulsive—an example of how living with other species inflects human logic and language [25]. When Déborah Danowski and Eduardo Viveiros de Cas-

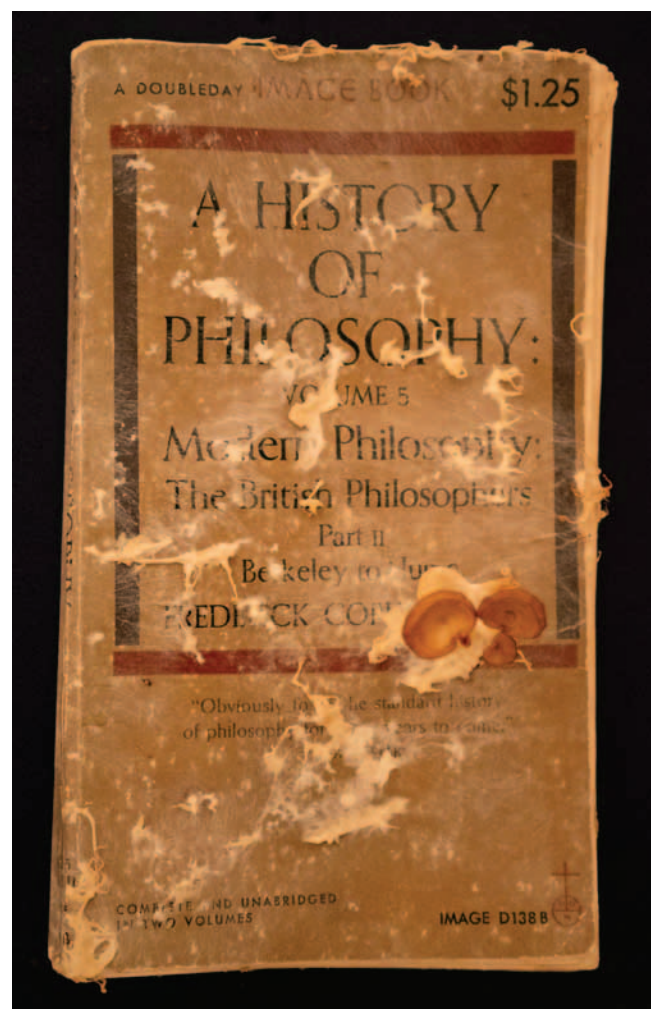


Fig. 6. *Thinking like a Mushroom*, 2018–present: mushrooms grow over philosophy texts, contemplated by viewers, aided by audio meditation, documentation of fruiting from growth cycle initiated in 2018, exhibited as living sculptures at A Ship in the Woods in Escondido, California, 2019, with editions at Mesa College Gallery in San Diego, California, 2019. (© Cesar & Lois)

tro assert that Amerindian collectives are “*not a remnant of the past*” but “*a substance of the future*” [26], we recognize our efforts of creative futurism as a repetition of a set of relationships that predates our existences, our technology, and our artworks. We strive to learn from these epistemologies to move in directions that recognize and value the traditions and wisdom of building human/nonhuman communities.

THINKING ACROSS LIFE FORMS

By collecting, growing, and observing living organisms, ranging from slime molds to fungi to lichens, we contemplate other modes of thinking, including various forms of microbiological logic that predate human beings. In *How Forests Think*, anthropologist Eduardo Kohn contemplates nonhuman thinking as a means of liberating human logic:

We are colonized by certain ways of thinking about relationality. We can only imagine the ways in which selves and thoughts might form associations through our assumptions about the forms of associations that structure human lan-

guage. And then, in ways that often go unnoticed, we project these assumptions onto nonhumans. Without realizing it we attribute to nonhumans properties that are our own, and then, to compound this, we narcissistically ask them to provide us with corrective reflections of ourselves.

So, how should we think with forests? How should we allow the thoughts in and of the nonhuman world to liberate our thinking [27]?

Kohn's thinking forest is perceived through the conduit of the Ecuadorian Amazonian Runa people. Most of us do not think in the way that forests think. Humanity in the large sense, the global and globalizing entity responsible for massive carbon output and the acceleration of climate change, performs and re-performs behaviors that defy a forest's logic.

How mushrooms think is connected to how forests think. Indeed, mycelia form mycorrhizal networks (akin to neural networks) within forests [28]. Anna Lowenhaupt Tsing, who simultaneously traces the cultural and economic mosaic of the matsutake mushroom and interviews mycologists about quorum-sensing, exclaims of mushrooms, "Chemical sensing that creates communal effects! How strange and wonderful the world" [29]. Donna Haraway recounts scientific models of relationalities that show that "interspecies—really, interkingdom—meetings and enfoldings can produce entities that hold together, develop, communicate, and form layered tissues like animals do" [30]. These logics—human and nonhuman—are at odds, with some exceptions, such as the logic of interconnection embedded in many Indigenous teachings and practices, which act as a foil for the formula for extraction and exploitation as delineated by Gómez-Barris: "Intangible geographies function as entropic spaces that cannot be contained by the extractive view, Western science, the commodity logic of late capitalism, or racial governmentality, but instead are managed by Indigenous peoples, cooperatives, and 'no contact' populations to amplify the multiplicity of the forest's life forms" [31].

CONCLUSION

When do we stop being human? This question extends in two directions. The first is related to the hypothesis that we stopped being human at a point in the past. We conjecture that this moment corresponds with the formulation of the so-called modern human, with the consolidation of anthropocentrism and the belief in human exceptionality. Such centering of the human existence, outside of Indigenous perspectives and more harmonious intercommunal relationships with environments, ultimately removes us from so



Fig. 7. Portrait of Cesar & Lois with *Physarum polycephalum*, 2018.
(© Cesar & Lois)

many factors of human existence. On the other hand, when we pose this question, we point to the future. When will we stop being human? The climate crisis has provided scenarios that make it possible to imagine a future of the planet without humanity. Approaching this question with another mode of thinking, one may consider its meaning to be: When will we stop being humans according to the concept of human (or man) forged in modernity? Further, when we will end the self-centered formulation that positions the human in a hierarchical position of control and authority over other entities in the living world? This text does not seek to answer these questions but assumes them as a starting point to speculate on the ways we position ourselves in relation to the ecosystem and technologies and societies we live in.

Connectionist and extractivist trajectories are on a constant collision course in which the latter threatens to expunge the former because of their distinct logics. Human logic that accepts ecosystem extraction as inevitable can be viewed as an extension of the Enlightenment's hierarchical moralism, and yet Kohn warns against drawing too close a moral lesson from the nonhuman world [32]. Despite this warning, we contemplate nonhuman forms of logic arising from the nonhierarchical organizations in forests and embedded in cooperative living systems (in Fig. 7 we replace our heads with networking microbiological organisms). Although applying the logic of the nonhuman to human challenges may constitute yet another form of anthropocentric thinking, the integration of human and nonhuman processing may bend human systems toward nonanthropocentric logic and away from speciesism. We as artists peer inward and ask, What does our logic dictate, and—in a time of ecological crisis and unprecedented technological connectivity—how do we build ecosystemic ways of being human?

Acknowledgments

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- See project documentation for *Degenerative Cultures* by Cesar & Lois at www.cesarandlois.org/degenerativecultures.
- See project documentation for *Thinking Like a Mushroom* by Cesar & Lois at www.cesarandlois.org/xknowledgesystems.
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LUCY HG SOLOMON is a Fulbright scholar whose global project probes microbiological connections across distant terrains. An educator in the Department of Art, Media and Design at California State University San Marcos, she leads the DaTA Lab (Laboratory for Data and Transdisciplinary Art).

CESAR BAILO is a CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) scholar whose postdoctoral work at i-DAT (Institute of Digital Art and Technology) at Plymouth University focused on data and the city. He is an educator in the area of art and technology at Universidade Estadual de Campinas (UNICAMP) and the director of actLAB (Laboratório de Pesquisa em Arte, Ciência e Tecnologia).

CESAR & LOIS is a collective formed in 2017 that probes the evolution of humanity's relationship with nature by advancing intersections and parallels between technological and biological systems. Cesar & Lois consists of artists Cesar Baio and Lucy HG Solomon, with contributions from other artists and scientists.

COLOR PLATE A: **WHEN DO WE STOP BEING HUMAN?
PREFIGURING NONANTHROPOCENTRIC THINKING**



Thinking like a Mushroom, 2019–present, living artwork in which mushrooms grow over philosophy texts and viewers contemplate that growth, aided by an audio meditation, documentation of fruiting from growth cycle initiated in 2018, exhibited as living sculptures at A Ship in the Woods in Escondido (pictured), California, 2019, with editions at Mesa College Gallery in San Diego, California, 2019; Yes We Cannibal in Baton Rouge (exhibition *Eat the Anthropocene*), 2021; and NARS Foundation in Brooklyn (*Texts and Soundings: The Image Talks Back*), 2022. (© Cesar & Lois)
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