BEYOND POLITICAL LIMITS CHAPTER II

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WE ARE ALL HOLOBIONTS!

RADIUS
Center for Contemporary Art and Ecology

BEYOND POLITICAL BOUNDARIES Chapter II: WE ARE ALL HOLOBIONTS!

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introduction
WE ARE ALL HOLOBIONTS!

The social and psychological transformations wrought by the pandemic have shed additional light on the idea that life is, first and foremost, a process of multispecies becoming-with: we humans, like before, are colonised by bacteria, viruses and fungi. “To be animal is to become-with bacteria, viruses and many other sorts of critters,” in the words of feminist philosopher of science Donna Haraway, as she continues: “The cultivation of viral response-abilities, carrying meanings and materials across kinds in order to infect processes and practices that might yet ignite epidemics of multi species recuperation and maybe even flourishing on terra in ordinary times and places.”[1] However, capital accumulation and its (neo)colonial tendencies that continue to objectify the world prevail, emphasising an ego-centric (instead of eco-centric) and anthropocentric race to the bottom, ignorant of the multitudes that need to be contained in order to make environments that are liveable. As anthropologist Anna Tsing reminds us, sustenance and resurgence in complex ecosystems is the work of many organisms, negotiating through and across difference, without which we humans would sacrifice our livelihood.[2]

Simultaneously it becomes increasingly clear that it is unattainable to continue to consider the Earth as a repository of natural resources for unbridled human exploitation, exhaustion and expanse. Economical and ecological crises, urthered by advanced capitalism, have exemplified the pitfalls of individualism and the competition-driven model of neoliberalism even further. Within this dynamic, it seems no longer possible to uphold simplistic demarcations such as self and other, difference and sameness, individuality and collectivity, and yet we are made increasingly complicit in the intensifying geopolitical polarities and the fever dreams of border politics in which ecocide and genocide form two sides of the same coin in the ongoing struggles for land sovereignty—of humans and other-than-humans.

Acknowledging that the world is toxic, irradiated, and full of injustice, and in moving against the feigned and fictitious categories of individuality and purity, this group exhibition is intended to form a multilayered assemblage that challenges current mechanisms of domination, competition, hierarchy, power structures and categorisation, in favour of ‘new’ ways of thinking and being in the world, in which reciprocity and interdependence form the basis.[3] Following a more recent paradigm shift, this exhibition does so on the premise of a symbiotic worldview, for which it echoes the work of evolutionary biologist Lynn Margulis (1938–2011) and the concept of the holobiont that she has popularised. From Margulis’ teachings, this exhibition follows the logic that life produces its own environment, by which living forms are not found *in* an environment, but that they—including humans—have ended up *making it*. The exhibition is conveyed through the work of a group of artists that consider the human and its figuration as an intrinsic part of life—we are not individuals by genetic criteria; the isolated island of the self being a myth—beyond a symbolic, wholesomely romantic and harmonious understanding of entanglement, to its recovery in the key of collaboration as a process of giving and taking. Rather than thinking about ourselves as individuated singularities increasingly turning in on themselves, the holobiont provides a call to action: feeling part of something more elaborately networked and extensive, to become part of an ecosystem comprised of symbiotic entities—we are all holobionts!

THE INTIMACY OF STRANGERS

Life is not a thing, life is a process—a proces of self-making. Life expands until it hits its limits. Life is material, but the process is formal or operational. Some use the word "autopoiesis" to name the self-making process. This is a "good word" because it reminds us that the behaviour or process of life supersedes its material elements. The foundational unit is the cell. The cell is a system that makes itself; no outer force or determination can bring about that process. All living beings share this process. Now, symbiosis is "the living together of unlike organisms." For instance, the lichen is a product of symbiogenesis, an organism formed from the symbiosis of a fungus and a bacterium or an alga. It is not a plant but a cross-kingdom consortium. Similarly, all life other than bacteria, all life in the remaining four kingdoms, is the outcome of symbiogenesis, the recombination of previously formed organism that yields something new and viable.[4]
— Summary by Bruce Clarke, of the video interview *From Life to Symbiosis* with Lynn Margulis

An adept in the study of microbes, cell biology, chemistry, geology, and paleogeography, as well as a lover of languages, arts, stories, systems theories, and alarmingly generative critters, including human beings, Margulis was a radical evolutionary theorist. Her first and most intense loves were the bacteria and archaea of Terra and all their bumptious doings. The core of Margulis' view of life was that new kinds of cells, tissues, organs, and species evolve primarily through the long-lasting intimacy of strangers. The fusion of genomes in symbiosis, followed by natural selection—with a very modest role for mutation as a motor of system level change—leads to increasingly complex levels of good-enough quasi-individuality to get through the day, or the aeon. Margulis called this basic and mortal life-making process symbiogenesis.[5]
— Donna Haraway

Symbiosis is the process of different organisms coming together and interacting, and the collaborations they establish within these encounters. There are multitudes of life forms that are interwoven with everything and everyone in our shared living environment—exceeding far beyond the limits of human scopic perception. One is enmeshed in a myriad of symbiotic affiliations that are composed of interactions between the host organism—be it an animal, plant, fungus—and the resident microorganisms, which shape elaborate and complex communities living in and on it. Such assemblages, without clear beginning or end necessarily, are called holobionts, a term popularised from 1991 by Lynn Margulis.[6]

Today, holobiont—etymologically “entire beings” or “safe and sound beings”—usually refers to a close association between different symbionts, usually host-microbiota symbioses (bacterial, protistan, fungal), that together form anatomical, physiological, immunological or evolutionary units: biotic communities, symbiotic assemblages! The holobiont thus refers to a host body—think of a coral reef, honeybees, beetles, and other pollinators, the rhizosphere of plants, or the human body—and its associated communities of microorganisms. Conversely, a host body and its microbiota thus form a holobiont: an entity formed by different species that become an ecological unit.[7] The coral reef cannot survive without its bacterial partners, whereas humans have around one to two kilos of microbes (of non-human DNA) in their intestines that are forming vital, life-sustaining dependencies for their subsistence.[8] Symbiosis is manifested in different relational forms and varying intensities, from mutualism that underscores mutually beneficial exchanges for the symbionts involved, to parasitism that is beneficial for one of the two, to competition that is unfavourable for all parties—and that these forms, with everything in between, exist next and through each other in practice, developing dynamically over their lifetime depending on environmental and other factors. Being essentially ecosystems (metagenomes) in themselves, holobionts are anything but static.

ONE PLUS ONE EQUALS ONE, TWO PLUS TWO EQUALS ONE

In the arithmetic of life, One is always Many. Many often make one, and one, when looked at more closely, can be seen to be composed of many.[9]
— Lynn Margulis and Ricardo Guerrero

[…] I want to focus specifically on the holobiont, the organism plus its persistent microbial communities, and the ways that this concept disrupts the tenets of individualism that have structured dominant lines of thought not only within biology but also in the fields as diverse as economics, politics and philosophy. The holobiont is powerful, in part, because it is not limited to nonhuman organisms. It also changes what it means to be a person.[10]
— Scott F. Gilbert

That is decidedly not the same thing as One and Individual. Rather, in polytemporal, polyspatial knottings, holobionts hold together contingently and dynamically, engaging other holobionts in complex patternings. Critters do not precede their relatings; they make each other through semiotic material involution, out of the beings of previous such entanglements.[11]
— Donna Haraway

Throughout her life and work, Lynn Margulis continued to emphasise such symbiotic relations, from microorganisms to planetary scales, that provided challenges to both human-centric concepts and the predominant notions used to define biological individuals. Rather than seeing organisms as biologically stable units, a symbiotic worldview favours the idea that lifeforms are “not ontologically in-divisible, but become in that the living modifies its relationship to its environment and also modifies itself.”[12] This is at the very heart of the concept of the holobiont by Margulis, “who described all eukaryotic living beings as the result of mergers between bacteria via reciprocal symbiosis within the biosphere, rather than something shaped by Darwinist notions of competition between organisms and survival through reproductive fitness.”[13]

Margulis’ work on symbiosis and symbiogenesis—from the outset—was considered unconventional and was deemed unpopular, especially in light of the (then) predominant neodarwinist theory of evolution. Epitomised by Richard Dawkins (and his pre-cursors like John Maynard Smith) and his publication *The Selfish Gene* (1976), neodarwinism is a scientific doctrine that claims that evolution and the origin of species rests completely on random mutations in DNA and natural selection of properties that are enclosed within this DNA. This in turn informed a more linear, reductive and competition-based understanding of evolution, relying strongly on generational next-of-kin inheritance. The holobiont theory stands as an antithesis to the neodarwinist doctrine, and challenges and seeks to replace, in the words of evolutionary developmental biologist and historian of biology Scott F. Gilbert, “the concept of a monogenomic individual whose essential identity arises during development, is maintained by the immune system, and which is selected through evolution.”[14]

Despite a growing understanding and a more extensive scientific embrace of symbiosis as an evolutionary biological theory and worldview—our current epoch sometimes even dubbed as the *Symbiocene*—it remains complex to capture the essence of the holobiont ‘figure’. Its symbiotic couplings and ever-unfolding interactions—for the right reasons—disrespect boundaries and elude fixation. Providing a fundamental counterpoint to the linear, individual and competitive scheme of survival of the fittest, the holobiont rightfully explodes the self-understanding of individual life, connects us symbiotically with other organisms through our microbiome, disrupts the division into subject and object, and frustrates the common ego concept. One, be it a plant, an animal, or a fungus, any complex organism as such, is never exactly one. Its apparent autonomy is an abstraction. In concluding with the words of feminist theorist and physicist Karan Barad: “To be entangled is not simply to be intertwined with another […] but to lack an independent, self-contained existence […]. Individuals do not preexist their interactions; rather, individuals emerge through and as part of their entangled intra-relation.”[15]

ι WIM VAN EGMOND

Origin of photosynthesis (2025)
Duration — 5 minutes and 25 seconds

Wim van Egmond works as a microphotographer, with close affiliation to scientific research. Interested in how scientific imaging can reduce nature to something abstract or artificial, he bridges his artistic background with microscopic photography. Within this discipline, the medium of photography is expanded with various techniques to enable us to perceive what the human eye cannot see and register.

In this new video work *Origin of photosynthesis*, Wim van Egmond invites us to attend a process of endosymbiosis, in which two organisms form a mutually beneficial relationship after one begins living inside the other. Under the microscope, a cyanobacterium—often confusingly referred to as blue-green algae—gets eaten by a ciliate, a single-celled organism, marking the start of a possible symbiosis. If integration occurs over time, the two may become a holobiont. As symbiont in this new cooperative relationship, the cyanobacterium contributes its capacity for photosynthesis to its host, the ciliate. It is precisely this ability, to turn sunlight into a shared energy source, that draws them together into potential symbiosis and enables their shared subsistence.

ζ ESTER VENEMA

Korstmos (We Are All Lichens Now)! (2018)

Ester Venema's work *Korstmos (We Are All Lichens Now)!* depicts the structure of a lichen. Referring to biologist Scott F. Gilbert's exclamation "We are all lichens", which challenges the idea of individuality by arguing that, neither animals nor plants exist as isolated beings, the work brings forth the biological reality of lichen life.[16] Lichens are composite beings consisting of fungi, algae and other microbial collaborators. They are decentralised, co-constituted, and continuously transforming forms of life.

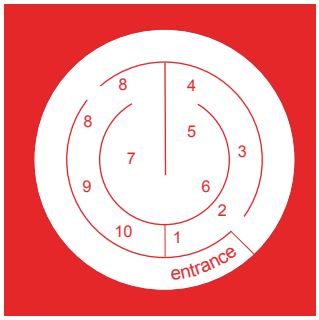
Korstmos (We Are All Lichens Now)! contends that lichens are figures of becoming: trans, plural, and symbiotic. It quietly echoes the artists' own experience of transformation, moving beyond a fixed identity. Lichens constitute themselves trough active relationships between collaborating entities. In paraphrasing the words of artist and writer Laurie Palmer, they remind us that seeing transformation as a departure from the self is a myopic view. Palmer suggests that lichen(s) are two—or many—or anyway, more than one; they are "them"—a trans/queer constitution.[17] Arguably, lichens refuse to fit into the binary shapes of thought that modernity has imposed on the many worlds that intersect ours.

ε LAURE VIGNA

Back and Forth it is Several (2021)
How She did it Twice (2021)

Laure Vigna's glass sculptures are shaped by the life they contain. Modeled after the topology of the Klein bottle—a volume with a continuous surface without clear inside or outside—these blown-glass sculptures host colonies of cyanobacteria. Among the oldest known organisms on Earth, cyanobacteria were the first to perform photosynthesis. By producing oxygen as a waste product, they are assumed to be responsible for oxygenating the Earth's atmosphere two billion years ago. As Lynn Margulis revealed, their symbiotic fusion with eukaryotes led them to eventually evolve into plant and algal cells capable of performing photosynthesis.[18]

In Vigna's work, these cyanobacteria return as co-agents, forming filaments on the glass surfaces of the sculptures, tinting them from within. Together, they form a symbiotic whole. The glass body acts as a host, offering its vessel-like qualities by providing water, light and enclosure.
In return the cyanobacteria slowly transform its surface.
Vigna's use of the Klein bottle, which collapses the boundary between the inner and outer, gestures towards the organismal structure of the holobiont, challenging the dualism between interiority and exteriority, between self and other.



ϟ NINA VAN HARTSKAMP

WORLDS WITHIN, bodies, bedrooms and breath (2020)
Duration — 30 minutes and 33 seconds

The world we perceive daily is only one plane of being within a larger world of worlds that stretches beyond what we humans can see, touch or measure. In *WORLDS WITHIN, bodies, bedrooms and breath*, Nina van Hartskamp turns to the air we breathe to lay bare the microbial worlds that quietly shape and connect our lives. In the early days of the Covid-19 pandemic, van Hartskamp sent Petri dishes by mail to forty-eight individuals in quarantine, asking them to expose the dishes overnight in their bedrooms. She later photographed the microbial growths captured in the Petri dishes, creating an archive presenting us with the life that is suspended in the air we breathe.

As a grounded counterpart to the 'overview-effect'—the relational shift astronauts describe when viewing Earth from space—van Hartskamp introduces the concept of the 'inview-effect'. Where the former evokes a sense of interconnectivity from afar, the 'inview-effect' invites this reflection from within. *WORLDS WITHIN* activates this awareness by highlighting that, on the smallest scale, we all find unity in one another through the microbes that pass within, between, and around us. In the words of philosopher Emanuele Coccia, "In breath, for the duration of an instant, the animal and the cosmos are reunited. […] To breathe is to know the world, to penetrate and be penetrated by it.".[19] Van Hartskamp's magnified images are reminiscent of celestial bodies and bridge planetary and microbial scales, connecting these coexisting and largely unseen worlds.

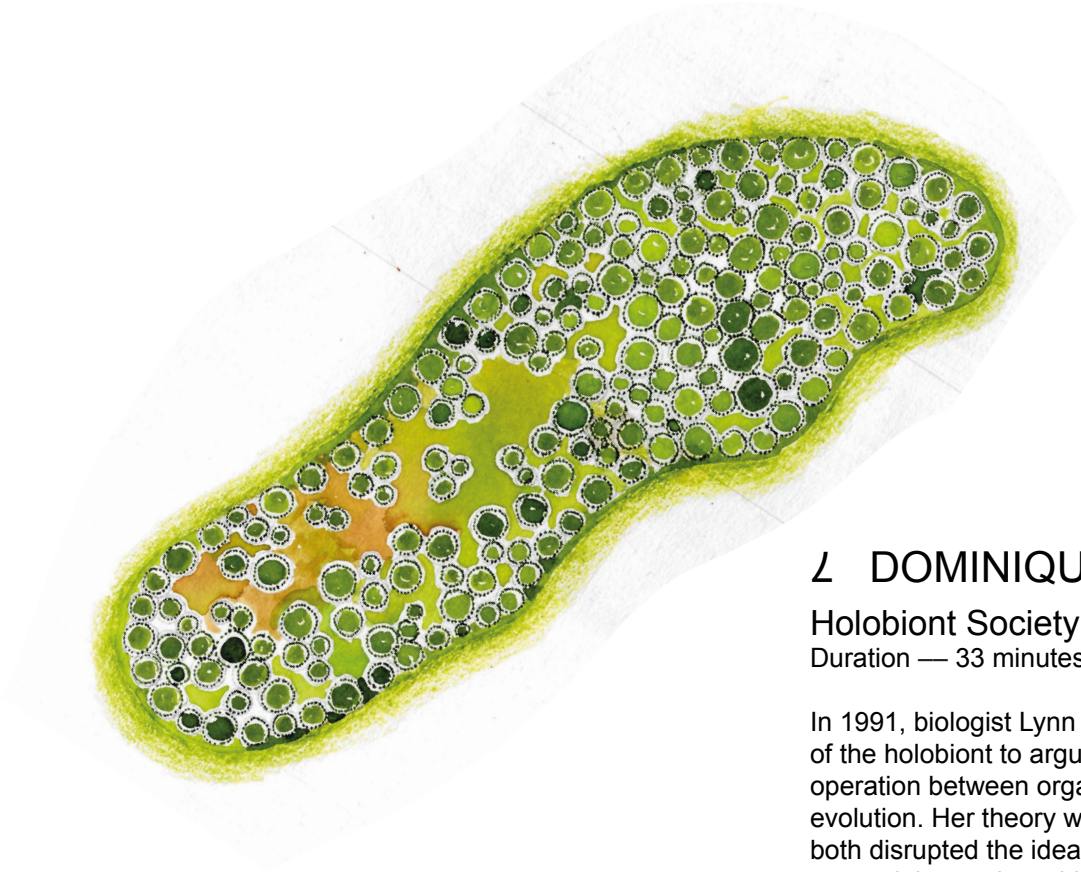
Ϛ ELISA STRINNA

My Body is a Plant - leaves my blood (2025)
My Body is a Plant - flowers my stomach (2025)
My Body is a Plant - Innervation (2025)

Elisa Strinna's artistic research draws from phytotherapy, ethnobotany, and traditional healing methods to explore the deep interdependence between humans and the botanical world. In collaboration with herbalist Karin Mecozzi, Strinna investigates a porous and co-constituted way of being, shaped and reshaped through contact with vegetal life *My Body is a Plant* challenges the notion of the body as a closed, autonomous and self-contained entity.

Strinna's work finds an echo in philosopher Micheal Marder's notion of *plant-thinking*, a reorientation of our own thinking in dialogue with vegetal existence. *Plant-thinking*, Marder writes, is a "non-cognitive, non-ideational and non-imagistic" mode of understanding, a "thinking without the head".[20] It is an invitation for encounter with the vegetal world and to abandon modernity's metaphysical projections of plants as mute, passive beings without agency or interiority. Strinna's work arguably takes up Marder's invitation for a non-anthropocentric understanding of plant life by giving form to a relational and embodied thinking with the vegetal.

Developed during her residency at the European Ceramic Work Center in Oisterwijk, this new chapter of *My Body is a Plant* centers on *Hyoscyamus niger*, a toxic plant historically used in healing and ritual practices. In phytotherapy and Chinese medicine, it is used to treat disorders of the nervous and digestive system; systems that in turn resemble the very veins and petal structures of the plant itself. This morphology becomes visible in Strinna's sculptures. They imagine healing as a process of becoming-with, or becoming-other.



9̄ JENNA SUTELA

Holobiont (2018)

Duration — 10 minutes

Jenna Sutela's video *Holobiont* connects gut microbiomes to scientific and speculative inquiries on life beyond Earth. Sutela imagines extremophilic microbes (organisms capable of living in extreme environments) as potential carriers of life beyond planets, challenging the idea that humans are the central agents of evolution. The work specifically focuses on the *Bacillus subtilis*, a probiotic that is found in fermented foods such as nattō and kimchi.

Partly shot inside the Planetary Protection Office of the European Space Agency, *Holobiont* documents protection protocols designed to prevent Earth's microbial contamination of other worlds. Yet, rather than upholding this logic of sterility and control, the video opens towards a culture of interspecies symbiosis. Sutela presents the body as a carrier of foreign life—the alien is within us. As the film suggest, we are "holons within holons," bodies within bodies. To eat nattō is to host another within, an invitation for symbiotic world-making, rather than an act of consumption. In this gesture, *Holobiont* also distances itself from the patriarchal overtones of panspermia—the theory that life spreads throughout the universe via microbial 'seeds'. Instead, Sutela turns to the egg as a symbol for unfolding potential, where life does not arrive from outside, but emerges from within.

∠ DOMINIQUE KOCH

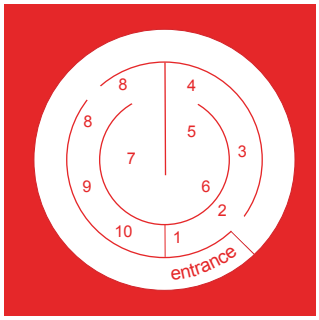
Holobiont Society (2017)

Duration — 33 minutes and 30 seconds

In 1991, biologist Lynn Margulis popularised the concept of the holobiont to argue that interdependence and co-operation between organisms are fundamental drivers of evolution. Her theory was severely criticised at first, for it both disrupted the idea that humans are on the top of the terrestrial organisms hierarchy and proposed a deeply entangled and co-dependent system between species to ensure their survival. The idea that we are holobionts turned the canonical definitions of individuality in anatomical, genetic, developmental, immunological, physiological, and evolutionary contexts upside-down.[21]

In her film and sound installation *Holobiont Society*, Dominique Koch applies this theory to a socio-political sphere. Through personal conversations with philosophers Donna Haraway and Maurizio Lazzarato, she weaves discussions on the codependency of species together with critique on neoliberalism. In so doing, the work reveals that by thinking from the holobiont, we can find alternatives to capitalist ways of reasoning and relating.

Apprehending the holobiont and its scientific, philosophical, and cultural implications entails a radical shift in how we think of ourselves in relation to what surrounds us. Like Haraway reminds us in the film: "Nothing makes itself, even in the most elaborate systems. Everything is always becoming-with and is always sym-poetic." The political constructs of purity and superiority fall through when genetic individuality is scientifically debunked. Dominique Koch inserts us into this paradigm and proposes a holistic body of knowledge from which to re-examine our perception of the self and the many multitudes it contains.



8 LUISEN ZELA-KOORT

Worlds Without Fever (III) (2023)
Worlds Without Fever (IV) (2023)

Luisen Zela-Koort's paintings envision spaces where the hermetic logic of modernity and barriers between inside and outside, human and non-human, self and other are undone. What emerges instead are open forms that move across micro and macro scales, touching both on cellular life and extraterrestrial worlds.

Rooted in Zela-Koort's artistic research into biochemistry, microbiology and astrobiology, their work resists the zero-sum and binary-driven narratives that modernity imposes on the history of life on this planet. Drawing from what they call a *Queer Metaphysics*, their work embraces desire as a generative force to imagine new alignments between bodies and their environment. Depicted are bodies that appear porous in open systems. Porosity here becomes an invitation for an open, relational, hybrid and mutual way of being. Zela-Koort's work imagines a shift from the language of individuality to one of symbiosis, from autonomy to interconnection and coexistence.

9 CANDICE LIN

Memory (study #2) (2016)

Memory Study #2 is a living sculpture sustained by human waste and institutional care. A cluster of lion's mane mushrooms grows outward from a red ceramic vessel, lined with a polypropylene grow bag. The fungi are nourished by a fine mist of distilled urine donated and periodically sprayed by RADIUS staff. Lion's mane—an edible fungus believed to support memory function in Chinese medicine—is a saprophyte: an organism that sustains itself by breaking down organic matter in decay. The sculpture turns waste into sustenance into growth.

Together with bacteria, fungi are the creators of the soil in which plants grow. As anthropologist Anna Tsing suggests, fungi are world builders: decomposers that make life possible for others. They thrive in entanglement and trough symbiotic arrangements and collaboration with plants and animals.[22] *Memory Study #2* echoes this holobiont logic of being trough exchange and co-dependence. The work becomes a metabolic system linking bodies, labor and institutional maintenance as RADIUS' byproducts become part of the sculpture's digestive circuit. In return, the mushroom grows; edible and medicinal. It stages a mutualism where nourishment circulates across and between bodies.

10 SONIA LEVY

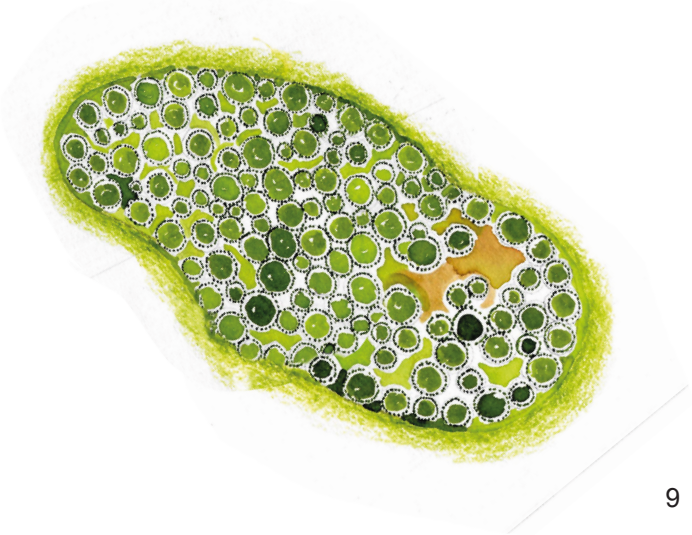
For the Love of Corals (2018)

Duration — 23 minutes

In 2017, Sonia Levy started following a team of aquarists and marine biologists led by Jamie Craggs at the Horniman Museum in London. In a broader effort to prevent the extinction of coral reefs in the face of climate change, *Project Coral* attempts to develop techniques to support coral reproduction in captivity. Levy's film *For the Love of Corals*, shows us the intimacy in the scientifically precise care work happening in a laboratory basement of the museum, transformed to replicate the climatic conditions of the Great Barrier Reef.

The Horniman Museum, like many natural historical institutions, still echoes enlightenment values of classification, universal order and human mastery over nature. Values and logics that the biological reality of corals—a holobiont being composed of photosynthesising algae, cnidarian polyps and other microbial collaborators—resists. Corals are worlding entities, they create webs of interdependent life and show that life forms do not simply adapt to environments, but actively shape them for themselves and for others.

Coral reefs are among the most vulnerable ecosystems on the planet, bleaching, dissolving and disappearing in oceans that grow hotter and increasingly acidic. Philosopher Donna Haraway rejects both apocalyptic fatalism and the cold optimism of geo-engineering, urging instead a commitment to shared responsibility across species. As she notes, the lives of at least 250 million people depend directly on the ongoing vitality of reef systems.[23] Coral holobionts show us that flourishing, if it is still possible, will be collaborative, or not at all.



1 Donna Haraway, *Staying with the Trouble*. *Making Kin in the Chthulucene* (Durham and London: Duke University Press, 2016), 65 and 114.

2 Anna Lowenhaupt Tsing, 'A Threat to Holocene Resurgence is a Threat to Liveability,' in *The Anthropology of Sustainability*, ed. M. Brightman, J. Lewis (New York: Palgrave Macmillen, 2017), 52.

3 Here we recommend the publication *Against Purity: Living Ethically in Compromised Times* (2016) by Alexis Shotwell.

4 Summary by Bruce Clarke, of the video interview *From Life to Symbiosis* with Lynn Margulis. Source: NHK TV.

5 Haraway, *Staying with the Trouble*, 60.

6 The term holobiont was first coined by German theoretical biologist Adolf Meyer-Abich, who introduced the holobiont concept in 1943. Although nearly completely forgotten today, in the 1940–60s he developed a comprehensive theory of evolutionary change through 'holobiosis'. It had a surprisingly modern outlook, as it not only addressed tenets of today's evolutionary developmental biology (evo-devo), like the origin of form and production of variation, but also anticipated key elements of Margulis' later endosymbiotic theory. The further popularisation of the term holobiont by Lynn Margulis was sprouted by two cases: that of organelles called mitochondria and chloroplasts. Mitochondria generate energy by metabolising glucose, and are found in all eukaryotes. Chloroplasts engage in photosynthesis, and are restricted to algae and plants. Both are the distant descendants of formerly free-living bacteria that began their relationship with the cells they now call home over a billion years ago.

7 More progressively, in Haraway's reference of Margulis: "Like hers, my use of holobiont does not designate host + symbionts because all of the players are symbionts to each other, in diverse kinds of relationalities and with varying degrees of openness to attachments and assemblages with other holobionts." Haraway, *Staying with the Trouble*, 60.

8 In the case of the coral reef, its attracting colours come from photosynthetic protists called zooxanthellae that live inside special cells in the sessile animals responsible for secreting the limestone of which coral heads are made—and it is these which provide the holobiont with most of its nutrition.

9 Lynn Margulis and Ricardo Guerrero, 'Two Plus Two Equals One: Individuals Emerge from Bacterial Communities,' in *Gaia 2: Emergence: The New Science of Becoming*, ed. William Irwin Thompson (Hudson, NY: Lindisfarne Press, 1991), 50–67.

10 Scott F. Gilbert, 'Holobiont by Birth: Multilineage Individuals as the Concretion of Cooperative Processes,' in *Arts of Living on a Damaged Planet*, ed. Anna Tsing, Heather Swanson, Elaine Gan, Nils Bubandt (Minneapolis and London: University of Minnesota Press), 75.

11 Haraway, *Staying with the Trouble*, 60.

12 Thomas Feuerstein, Jens Hauser, and Lucie Strecker, 'Towards a General "Holobiontics"? Beyond Selfism and Anthropocentrism,' in *Life is Other. A/Biotic Entanglements in Art and Curating* (Berlin and Boston: Walter de Gruyter GmbH, 2025), 9.

13 Ibid., 9.

14 Scott F. Gilbert, 'Symbiosis As The Way Of Eukaryotic Life: The Dependent Co-Origination Of The Body,' in *Journal Of Biosciences 39, no. 2* (2014), 202.

15 Karen Barad, *Meeting the Universe Halfway. Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press, 2007), ix.

16 Scott F. Gilbert, 'A Symbiotic View of Life: We Have Never Been Individuals,' in *Quarterly Review Of Biology 87, no.4* (2012), 336.

17 A. Laurie Palmer, *The Lichen Museum* (Minneapolis and London: University of Minnesota Press, 2023), 10.

18 Lynn Margulis, Ricardo Guerrero and Mercedes Berlanga, 'Symbiogenesis: the holobiont as a unit of evolution,' in *International Microbiology no. 16* (2013), 133-43.

19 Emanuele Coccia, *The Life of Plants. A Metaphysics of Mixture*, trans. Dylan J. Montanari (Cambridge: Polity Press, 2019), 63.

20 Michael Marder, *Plant-Thinking. A Philosophy of Vegetal Life* (New York: Columbia University Press, 2013), 10.

21 Gilbert, 'A Symbiotic View of Life,' 325-341.

22 Anna Lowenhaupt Tsing, *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton, NJ: Princeton University Press, 2015) 115.

23 Haraway, *Staying with the Trouble*, 56.