
antennae
THE JOURNAL OF NATURE IN VISUAL CULTURE
SUMMER 2022
mycologies

of humidity, especially during the first weeks which led us in cleaning the Petri's dish so that our "garden" can be visible to the visitors at all times.

GA: How do you feel about the concept of "multispecies architecture"? Is it a truly sustainable model or more of a space for thinking beyond the anthropocentric restriction of more traditional architectural approaches?

d: As a team, we strongly believe that the concept of "multispecies architecture" is the sustainable model for our planet. We consider ourselves fortunate in having the chance of sharing our beliefs with the curator of the 17th Biennale, Hashim Sarkis, and the participating groups. We firmly believe that the only way for humanity to survive the multiple crises and thrive is by respecting the natural equilibriums and learning from the way that other species function and interact. The concept of "multispecies architecture" might at first seem like another avant-garde approach that only aims to broaden our perspective however it firmly expresses and forms its era. Architecture cannot be only anthropocentric and rigid anymore, it must create spaces inspired by the different forms of life while respecting and coexisting with its surrounding nature.

GA: What climatic/sustainability challenges is Greece more concerned with at this moment in time?

d: Mediterranean countries, and especially Greece, are very fragile due to the sparse – though intense- rains and warm climate. We are alarmed by the challenges that Greece is and will be facing – and are leading the program *LIFE-IP AdaptInGR boosting the implementation of adaptation policy across Greece* for Greece's adaptation to the effects of climate change.

GA: Are currently working on something new?

d: We have been contacted by a very interesting group of artists to collaborate on a new exhibition in Rome Italy which will open by the beginning of 2022. In this exhibition, we are exploring fungi and their sexuality and how it connects with the evolution and future of sexuality. We will be announcing more details shortly.

doxiadis + is considered one of the most prominent and pioneering architectural and landscape architecture offices in Greece. For more than 20 years, doxiadis + creates projects based on the philosophy of human coexistence with nature (forming symbiosis), combining the legacy of Greek classical thought with the pioneering ideas of today.

Founded in 1999 by Thomas Doxiadis, Architect-Landscape Architect ASLA, B.A. MArch, MLA Harvard University, the office undertakes Architecture and Landscape Architecture projects. With a core value of respect for the natural environment, the company is active in issues such as climate change where it works in the "LIFE-IP AdaptInGR - Boosting the implementation of adaptation policy across Greece" to adapt Greece to the effects of climate change.

Metabolic rhythms of fungus-farming

The fungus farming of leaf-cutter ants can be amplified by means of creative uses of technologies. These ants produce acoustic vibratory messages and enact fermentation processes by cutting, licking, and secreting chemical substances on leaves. This ant-fungus association is however not exclusive and is entangled with antibiotic-producing microorganisms and fungal parasites. What follows is a ten-years exposition of artistic installations dedicated to amplify mycological relations in vitro, in silico, and in vivo. Kuai Shen's performative ant mediations demonstrate social recompositions and decompositions of different kinds based on the concept of metabolic rhythms. The full title of this essay is 'Metabolic rhythms of fungus-farming: a techno-ecological aesthesis in performance'.

text and images: **Kuai Shen**

Leaf-cutter ants of the *Attini* tribe, genus *Atta* and *Acromyrmex*, are fungus farmers. They weave complex relations with other non-vertebrate life forms in their natural Amazonian habitats, but also in artificial environments cared for by ant lovers, zoological institutions, and scientists around the planet. These ants have become a paragon for the scientific study of symbiosis. But they are also considered herbivore plagues by the agricultural industry in South America and are treated with pesticides. Despite the capitalist appetite for monocultures clearing patches in Amazonian rainforests, some leaf-cutter tribes still resist and emerge from underneath the surfaces of toxic management to carry on with their farming. This form of nonhuman farming can be explored through an artistic practice of amplification of metabolic processes that intertwine multiple co-existences.

When a vegetation source has been allocated, and recruitment trails have been reinforced through chemical messages, leaf-cutter ants enact a particular performance. Using sharp-serrated mandibles and emitting resonant vibrations, each ant cuts a distinctive piece of leaf and carries it back to an intricate network of chambers underground. A prominent parade forms along the way on the forest tapestry in which green flags appear to dance in synchrony, swaying from side to side beneath the canopy. Deep in the nest, specialised ant gardeners take over, fragmenting, licking, and rubbing the leaves with glandular secretions. The leaf fragments are then carefully implanted into selected sections of different fungal gardens interconnected through tunnels, along which ants move inoculated mycelium from one compartment into another.

The fungus symbiont, *Leucocoprinus agraricus,* grows in a decentralised fashion, metabolising these anointed fragments, consuming and breaking down cellulose walls, to produce fruiting bodies rich in lipids and carbohydrates which become food for the ants. Yet beyond typical symbiotic representations, the fungus grows not only as a food source for the ants but as a complex edible architecture that shelters many life forms. It comprises agencies not perceivable to humans that can be amplified using piezoelectricity and computer vision algorithms. To this regard, my transversal mediations align with what Louis Bec

Kuai Shen
0h!m1gas: biomimetic stridulation environment, media installation of various dimensions: community of ants, fungi, bacteria, four surveillance cameras, two scratching turntables, two channels piezoelectric amplification, computer vision algorithms, 2012 © Kuai Shen

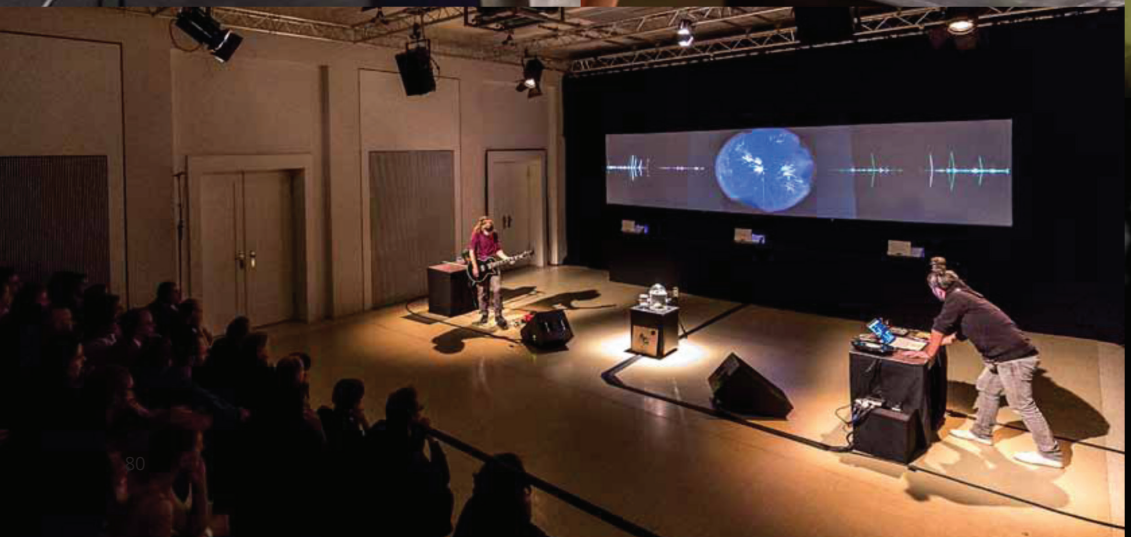
Kuai Shen
0h!m1gas: biomimetic stridulation environment, media installation of various dimensions: community of ants, fungi, bacteria, four surveillance cameras, two scratching turntables, two channels piezoelectric amplification, computer vision algorithms, 2011-14 © Kuai Shen

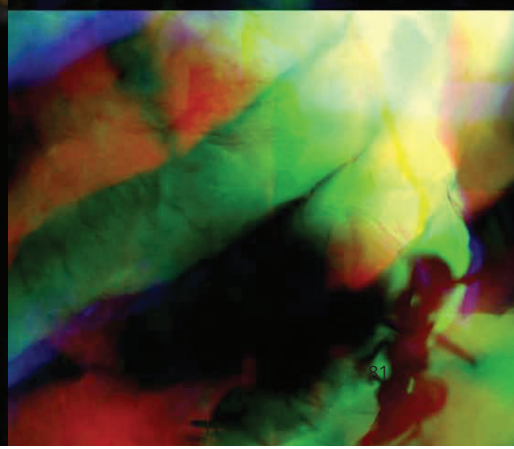
has called the technozoosemiotics at the crossroads of ethology, technology, computer science, and artistic activity.[1]

The first one is *0h!m1gas: biomimetic stridulation environment* (2010-2020). *0h!m1gas* amplifies the vibratory signals leaf-cutter ants enact during social farming of the fungus garden. Using piezoelectricity, while parsing data from live surveillance cameras interfaced with computer vision algorithms, two turntables are set to rotate scratching vinyl records with pre-recorded sounds of the ants. This hybrid system plays with the representation of a cybernetic orchestra, in which multiple artefacts and organisms combine to form a techno-ecology. The source of inspiration is based on the resemblance of the sounds produced by scratching turntables with those produced by the stridulatory organ of *Attini* leaf-cutters. These vibrations are known as stridulations, bioacoustics generated when an individual moves its rear up and down so that a scraper element of the ant's body known as plectrum rubs against the pars stridens, a surface of parallel ridges.[2] The signal, which spans frequencies from 2-5 Hz up to 38-46 Hz,[3] is an eerie sound of variable chirps whose quality depends on the morphology of the organ, the size of the ant, and how she rocks her body. The vibration resonates across the ant's exoskeleton enabling each individual to recruit nest mates, while mechanically turning its mandibles into a razor-blade that facilitates cutting.

The second art project pushed the creative boundaries of the previous one by involving human participation. *Plectrum: viral vibrations and electric ants* (2015-2018) is a live audiovisual performance that uses piezoelectric circuit-bending to amplify the entangled matterings emerging from the fungus garden.[4] *Plectrum* is a collaboration with sound artists, Auriel, Markus Muschenich, and João Martins. We use electric guitars, turntables, live coding, and visuals to amplify the processes of growth and decay of fungus farming. I co-opted wireless live cameras with macro-lenses to project the multispecies social dynamics in place, and in parallel, mixing own video documentations of leaf-cutter ants in the Amazon forests of Ecuador.

These living laboratories, as I like to call them, bring together technology and biology in a way that promotes and consolidates breeding environments. In this vein, Dominique Lestel is a good reference for understanding the intricacies of nonhuman worlds via technical means; he proposes that "the relation of the human to the [animal] goes by way of artifact and technology" in order to make sense of their subjectivities.[5] Indeed, through creative practices using technologies of amplification over the span of ten





Kuai Shen
p80-82 and 82: *Plectrum: viral vibrations and electric ants*, audiovisual performance with community of ants, fungi, bacteria, 2015 and 2018 © Kuai Shen

years, I have learned to see and listen to ants working on fungi as an invertebrate performance; invertebrate not because it is conducted by insects, but rather because a diversity of beings without vertebrae, and without familiar forms that humans can embrace, are involved in improving and interfering life conditions, entangling new relational tensions between parties. These relational tensions can be approached through an idiom of rhythm. Rhythm enables us to work on the exposition of relations between life forms by focusing on how acoustic forms can be manifested by agencies moving along or against each other, becoming actively dominating, submissive, or co-constitutive.

Various antibiotic-producing bacteria and specialised fungal pathogens interfere in the rhythms of fungus farming. *Ant*agonists in microscopic disguises, such as the Actinobacteria *Streptomyces* and *Pseudonocardia*, inhabit ant bodies covering them with a white coating that exudes antibiotics, which in turn inhibits the fungal pathogen *Escovopsis* from parasitising the ants' fungal gardens. Bacteria and fungi have established a long-lasting spectrum of relationships with leaf-cutter ants that fluctuate between mutualism, commensalism, inquilinism, and parasitism. The many different lifespans coalesce in a multi-scalar microecology. Without technical means—microscopes, bioassays, spectrometry, computer algorithms—their magnitudes are imperceptible and the myriad of interconnections untraceable. In this light, I created an audiovisual exploration focused on terrestrial chemistry and microscopic landscapes entitled *[ant]ibiotica* (2014-2017). I combined scanning electron microscope images with acoustic experimentations, and time-lapse photography of microorganismic metabolisms, to portray the entangled topologies of fungus, bacteria, and ants. By rendering a different representation of ant bodies, mycosis, and bacteria cultures, the project took issue with the conveniently negative image of parasites regarding the antibiotic resistance arms race, which the pharmaceutical industry promotes for its economic benefit.

The concept of metabolic rhythms emerges at the crossroads of art and science to propose that a different world is brought into life by focusing on spatiotemporal phases of growth and decay interfering with one another. These interferences can be amplified electro-acoustically and can be further explained with the notion of syncopation. Syncopation is the placement of rhythms where they are not expected to occur. On the one hand, the concept goes hand in hand with electronic music performances, in which certain sonic patterns are purposely inserted to displace the flow of rhythms. On the other hand, the metabolic rhythms of fungus farming are syncopated, as multiple beings displace one another at different intervals. The approach of syncopated rhythms thus implies that different species tangle up different life histories however in shared intimacy. In syncopation they take turns and no partner can play without the other.

Acknowledging this multispecies performance through an idiom of rhythm centred around mycelium vitality, in which metabolisms interpose one another, turns this into a mycology that defies anthropocentric logics of time, space, and aesthetics. To this extent, I argue that the concept of aesthesis, rather than aesthetics, provides a consonant ground to sustain rhythm as an idiom of performativity in nonhuman worlds. Aesthesis offers an alternative passage besides conventional understandings to re-present nonhuman social interactions. Aesthesis means the awareness of stimulation; it signifies the sensation of touching and being touched.[6] While aesthetics is a strongly visual conforming set of principles regulating the sensorial values of appealing human experiences, aesthesis comprising strongly tactile, corporeal, chemical, and physiological sensations, opens a different engagement with mycological worlds.

In my practice aesthesis allows me to develop initially speculative discourses around the particular modes of bacteria, fungus, and ants sensing each other. Different from forcing fungal relations to be aesthetically pleasing for human evaluation, aesthesis does a work of re-evaluating forms for making sense

1µm

10µm

and relating otherwise. I claim aesthesis offers a dirty, noisy, down-to-earth, friction-riddled engagement with mycological worlds. With this in mind, I challenge aesthetics and scientific methods beyond obligatory alignments with anthropocentric histories or disciplinary boundaries. I do so to ground the idea that nonhuman social forms, centred around fungal metabolic processes, are woven through relational antagonisms that create a vibrating sensible alterity (7). This alterity can be explored through creative mediations at the crossroads between technology and ecology to advance different knowledge-making practices about life.

Endnotes

[1] Bec, Louis. 'Squids, Elements of Technozoosemiotics. A Lesson in Fabulatory Epistemology of The Scientific Institute For Paranatural Research'. *TechnoMorphica*, 1997. https://v2.nl/archive/articles/squids-elements-of-technozoosemiotics

[2] Auson, Kuai Shen. 'Tactical Ant Media: Amplifying the Invertebrate Aesthetics of Ants Using Transversality as an Artistic Process'. *Society & Animals* 27, no. 7 (December 2019), p. 686.

[3] Auson, Kuai Shen. '0h!m1gas: A biomimetic stridulation environment'. *Biologically-inspired computing for the arts: Scientific data through graphics*, edited by Anna Ursyn, Hershey, PA, Information Science Reference, 2012, p. 70.

[4] Barad, Karen. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, Duke University Press, 2007.

[5] Lestel, Dominique. 'Toward an ethnography of animal Worlds', *Angelaki* 19, no.3 (2014), p. 142.

[6] Mignolo, Walter, and Rolando Vasquez. 'Decolonial AestheSis: Colonial Wounds/Decolonial Healings'. *Periscope/ Social* Text Online (2013). https://socialtextjournal.org/periscope_article/decolonial-aesthesis-colonial-woundsdecolonial-healings/.

[7] Bishop, Claire. "Antagonism and Relational Aesthetics." *October* 110 (2004): 51–79; Tarde, Gabriel. *The Laws of Imitation*, translated by Elsie Clews Parsons, Henry Holt and Company, 1903.

Kuai Shen
p84-85: *[ant]ibiotica*, 120x92cm photograph on metallic paper using scanning electron microscopy of the ants' fungus Leucocoprinus agraricus, section showing entangled tubular growth of hyphae (cultured in vitro), 2017 © Kuai Shen and *[ant]ibiotica*, 120x92cm photograph printed on metallic paper using scanning electron microscopy of unknown yeast species sampled from Acromyrmex octospinosus decomposing body (cultured in vitro a), 2017
© Kuai Shen
p.86: *The leaf-cutters*, photograph of the artist's techno-ecological habitat harbouring the community of ants-fungi-bacteria in his studio, 2020 © Kuai Shen

Kuai Shen is a media artist from Ecuador. In cooperation with ants, he generates techno-ecologies which explore the concept of invertebrate aesthesis, problematising scientific and artistic modes of knowledge. His research and works have been exhibited internationally and received several awards: a 2016 art grant from Michigan State University, the 2014 Cynetart Award of the Science and Culture Saxony Ministry, and in 2013 both an honorary mention at Prix Ars Electronica, and the Edith-Russ-Haus Media Art Prize. He is currently working on his practice-led PhD on army ants at Deakin University in Melbourne. https://kuaishen.tv