

Bacterial Mechanisms, material speculation on posthuman cognition.

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Extended abstract

Cognition is not uniquely human. Life on earth, from microbes to mammals, has performed cognition deep in time. Through the material speculation that art makes possible, this paper considers bringing forth microbial cognition as a wider possibility for models of intelligence.

Artificial intelligence has often had human intelligence as parameter and aspiration. Basic definitions of AI describe its goals in relation to human intelligence. This paper focuses on how art can be the place where research about non-human cognition in microorganisms can encounter AI machine non-human intelligence.

Some authors like Adrian Mackenzie have described how biology has been used as a technology, in the specific case of bacteria as technical objects [1], comparing bacterial genomes to operating systems [2] or in synthetic biology. This project, thinking with and through art, goes beyond DNA-centered biology [3] and its implied simplification, to think of microorganisms' cognition [4] as a whole, in collectivity and with its environment.

Lyon [4] carefully describes non-human centered forms of cognition present in eubacteria such as sensory signal transduction, valence, different forms of communication, sensorimotor coordination, memory, learning, anticipation, and decision making in complex and changing circumstances. (p.2) Following Lyon's work as a theoretical framework, this

paper refers to the artwork *Speculative Communications* (2017) by the art collective Interspecifics as a form of material speculation.

In *Speculative Communications* the imagination of possibility is grounded in the materiality of art and it is made possible through DIY logics of production. The speculative figurations in this paper are a form of understanding art and biology and its enquiries, to give value to its propositions as an open-ended process without the constraints of institutionalized science, with the opening of possibilities of speculative thought [5] and imagination, and with the non-essentialist grounding of new materialism of biological matter. In other words, to preserve a powerful capacity of speculation without losing accountability, by imagining strategies that balance political accountability, with scientific speculation and a valuable esthetical experimentation on materiality.

Speculative Communications was premiered at the MUTEK, a festival dedicated to the promotion of electronic music and the digital arts, Montreal 2018. The work is a microscope powered by AI to observe and learn from a culture of *Bacillus circulans* bacteria. The data is then used as a sound art score. This generates an experience of the phenomenon of machines and microorganism's cognition together, becoming sound and image. Resourcing to DIY techniques [6] and transdisciplinary collaboration, the machine monitors and learns. Through computer vision in the microscope it learns from the bacteria module, by tracking

and recognizing its movements and patterns. This information is fed to an algorithm that starts to learn and recognize behaviours. Then, AI is given the freedom to generate with the input of images and data using OpenFrameworks and Supercollider, as a continually generative piece. All the contents are transmitted, so a human audience can experience the phenomenon of *Speculative Communications*.

The work contains multiple dimensions. Aesthetically, it shows the tracking and analysis of the behaviour of *Bacillus circulans*, and the data turned into sound, mediated by algorithms, in an experience similar to contemporary sound art. Interspecifics, also resources to DIY logics to access AI, allowing it to focus on another side of cognition and AI, that of non-human cognition of microorganisms.

In the use of art as a way to carry out material speculation, *Speculative Communications* brings forward the posthuman (understood by Braidotti [7] as a post-anthropocentric approach to life.) This work also enacts the cyborg continuum of non-humans and machines of Haraway's classic cyborg manifesto [8] with the minimum of what is considered living in bacteria, and without the anthropomorphic shape of many robots, a greater posthuman leap.

Finally, situated imagination of possibility takes place through art in the work of Interspecifics, as the material speculation about cognition of microbial-machine. This form of speculation hints to a post-anthropocentric perspective bringing forth the communication, coordination and behavioural patterns of *Bacillus circulans*. This paper suggests that the aims of AI could be widened by notions of intelligence including forms of cognition from the most basic and prevalent forms of life, bacteria.

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technology. She studied an Erasmus Mundus master in Gender Studies at the University of Bologna, Italy. She has presented her work in ISEA 2012 and has been involved in the Mexican Pavilion at the 56th Venice Biennale. Her research in the School of Creative Media revolves around Art and Biology, Epistemology, New Materialism, Biohacking, Wetware, and bacteria.



Fig 1. *Speculative Communications*, 2018, Interspecifics, multispecies performance, courtesy of the artists.

References

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