

OPEN HISTORICITY OF LIFE

— THEORY, EPISTEMOLOGY, PRACTICE —

9 - 10 NOVEMBER 2023

École Normale Supérieure, 45 rue d'Ulm, Paris

ORGANIZATION: *Marie Chollat-Namy, Maël Montévil, Anton Robert*

In the theory of evolution, the forms of life change, and these changes are critical for the understanding of living beings. However, the nature of these changes, and the way to understand them, remains a matter of open discussion. In the XIXth century, physics, especially classical mechanics, was the paradigm of science, and physics understands change as a displacement in an abstract mathematical space. This method has been imported into biology, for example, in population genetics; however, philosophers, notably Bergson, called into question the notion that things (always) exist as a possibility before they become actual. Bergson concludes that there are limits to our ability to understand living being that is intrinsic to mathematics and come from the creativity of evolution. To our knowledge, the only field of biology that built explicitly on this notion is phylogenetic systematics — however this field also has very specific purposes.

In the last decade, the notion that new possibilities appear over time in biological phenomena has received renewed and growing attention. Kauffman approaches it as the adjacent possible, Sarti and Citti as heterogenesis, and Longo and Montévil as symmetry change and specific objects. Accordingly, there is a growing understanding that this notion is a significant shift and challenge in the way to do science.

However, there has yet to be a systematic effort to bring together the different perspectives on this question in biology and in other fields confronted with it. In this conference, we intend to create bridges between the different perspectives that have been developed, mostly independently, on the question of changing possibility spaces in biology. We aim to discuss the status of this notion: Do new possibilities appear by principle, or can their existence be proven? The second major topic of discussion will be the scientific possibilities and limits that this notion leads to. In particular, can it be captured by existing mathematics, new mathematics, something somewhat different, or no theoretical construct at all? In general, what kind of scientific practice does this question open?

PROGRAM

NOVEMBER 9

— 9h30 — *Introduction*

SESSION 1 The question of possibility in biology

(Chair: Marie Chollat-Namy)

— 09h45 — **Sélène Domino**, *Institut de Systématique, Évolution et Biodiversité (ISYEB), MNHN and IHPST, University Paris 1.*

Can there be new biological possibilities in Systematics?

— 10h20 — **Andrea Rolli**, *Department of Computer Science and Engineering, Campus of Cesena, Università di Bologna.*

A cybernetic perspective of evolution

— 10h55 — **Coffee Break**

— 11h10 — **Giuseppe Longo**, *Centre Cavaillès, République des Savoirs UAR3608, École Normale Supérieure (ENS), CNRS, Paris.*

Twenty years after the [2001](#) and [2003](#) lectures on "changing phase spaces" in Biology, the challenge of "novelty production"

— 11h45 — **Discussion**

— *Lunch break (12h15-14h)* —

SESSION 2 Theoretical frameworks accommodating new possibilities

(Chair: Ana Soto)

— 14h00 — **Alessandro Sarti**, *Centre d'analyse et de mathématique sociales (CAMS), École des hautes études en sciences sociales (EHESS), Paris.*

Beyond possibility spaces: heterogenesis and meaning

— 14h35 — **Stuart Kauffman**, *Affiliate Professor, Institute for Systems Biology, Seattle.*

A Third Transition in Science

— 15h10 — **Maël Montévil**, *Centre Cavaillès, République des Savoirs UAR3608, École Normale Supérieure (ENS), CNRS, Paris.*

Mathematical spaces and biological objects

— 15h45 — **Discussion**

— 16h15 — **Coffee Break**

General Discussion: The question of possibility spaces in biology

(Chair: Mathilde Tahar)

— 16h30 — **Discussion (with the participation of Johannes Jaeger)**

— *Dinner* —

NOVEMBER 10

SESSION 3: *Views across disciplines*

(Chair: Anton Robert)

— 09h30 — Armand Hatchuel & Pascal Le Masson, *Centre de Gestion Scientifique, Mines Paris, PSL.*

How can contemporary design science contribute to the theoretical foundations of biology ?

— 10h20 — Marina Cortes, *Institute for Astrophysics and Space Sciences, University of Lisbon*

There will be no absolute truths left in the study of reality.

— 10h55 — Coffee Break

— 11h10 — Andrea Loettgers & Tarja Knuuttila, *Philosophy Department at the University of Vienna.*

The combinatorial possibilities of synthetic biology

— 11h45 — Discussion

— Lunch break (12h15-14h) —

SESSION 4: *Practical and philosophical perspectives to move forward*

(Chair: Carlos Sonnenschein)

— 14h00 — Marie Chollat-Namy, *Post-doc, Centre Cavaillès, République des Savoirs UAR 3608, École Normale Supérieure (ENS), Paris.*

Perspectives on Anti-entropy as the reconfiguration dynamic of historicity

— Anton Robert, *PhD student, Centre Cavaillès, République des Savoirs UAR 3608, École Normale Supérieure (ENS), Paris.*

Physical arguments for an epistemology of new possibilities via a methodical deconstruction of biophysical models

— 14h35 — Mathilde Tahar, *Laboratoire Savoirs Textes, Langage, University of Lille*

How to account for the unpredictability of evolution?

— 15h10 — Paul-Antoine Miquel, *Équipe de recherche sur les rationalités philosophiques et les savoirs (ERRAPHIS), Université Jean-Jaurès, Toulouse.*

Novelty in biological systems

— 15h45 — Discussion

— 16h15 — Coffee Break

General Discussion: *Practical and theoretical perspectives for the future*

(Chair: Maël Montévil)

— 16h30 — Discussion