PhilInBioMed

THE MAGAZINE

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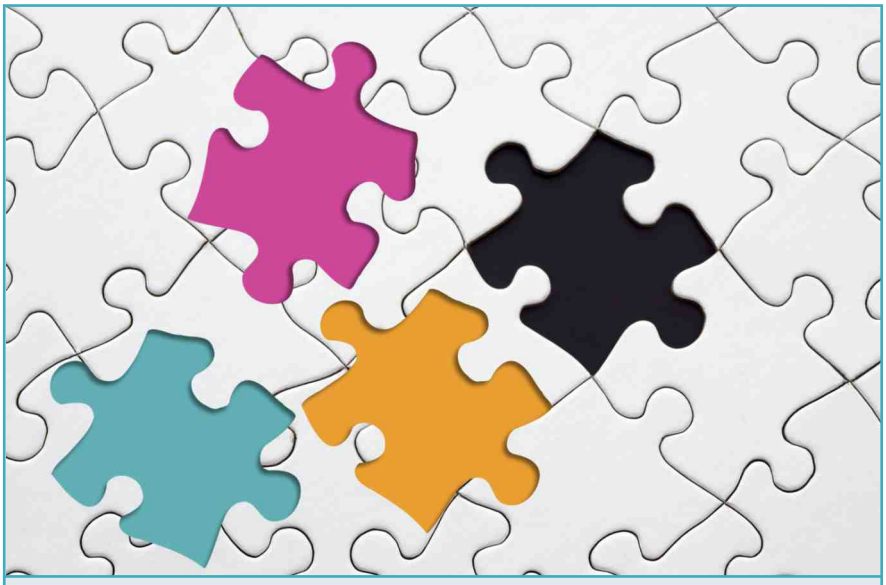
Same, but different

Dear PhilInBioMed members,

The coronavirus crisis has overturned many plans and canceled many conferences. But new ideas are blossoming and in this issue you will read about virtual tutoring sessions and why philosophers of science are uniquely prepared to help handle this crisis.

Cordially, your
PhilInBioMedMagazine team



In biology it is often postulated that it is the structure that dictates the function. But what exactly is meant by "structure" and "function"? And is it possible that alternatives exist?

The structure, the function and the philosopher

Like in many other areas of biology, two frequently used notions play a central role in microbiome research: “structure” and “function”. But what, exactly, do scientists mean when using these terms? In his forthcoming *BioEssays* article Microbiome Structure and Function: A New Framework for Interpreting Data PhilInBioMed member Gregor Greslehner (ERC IDEM, CNRS & University of Bordeaux) argues that “structure” and “function” can have different meanings in different contexts in microbiome research: genomic sequences, biochemical agents, interaction networks, and taxonomic communities are different kinds of structures – which relate to different notions of function, respectively.

While philosophical debates have traditionally focused on causal role versus selected effects accounts of function, each of the four notions of structure can be mapped, respectively, onto functions as potential and actual biochemical activities, causal roles, and proxies for repertoires thereof. Selected effects, on the other hand, can be used to explain variations and dynamics of these structures and functions. By spelling out these different meanings, it becomes clear where meaningful causal connection between different notions of structure and function might be found, and why some associations can be misleading.

Many recent studies heavily rely on genomic sequence data and taxonomic composition, obtained from the sequences of 16S ribosomal RNA. While these can serve as limited proxies for other notions of structure and function, we must not forget how all the other notions need to be addressed by different tools and techniques, especially those that address functions directly. In the ongoing struggle to establish causal claims in microbiome research, the suggested philosophical conceptual clarification should help scientists in interpreting data in microbiome research, building causal models, and avoiding rash inferences about connections based on mere genomic or taxonomic data. This article has a video abstract.

Individual mentoring sessions for early career researchers

Dear colleagues,

We are sorry to let you know that, because of the COVID-19 pandemic, we decided to cancel this year's European Advanced Seminar in the Philosophy of Life Sciences with the title “Dealing with Complexity in the Life Sciences”.

The seminar was supposed to take place Sep.7-11, 2020 at the Konrad Lorenz Institute for Evolution and Cognition Research (KLI), close to Vienna. We also announce that the next in-person EASPLS will take place in 2022 at the KLI.

However, the EASPLS Consortium is committed to support early career researchers working in the philosophy of the life sciences in a different way. **Between September 7 and September 11, each of the instructors will offer a mentoring session of two hours each**. Priority will be given to those who have applied for EASPLS 2020. If seats are still available, it will be possible for other early career scholars to sign in. We will circulate information about the details of the mentoring sessions (exact times, topics, how to register, specific topics etc.) before June 30.

The instructors who will be offering mentoring sessions are:

Giovanni Boniolo (University of Ferrara)
Guido Caniglia (KLI Klosterneuburg)
John Dupré (University of Exeter)
Sara Green (University of Copenhagen)
Philippe Huneman (CNRS/Paris-Sorbonne University)
Maël Lemoine (University of Bordeaux)
Sabina Leonelli (University of Exeter)
Thomas Pradeu (CNRS/University of Bordeaux)
Thomas Reydon (Leibniz University Hannover)
Federica Russo (University of Amsterdam)
Isabella Sarto-Jackson (KLI Klosterneuburg)
Jon Umerez (University of the Basque Country)
Marcel Weber (University of Geneva)

We will be in touch with more information soon.
With our very best wishes,

Guido Caniglia and Marcel Weber
(on behalf of the EASPLS Consortium)

Virtual colloquia series at the KLI

Conferences and seminars around the globe are being canceled, but thanks to the internet virtual workshops are becoming more and more common. The Konrad Lorenz Institute for Evolution and Cognition Research (KLI) was one of the first to set up a virtual colloquia series.

The next seminar is on Tuesday May 19th. The speaker will be Michiru NAGATSU (University of Helsinki) on Sustainability Science as a Management Science: Beyond the Natural-Social Divide. A full list of upcoming and past seminars is available on the KLI website.

Upcoming*

* coronavirus permitting

May

19th Sustainability Science as a Management Science: Beyond the Natural-Social Divide, virtual colloquium organized by the KLI

June

Philosophy of Biology at the Mountains, virtual conference, organized by the University of Utah

October

17th-18th The Problem of Cognitive Ontology, Pittsburgh, USA

... and counting

The current sanitary crisis is not the first pandemic that the world has had to deal with, however, it is the first where numbers on infections, hospitalisations and deaths are available almost in real time. But numbers alone do not tell a story, they need to be analyzed and interpreted.

In a recently published article PhilInBioMed member Pierre-Olivier Méthot takes a look at methodological and cultural differences in COVID-19 data production (article in French). He points out the limits of the real time decount and lists important differences in data production between countries. Méthot concludes that it is currently near impossible to reliably compare COVID-19 data on a supranational scale and he cautions against those who try to draw political gain from these comparisons.

Unboxing Metaphysics of Science

Recently in the field of "metaphysicis of science" a debate has arisen as to whether or not naturalistic metaphysics needs to be based solely on current science. Alexandre Guay (Université catohlique de Louvain) and Thomas Pradeu (CNRS & Université de Bordeaux) have now published Right out of the box a paper in which they assess that claim by examining the relations between metaphysics of science and general metaphysics.

The article describes the field of Metaphysics as a three dimensional box where the axes mark the oppositions 'descriptive-revisionary', 'a priori-a posteriori' and 'metaphysics of science-common sense-traditional metaphysics'. The authors then go on and analyze how metaphysics of science relates to these different metaphysical approaches of this three-dimensional box.

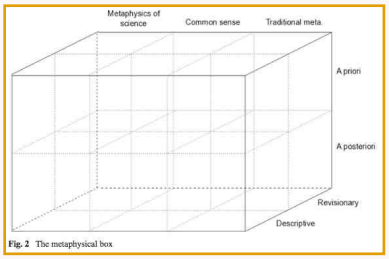


Fig. 2 The metaphysical box

The mystery of how the cow came to eat grass

Cows eat grass, that does not surprise us. Yet the cow's genome does not encode even one single plant digesting enzyme. It can only survive, because of the millions of cellulose-digesting microorganisms that live in its digestive system. Therefore, it is not the zygote-derived animal alone, but the "holobiont (the host and its microorganisms) that needs to be considered when looking at the evolution of herbivores.

In the forthcoming book Phenotypic Switching: Implications in Biology and Medicine, PhilInBioMed members Lynn Chiu and Scott Gilbert have written a chapter on *Niche construction and the transition to herbivory*. The authors argue that the reciprocal niche construction of the host and its associated microbial organisms (i.e. the "holobiont") scaffold each other's developmental and phenotypic processes as well as organize a new selective environment of the holobiont as a whole.

Unhinged

Collaboration chronicle: The revival of group selection

In this edition of the collaboration chronicle Elliott Sober (left) and David Sloan Wilson (right) reflect on 40 years of collaboration.

Elliott Sober is Hans Reichenbach Professor and William F. Vilas Research Professor in the Department of Philosophy at University of Wisconsin–Madison, USA. He is a member of the PhilInBioMed Scientific Committee.

David Sloan Wilson is an evolutionary biologist and a Distinguished Professor of Biological Sciences and Anthropology at Binghamton University. He is also the co-founder of the Evolution Institute.

Could you explain in a few words the topic of your collaboration?

ES: We have worked together for about 40 years, off and on, on the units of selection problem. Do traits evolve by natural selection solely because they are good for the individual organisms that have them, or do they sometimes evolve because they are good for the groups in which they arise? Darwin defended the latter position, and it became standard during the heyday of the Modern Synthesis. All that changed in the 1960's when the idea of group selection came under vigorous attack. David dissented from this influential position before I got in on the act.

DSW: Specifically, my first publication on the topic was in 1975 and Elliott first addressed it in an article he published in 1980 and then at greater length in his 1984 book *The Nature of Selection*. Group selection was almost entirely rejected during this period. An anecdote that we report in our 1998 book *Unto Others* concerns advice that an eminent professor gave to a graduate student in the late 1980s: "There are three ideas that you do not invoke in biology—Lamarkism, the phlogiston theory, and group selection (p 40)." The revival of group selection (or more generally multilevel selection) theory has required decades and still is not complete. Why a topic such as this should be so contested is an important topic in its own right.

How did you meet?

DSW: I recall meeting at a conference but my memory is vague and I could be wrong about that. I do remember that sex ratio was the immediate topic of our conversation. We independently had the insight the female-biased sex ratios provided evidence for group selection that was right under the nose of those who rejected group selection.

ES: I'm afraid my memory on how we met is as rusty as David's!

Could you each describe what your collaborator brings to this joint work?

ES: David had a firmer grip than I did on the biology (not surprisingly) – both the model building and the empirical examples that were discussed in the literature. I was especially tuned into the detection of fallacious arguments. It startled me that George C. Williams, in his influential 1966 book *Adaptation and Natural Selection*, gave empirical arguments against group selection's being the right explanation for this or that phenomenon, but also gave nearly a priori arguments attacking the very coherence of group selection as a theoretical construct.

I also was puzzled by the use that Williams and others made of the principle of parsimony, which was something I was interested in before I started thinking about evolutionary biology. And my teaching introduction to philosophy every semester for many years got me interested in psychological egoism as distinct from evolutionary selfishness (a distinction we took pains to draw in our book, *Unto Others*).

DSW: A reflection on the nature of theory is in order before I can answer this question. It is easy to confuse theory with mathematical models, but Darwin's theory of natural selection was stated entirely in words, with mathematical models coming later and always playing an auxiliary role. This means that the kind of conceptual analysis that Elliott does so well counts as theory or at least is a very close cousin. As a theoretical biologist, I therefore regarded Elliott as a colleague and one better able to spot inconsistencies than many of my biological colleagues. I think that this is true for all philosophers who gain a professional level of knowledge for the topics that they cover.

What are the obstacles that you have met during your collaborative work?

ES: Maybe I am seeing the past through rose-colored glasses, but I don't think that we encountered any obstacles in collaborating with each other. We were very well suited to each other in terms of our work ethic, meaning that we promptly commented on each other's prose, adding as we saw fit. And our prose styles meshed nicely too, which was a help. We rarely met face to face, but I don't think that slowed us down. I don't think we ever had trouble publishing our work, even though there were lots of influential biologists who regarded group selection as a pernicious idea. Lucky for us!

DSW: I agree! Almost everything was done by correspondence and it didn't slow us down a bit. I think it helped to assign leadership roles. For example, I had the leadership role for part I of *Unto Others* and Elliott has the leadership role for part II. We commented extensively on each other's drafts but the final decision was up to the leader. This made the writing process clip along. I should add that whenever we do get together, it is immensely enjoyable and probably generates ideas that we work out by correspondence later. Lastly, I try not to be photographed side by side with Elliott. His head is so much bigger than mine that it looks as if I am either microcephalic or standing three feet behind him!

Do you have suggestions as to how to improve collaborations between scientists and philosophers?

ES: I think that the formula that worked so well for David and me is still viable. When I started reading what biologists had said about group selection, I saw my work cut out for me. One argument after another struck me as fallacious. When I read David's first book, I thought that he and I were on the same wavelength. I especially admired the conceptual clarity he brought to the task of defining the concept of group that was relevant to units of selection issues – his idea of a trait group.

DSW: The first requirement is for the philosopher to gain a professional level of mastery over the subject matter. The second requirement is for the scientist to be interested in foundational issues. Fortunately, this is quite common for philosophy of biology and many examples come to mind.

What are the most exciting questions that you would like to address in your future collaborations?

ES: We have no future projects in mind, but I'm hoping that one will come to mind! I'm now interested in the evolution of infectious diseases, so maybe this will be a subject that will get us working together again.

DSW: The topic of multilevel selection has not been exhausted. It deserves to occupy center stage for important and timely subjects such as disease virulence, microbiomes, and human societies as products of cultural group selection. Also, as mentioned above, the longevity of the group selection controversy bears examination. Why did group selection enter a dark age in the first place and why were decades required to emerge from it? In my opinion, this question is bound up with individualism as an intellectual tradition that became dominant across the board during the middle of the 20th century, including economics and the social sciences in addition to evolutionary biology.

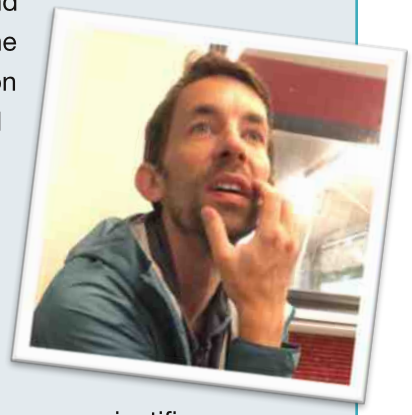
What enabled Margaret Thatcher to say in the 1980's that "there is no such thing as society"? In my current writing, I describe multilevel selection theory as a paradigmatic alternative to both individualism and the kind of axiomatic group-level functionalism that preceded it. I would love to saddle up with Elliott again to address these and other foundational questions—but as he said, we have no specific plans at the moment!

Predicting the future in times of COVID-19

Predicting the future is always a risky business, but even more so in times of unprecedented events. The coronavirus pandemic has brought about a lot of questions as to what measures to take and when. In a recently published article Jonathan Fuller describes the conflict between disease epidemiologists and clinical epidemiologists or Models versus Evidence and he explains why we need to draw on both to overcome this crisis.

In a second article Fuller asks What's missing Pandemic Models and he explains why philosphers can play a critical role in putting the science of COVID-19 into perspective. He argues that even the best models and predictions need to be interpreted and challenged. Questions that arise around causation, evidence and the relationship between models and reality are precisely what philosophers are trained to answer.

3 questions for Fridolin Gross



Fridolin Gross is an interdisciplinary scholar with a background in physics and philosophy. He is currently a postdoctoral fellow at the Philosophy Department at the University of Kassel, but also works on computational models of cell cycle regulation at the Firc Institute of Molecular Oncology (IFOM) in Milan. His philosophical interests concern the implications of epistemic strategies used in molecular biology and systems biology, including mechanistic and systems-theoretical approaches.

1. What first sparked your interest in philosophy of science?

I studied physics and was strongly infused with ideas about the superiority of the exact sciences and of theory over experiment. Reading Kuhn's *The Structure of Scientific Revolutions* shattered many of my simplistic ideas about how science works. But I think the most important experience was to see the experimental work in an actual laboratory, and how much harder it is to generate knowledge than to just sit down and invent beautiful equations. This finally got me interested to think about the relationship between theory and experiment in biology.

2. What is your main research focus?

My philosophical work has largely focused on systems biology. I have tried to understand what it is and how exactly it is different from "traditional" approaches of doing biology. This is connected to different philosophical debates, for example on strategies of scientific discovery, reductionism, complexity, and mechanisticexplanation. Aside from my philosophical research, I have also been working on scientific projects as a computational biologist, and there has always been a close connection between my philosophical and my scientific work.

3. What are the topics you want to explore in the future?

I want to understand more generally how science, and especially biology, can be successful in the absence of formal theoretical tools and why under certain circumstances such tools become advantageous. This may seem obvious to many people, but to me it is not. I want to develop a general conceptual framework to evaluate and compare formal and informal approaches in science. Such a framework may help to understand how alternative approaches can be integrated and how the communication between different groups of scientists can be improved.