

Understanding Life in a Changing Planet

20+2 Years of Egenis, the Centre for the Study of the Life Sciences

17-19 April 2024



University
of Exeter

Egenis, Centre for the
Study of Life Sciences

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Key Conference Information

VENUE

The conference will take place in the Henderson Lecture Theatre in the XFi building. This is building number 30 on the [Streatham Campus](#) map. The reception on Wednesday evening will take place in Byrne House, the institutional home of Egenis, which is a three-minute walk from the XFi Building. You will be guided there by our local colleagues and student helpers, who will be introduced to you at the start of the conference and will be at hand for any questions.

GETTING ON CAMPUS

Please be aware that the campus is on a hillside, so there will be some uphill walking if you come to the campus on foot. If you prefer not to walk, we ask that you use local sustainable travel rather than driving to the campus. The bus stop on Rennes Drive is close to the conference venue.

There is a UNI bus connecting Streatham Campus - Exeter Central railway station - City Centre - Central Bus Station - St Luke's Campus, every 20 minutes during term time. During the holiday period, the UNI bus runs every 40 minutes. More information on the [UNI bus is available here](#).

PARKING

If you book accommodation at Holland Hall on the Streatham Campus, you can obtain a parking permit from the reception desk. Please let them know if you require a permit. There is limited pay and display parking on the campus or bordering the campus along Prince of Wales Road.

Organizing committee and key contacts

- Sabina Leonelli (Chair): S.Leonelli@exeter.ac.uk (General Enquiries)
- Adrian Currie: A.Currie@exeter.ac.uk (General Enquiries)
- Chee Wong: S.C.Wong@exeter.ac.uk (Registration enquiries)
- John Dupré
- Adam Toon
- Stephan Güttinger
- Celso Neto

Program

17th of March: Life, Pluralism, & Process: In Honour of John Dupré

9:15	Arrival, Coffee
9:30	Introduction
9:45	John Dupré: Philosophy as Iconoclasm Hasok Chang (Cambridge)
10:30	Economics and the Big Wide World Outside Nancy Cartwright (Durham)
11:15	Coffee Break
11:40	Free Will Meets Human Behavior Genetics Jonathan Kaplan (Oregon State)
12:25	Lunch
13:25	The Disorder of Processes: The Case of Human Nature Tim Lewens (Cambridge)
14:10	“And the wine is bottled poetry”: Dupré on Reductionism and the Mental Adrian Haddock (Leipzig)
14:55	Coffee Break
15:20	Soil and what to make of it? Katie Kendig (Michigan State)
16:05	Thou hast taught me, Silent River, Many a lesson, deep and long Scott Gilbert (Swarthmore College)
16:50	Break
17:00	Public Lecture: The Mighty Worlds We Half Create Philip Kitcher (Columbia)
18:00	Break
18:30	Reception in Byrne House (the home of Egenis)

18th of March: Twenty Years of Achievements in the Philosophy, History and Social Studies of Biology

9:00	Welcome and Introduction Sabina Leonelli (Exeter)
9:30	Sex as Process Paul Griffiths (Sydney)
10:10	Darwinizing Gaia Ford Doolittle (Sydney)
10:50	Coffee Break
11:20	Roundtable on Prospects for Interdisciplinary Studies of the Life Sciences Making Classes Staffan Müller-Wille (Cambridge) Navigating the Challenges of Interdisciplinarity: Some Personal Lessons Dan Nicholson (George Mason) From studies <i>of</i> to studies <i>with</i> Jane Calvert (Edinburgh)
13:00	Lunch
13:50	Promiscuous mutualisms: The contribution of philosophers, especially John Dupré, to the scientific understanding of symbiosis Thomas Pradeau (Bordeaux)
14:30	Case reports in times of pandemic: Evolving entities, evolving knowledge Rachel Ankeny (Wageningen)
15:10	Coffee Break
15:30	Philosophy of Biology in an Interdisciplinary Key Alan Love (Minnesota)

16:10	Entangled Banks of the River <i>Reproduction: Thoughts on Thickety Nature, Science and Philosophy</i> Jim Griesemer (UC Davis)
16:50	Concluding Talk John Dupré (Exeter)
17:30- 19:30	Poster Session & Reception (XFI Building)

19th of March: Into the Future: Challenges for the New Decade

9:30	Introduction & Opening Adam Toon (Exeter) and Katharine Tyler (Exeter)
10:00	Panel 1: Biology and Environment theme <i>Environments across scales, values and contexts</i> Panel: Melanie Smallman (UCL, Dept of Science and Technology Studies), Rose Trappes (Exeter, Egenis), Sam Scriven (Jurassic Coast Trust), Arwen Nicholson (Exeter, Physics & Astronomy), Andy Flack, (University of Bristol, Department of History) Discussants: Astrid Schrader (Exeter, Egenis), Hugh Williamson (Exeter, Egenis/Business School), Oli Moore (Exeter, Egenis/CRPR) Commentators: Adrian Currie (Exeter) and Angela Cassidy (Exeter)
11:15	Coffee Break
11:45	Panel 2: Data, Knowledge, and AI Theme <i>Automation in Biological Research:</i> Niccolò Tempini (Exeter), Silvia Milano (Exeter), Celso Neto (Exeter), James Wakefield (Exeter), Sara Green (Copenhagen) Commentators: Stephan Güttinger (Exeter) and Sabina Leonelli (Exeter)
13:00	Lunch
14:00	Panel 3: Health and Biomedical Research Theme: <i>Stigma emergence: A new theory of stigma change over time:</i> Hannah Farrimond (Exeter)

	<p><i>Psychiatric fictionalism, diagnosis and epistemic injustice:</i> Sam Wilkinson (Exeter)</p> <p><i>The dynamic lifecycles of psychiatric categories:</i> Ginny Russell (Exeter)</p> <p>Commentator: Havi Carel (Bristol)</p>
15:15	Coffee Break
15:45	<p>Panel 4: Mind and Culture Theme: Boundaries of the Mind, Boundaries of the Discipline</p> <p>Giovanna Colombetti (Exeter), Paul Griffiths (Sydney), Becky Millar (Cardiff)</p> <p>Commentators: Tom Roberts (Exeter) and Joel Krueger (Exeter)</p>
17:00	<p>Closing Discussion</p> <p>Sabina Leonelli (Exeter), Adam Toon (Exeter), and Katharine Tyler (Exeter)</p>
18:00	End

Associated activities

Exeter Science and Technology Studies (STS) Network Social, 5-7 pm Tuesday 16th April, Byrne House

Egenis has a strong tradition of STS scholarship in conversation with philosophy and the history of the life sciences across multiple generations. This extends beyond our home department of SPSPA and in recent years STS has been flourishing at Exeter across many more disciplines, and concerns beyond the life sciences. In response, this lively community has recently started coming together for [monthly brownbag lunch sessions](#). Come and join us to celebrate 20+2 years of STS at Egenis, bring a drink or snack to share, and meet old and new friends!

Talk Abstracts (in alphabetical order)

Case reports in times of pandemic: Evolving entities, evolving knowledge

Rachel A. Ankeny
Wageningen University, Netherlands

COVID-19 brought many of issues associated with pandemics into sharp relief, highlighting critical evidence gaps and lost opportunities. This paper explores the philosophical underpinnings of real-time evidence generation during pandemics. It has been previously argued that overreliance on creating a reified, standardised entity led to problematic generation and use of data and models (Dupré & Leonelli 2022). This paper makes a positive argument for how case reports can be used in such circumstances, so long as they are considered in terms of critical questions to be answered and in a contextualised manner, and data are standardised across a range of variables associated with the condition of interest, not solely in terms of an assumed disease entity. Case reporting is especially important in lower income countries and more 'fragile' settings where technologies and resources are limited. Hence recognising case reports as critical sources of public health evidence is important both for fostering greater accuracy and achieving greater equity during pandemics.

From studies *of* to studies *with*

Jane Calvert
University of Edinburgh, Scotland

What does it mean to do interdisciplinary studies *with* the life sciences, rather than *of* them? What are the benefits and challenges of working closely with scientists and engineers, not as objects of study but as collaborators? Could we even think of collaborating with other organisms, and what would that look like? And does studying *with* help us rethink our relationship to our changing planet?

Economics and the Big Wide World Outside

Nancy Cartwright
Durham University, United Kingdom

John Dupre has notoriously questioned 'Could there be a science of economics?' In his conclusion to the article by that name he explains that his answer to that question

is a qualified, Very probably yes. First, my skepticism has been directed to theoretical, especially mathematical constructs in economics. I do not deny that there may well be much useful, if generally loose, causal knowledge to be had in economics....

I recently gave a set Schumpeter Lectures in Graz arguing that economics, which above all aims to be an exact science, can indeed be an exact science – but only in ‘small worlds’, that is in settings where the only causes of the phenomenon of interest are ones that economics knows how to model. But most real world settings are not like that. As John says, ‘The complexity of the phenomena investigated by economics is such as to make claims of fundamental lack of order at least superficially plausible.’ What then should we do? On rereading John’s paper for this event I realised that my proposal all these years later is a development of John’s original idea of ‘loose... knowledge’.

This is the topic of this talk. In order to help with the large world outside its borders, I argue, economics should forego its pride in being quantitative and exact. Instead economics should export her rigorously-established principles as *qualitative, inexact tendency principles*. Though inexact once exported to the large complex world, the rigorous backing these principles receive in economics’ small-world models can be helpful in figuring when we can expect these tendency principle to obtain.

John Dupré: Philosophy as Iconoclasm

Hasok Chang
University of Cambridge, United Kingdom

I have learned a great deal from John Dupré ever since I took my first graduate seminar with him in 1989. The most important lesson I have taken from him is not so much about specific doctrines or arguments, but about the spirit in which philosophy should be done. He taught me (by example and never by explicit instruction) to focus my philosophical critique on the most widespread, fundamental and seemingly obvious assumptions. If philosophers do not question what is taken as common sense in wider communities, who will? I learned this lesson most strongly from John’s critique of reductionism and unificationism, starting with the trenchant arguments contained in *The Disorder of Things* (1993). The general spirit of iconoclasm was already evident in the seminars I took from him on philosophical skepticism and feminist philosophy of science, and continued on with his delight in teaching everyone to obsess about bacteria, down to his current insistence that we should think in terms of processes instead of objects or structures.

Darwinizing Gaia

Ford Doolittle
Dalhousie University, Canada

First, I'll introduce the Gaia hypothesis and say why Darwinians (then and now) discount it. Then I will try to legitimize the hypothesis using "Lewontin's Recipe". That attempt will fail unless we allow differential persistence (as well as differential reproduction), requiring either an expansion of that recipe (as usually conceived) or adoption of the "gene's-eye view". We might also use that later view to bolster "It's the song, not the singer(s)" theory. This last is reconcilable with John Dupré's process ontology.

Thou hast taught me, Silent River, Many a lesson, deep and long

Scott F. Gilbert
Swarthmore College, United States

Two of John Dupre's major ideas--co-metabolism between replicating entities (Dupré and O'Malley, 2009) and a biology of flux (Nicholson and Dupré 2018)--converge in the notion of sympoiesis. While most studies of symbiosis highlight two or more consenting adults, symbiosis also takes place during development to *generate* the adult. This sympoiesis is a "making-with" process, rather than autopoietic "self-formation." In vertebrates, sympoietic microbes mature the neurons needed for hearing and peristalsis, differentiate the vasculature of the intestinal villi, help form the gut-associated lymphoid tissue, and promote the proliferation of insulin-secreting beta-cells in the pancreas. Here we also see competition for making a cooperative team.

Entangled Banks of the River *Reproduction*: Thoughts on Thickety Nature, Science and Philosophy

Jim Griesemer
UC Davis, United States

This talk celebrates themes, resonances, engagements, and collaborations I have had with the people of Egenis over many years. These themes include "turns" in science studies toward practices, process ontologies and epistemologies, historicizing as philosophical pursuit, and heuristic values in and of techno-science. Rather than offer a sober argument on somber topics, today I'm going to play with some ideas that frame my own projects engaging these themes. I start from a topic emerging from Bill Wimsatt's work on the organization of complexity: the entanglement of ontology and epistemology in the breakdown of

levels and levels talk in what he calls “perspectives” and the still higher-level breakdowns of tidy organizations he calls “thickets.” The entanglement arises because the descriptions of nature scientists offer “cross-cut” the causal organization of “levels” of organization in such a way that no tidy arrangement of branches emerges from scientific inquiry.

I like the thicket metaphor because it signals scientists should not feel too comfortable that they know what they are doing when they talk about interpreting nature in “levels” of organization, nor should we analysts feel too comfortable that we know what we are doing. It’s hard to be reflective about your own practice especially when careers are built on entrainment into a way of doing, a way of talking, a way of thinking.

The starting point of my “reproducer” project was the idea that we (scientists and philosophers) have become all too comfortable thinking we know what biologists have been saying, doing and thinking about biological ideas and phenomena of replication and reproduction, too comfortable with our philosophical representations of their scientific representations.

One way to make familiar ideas unfamiliar is to look to history, so as to realize ideas have not always been arranged as they are now, that they had once upon a time been otherwise. I’ve done a bit of that in my own work on concepts of reproduction, looking back at rather different ways of arranging ideas in the 19th and early 20th centuries. I think we also need philosophical aids for dealing with the unknown, so I will play with the idea in the talk of shifting familiar metaphors, from heuristic models for representing to compass navigation of unfamiliar landscapes without a map. I’ll try to motivate the shift with a reflection on what I am trying to do in making a compass aid in my project on “reproducers” for navigating thickets of concepts of heredity and development in the landscape of biological reproduction. In that journey, I’ve landed in some philosophical thickets about relations and processes that need a compass as well. I don’t yet have a well designed, functioning philosophical compass for journeying far from familiar ground, so I’ll simply display some of the bits and pieces I’ve laid out on my workbench in the hope that you’ll have thoughts about how to build a philosophical compass.

Sex as a Process

Paul Griffiths
University of Sydney

Biological sex is not determined at conception. This fact has been obscured by concentrating on humans and ignoring the many species which regularly change sex, as well as the many species with non-genetic or facultatively genetic sex determination systems. In these species it is self-evident that sex is the outcome of a developmental process, a process that can take different paths in different circumstances. But the general point applies equally to humans. Human sex chromosomes cause sexual development to proceed down a particular pathway

(other things being equal), but they do not constitute sex. In humans, just as in species with non-genetic sex determination, assigning sex to pre-reproductive life-history stages involves ‘prospective narration’ – classifying the present in terms of its predicted future. Sex is a process.

And the wine is bottled poetry”: Dupré on Reductionism and the Mental

Adrian Haddock
Universität Leipzig, Germany

This talk has two main agenda. The first is to celebrate John’s criticism of reductionism in the philosophy of mind. The second is to consider John’s resistance to the idea that the ultimate ground for rejecting such reductionism is the subjectivity of the mental. John rightly recoils from those versions of this idea which rest on repetition of the stock phrase “there is something it is like to be X”. But he does not consider its best version, which understands subjectivity as self-consciousness: a form of cognition which is at once first personal and non-empirical. I suggest that John should endorse the idea in this version. But I also suggest that he cannot do so because, if he were to do so, then he would no longer be an empiricist, and empiricism is integral to John’s philosophical identity.

Free Will Meets Human Behavior Genetics

Jonathan M Kaplan
Oregon State University, United States

In her recent book, *The Genetic Lottery: Why DNA Matters for Social Equality*, Paige Harden takes up a suggestion made earlier by Eric Turkheimer, and argues that human free will can be identified with the proportion of variance in a behavioral trait that is associated with neither environmental nor genetic variation. While this view is at best truly bizarre, reflecting on how a researcher might arrive at or adopt such an odd view provides an opportunity to explore two parts of John Dupré corpus – his writings on free will, and his work critiquing misuses of human behavior genetics.

Soil and what to make of it?

Catherine Kendig
Michigan State University, United States

Categorization strategies hold suites of epistemological and metaphysical commitments that are learnt, interacted with, and passed on within both disciplinary and cultural communities. These categories and their associated commitments shape thinking and practices relying on them. In this talk, I bring John Dupré's work on natural kinds, classification, and processes to bear on the pragmatic choices surrounding soil and care of it. In particular, I investigate how the classification of soil and soil management practices shapes concepts relating to soil such as soil health. Doing so demonstrates how a Dupré-inspired analysis provides tools to uncover implicit and explicit use of the categories, kinds, models or practices relied upon to make sense of soil assessments.

The Mighty Worlds We Half Create

Philip Kitcher

Columbia University, United States

John Dupré challenged us long ago to think of “promiscuous realism” and of “the disorder of things”. He argued cogently against any grand programme of unified science, and for the thought that there are many cognitively valuable ways to divide up the world. His arguments have convinced me, and I have retreated from thinking about explanation as achieved through unification to the view that there is no general theory of explanation, or even of scientific explanation.

But John has changed too, or, perhaps, his metaphysical tendencies have demanded their full expression. He has started to think in terms of a unified ontology for the world, one that takes processes as its fundamental constituents. The shift does not retract his opposition to reductionism, but reflects his conviction that our understanding of many phenomena, particularly those connected with the living world, is best advanced by downplaying things and prioritizing processes. I find the idea of sometimes thinking in terms of processes highly congenial, but I am ever more convinced of the value of different ways of conceiving things.

My lecture will explore a tradition of pluralist (promiscuous?) constructivism that runs through Emerson, William James, and Dewey to Kuhn and Nelson Goodman. It is grounded in the thought of a world of experience that can be shaped and reshaped to facilitate our purposes, not only our inquiries but also our interactions with one another. The values to which we may legitimately appeal in our reshapings need not be restricted to the purely cognitive.

This tradition can be thought of as a version of Kantianism with moveable categories. It clearly emerged in the writings of some post-Kantians. Its roots, though, as I'll suggest, are slightly earlier, in a different source.

The Disorder of Processes: The Case of Human Nature

Tim Lewens

University of Cambridge, United Kingdom

Human Nature is a concept that has considerable attractions. It is also one that presents considerable problems. For the defence, it seems relatively unproblematic to conjecture that there are some non-trivial truths about what humans in general are like. These might relate to dispositions underlying moral appraisal, or probabilistic reasoning, or colour perception, or learning from others. As a consequence, it may also seem obvious that it is worthwhile for scientists to find out exactly what these species-wide dispositions are. In this respect, delineating Human Nature seems like a respectable—even an urgent—goal for scientific inquiry. The prosecution, on the other hand, note that efforts to further theorise Human Nature often resort to distinctions—between the innate and the acquired, between nature and culture, between proximate and ultimate explanation, between evolutionary and non-evolutionary causes—that are fraught with difficulties. In these respects, Human Nature can quickly seem to be a concept the sciences would be better off without. In an insightful series of papers, John Dupré has argued that a process-based approach leads to a better understanding of why the Human Nature concept has such ambiguous appeal. This talk follows Dupré's lead, using the disordered plurality of processes that underpin species-wide generalisations, and species-wide stability, to argue for a sceptical approach to the very idea of Human Nature.

A couple of fabulous arguments

Elisabeth A. Lloyd

Indiana University, United States

John Dupre's contributions to Philosophy of Biology have covered much territory in Philosophy of Biology, but I will concentrate on his most recent work on metaphysics of biology, the occurrence of processes in Life. I will focus on exploring two topics. First, I will consider his contrast between mechanisms and processes, a distinction that poses quite an important contrast, especially given the dominance of the mechanistic view in the literature today. I find that his anti-mechanistic view finally articulates a very vague concern about the mechanistic view that I've had. Second, I will review his particular style of anti-reductionism, which is an especially potent one compared to others available today. What makes it different is that it has a means to break down the reductionist devolution of the structure of life.

Philosophy of Biology in an Interdisciplinary Key

Alan C. Love

University of Minnesota, United States

A distinctive intellectual legacy of John Dupré and Egenis at Exeter is the productivity of interdisciplinary collaborations from scholars across the divide of different sciences and the humanistic study thereof, especially in the context of large projects (e.g., “Questioning the Tree of Life”). In this presentation I honor that legacy in a tripartite fashion with reference to my own research in a similar vein. First, I briefly highlight a current project that emulates large-scale interdisciplinarity to interrogate one of the most controversial aspects of life science: teleology. Second, I describe my role as Director of the Minnesota Center for Philosophy of Science in cultivating an interdisciplinary intellectual community like Egenis. Finally, I detail several of my own collaborative efforts with biologists, focusing on the distinctive value of jointly exploring the assumptions and evidence behind scientific models, as well as characterizing the diversity of scientific practices, to advance our understanding of how the (life) sciences work and decipher what kinds of answers they deliver.

Making Classes

Staffan Müller-Wille

University of Cambridge, United Kingdom

It has gone largely unnoticed that the very term “classification,” like so many other terms in science, is an eighteenth-century neologism. If “biology” did not exist before the end of the eighteenth century, perhaps more fundamentally classification – literally “the making of classes” – did not exist either? Building on John Dupré’s “In Defence of Classification” as well as Sabina Leonelli’s “Classificatory Theory in Data-Intensive Science” I am going to suggest that history and philosophy need to work hand in hand to resolve the seeming paradox that an activity that seems absolutely fundamental to any form of knowledge-making should have a historical beginning.

Navigating the Challenges of Interdisciplinarity: Some Personal Lessons

Dan Nicholson

George Mason University, United States

Doing genuinely interdisciplinary work comes with a distinct set of challenges that can be difficult to navigate. Having originally trained as a biologist to later become a

historian and philosopher of science, it has always been my hope that my work would be deemed relevant and valuable not just by other philosophers and historians but also by biologists themselves. Drawing on specific examples taken from my own work—much of it conducted while being associated with Egenis—I reflect on what historians and philosophers of science might do to engage more effectively with practising scientists.

Promiscuous mutualisms: The contribution of philosophers, especially John Dupré, to the scientific understanding of symbiosis

Thomas Pradeu

CNRS and University of Bordeaux, France; Chapman University, USA

My talk will explore the role that philosophers of biology, especially John Dupré, have played in the last two decades in the emergence of a novel scientific image of the biological world that gives a central role to symbiosis and intricate mutualisms. This topic, I suggest, offers an excellent opportunity to take a fresh look at three issues that run through John's work: i) scientific metaphysics; ii) processes; and iii) the impact of philosophers on science.

Poster Abstracts (in alphabetical order)

Scientific Imperialism in the Tangled Bank

Hannah Allen

University of Utah, United States

The history of entomological taxonomy demonstrates scientific imperialism in which genomic techniques, introduced in the 1970s, are considered more accurate than previously accepted morphological taxonomic methodologies. Furthermore, when making taxonomic decisions, if there is genetic evidence presented advocating for a given species concept, morphological evidence is often not consulted. I follow Dupré's (2001) account of scientific imperialism here, arguing that the introduction of genetics into entomological taxonomy represents "the tendency to push a good scientific idea far beyond the domain in which it was originally introduced, and often far beyond the domain in which it can provide much illumination." Not only does this have serious implications for scientific success in entomology, but also for our understanding of biodiversity and conservation efforts of insects.

Despite the progress made on genetic techniques from allozyme electrophoresis to direct sequencing, their continued use by entomologists, in cases of hybridization and convergent evolution, morphological techniques continue to be more reliable in delineating species. Yet entomologists tend to privilege each generation of genetic technique and subsequent generation of data from these techniques to drive inquiry. In this way, I expand Dupré's notion of scientific imperialism. It's not that genetics is not relevant to entomological taxonomy, but its use is over-extended. This has serious implications for the scientific practice of entomology. With increased focus on genetic data driven science, some have referred to the death of hypothesis driven science. If we consider a phylogenetic tree to be a series of nesting hypotheses, then, what are we missing from separate, parallel investigations of gene-driven and morphology-driven investigation?

Pluralism in the Philosophy of Cancer

George Alexandrou
University of Bristol

Reductionism in cancer research has been a topic of controversy since, at least, the late 1990s. In recent works, Plutynski and Bertolaso attempt to bridge the divide between reductionist and antireductionist theories of cancer's origin. The pluralist frameworks put forward by these works converge upon two premises that enable the coexistence of two theories often claimed to be opposed – the Somatic Mutation Theory (SMT) and Tissue Field Organisation Field Theory (TOFT). I evaluate these premises against the conditions of integrative pluralism, and discuss whether pluralism between SMT and TOFT could be 'truly' integrative.

Epistemic conditioners of scientific communication and its impact on lay audience's perception: the case of de-extinction

Mikel Asteinza Arteché and Jon Umerez Urrezola
University of Basque Country, Spain

Since their inception, de-extinction techniques have been the subject of much debate, including the terminology and forms of communication through which they are presented. In 2016, an IUCN report warned that the terminology used was misleading, as it seemed to promise, in contrast to the actual capabilities of these techniques, that the recovery of the original extinct species was possible. At the same time, some conservationists and researchers critical of de-extinction, as Campagna et al. (2017), warned of the dangers of this form of communication and the misinformation, misconceptions and unrealistic expectations it could lead to. The research we are carrying out engages in this debate and examines the impact of

scientific communication about de-extinction and its terminology on the lay public, as well as on the judgements they generate, highlighting and examining its epistemological aspects. To this end, we conducted a survey in which 200 subjects were divided into 3 experimental conditions and required to read a text about de-extinction and then answer a questionnaire. We designed 3 similar texts, one for each condition, among which the principal variable was the terminology used. Some of the data obtained indicated (1)- that terminology typically used to present de-extinction techniques tends to misinform subjects and (2)- encourage support for de-extinction; we also found out (3)- that there is a hypertrophied optimism about de-extinction among the lay public if we compare their opinions with those of the experts (Valdez et al., 2019). We will present these results and analyze their epistemological consequences.

Seeking a Definitive Definition of Living Organisms as a Phenomenon

Kazem Haghnejad Azar
University of Mohaghegh Ardabili, Iran

The interaction of non-living chemical compounds, γ , with the environment, a cognitive system in γ , which possesses the ability to process information and adapt, has evolved. This cognitive system gradually became more complex over time, leading to the emergence of living organisms with intricate biological structures and functions. As a result of the evolution of this cognitive system, living organisms have been created. There are compelling reasons behind this phenomenon. The search for a precise definition of living beings has been a topic of study and investigation for philosophers and scientists for a long time. Pross (2021) argues that a cognitive chemical system can evolve and adapt to exploit its environment, leading to the emergence of a living being, on the other hand, Pascal and Pross (2022) suggest that life arises from contingent events driven by kinetic forces and the properties of covalent bonds. Organic chemistry (γ) plays a crucial role, and recent experiments show complex kinetic behavior ($f(\gamma)$) in simple organics. Understanding the difference between living and non-living entities requires comprehending how a non-living compound transforms into a living organism. There is no clear point at which life begins, and the boundary between non-living, pseudo-living, and living states is not well-defined. In this manuscript, I argue that life is a chemical and physical process that emerges from non-living matter, and there is no distinct division between living and non-living states. A living organism is essentially a complex arrangement of matter with an evolved cognitive system. Mathematical analysis supports the idea that there is no comprehensive definition for living beings, and living organisms do not have unique characteristics that completely separate them from non-living entities. Therefore, a universally accepted definition of life is lacking.

Shape is everything: on protein's functions

Francesca Bellazzi
University of Birmingham, United Kingdom

Functions are easily attributed to living things, such as traits of organisms. However, functional attribution is less clear when it regards complex macromolecules, such as proteins. For instance, haemoglobin has the function of carrying oxygen around the body. However, what does it mean that haemoglobin – a complex macro molecule – has a function? The tension regarding the function of proteins concerns the fact that proteins are objects characterised by a complex set of properties that might be relevant for their functional component: a) structure (chemical and physical-geometrical properties); b) evolutionary history; c) the environment. Accordingly, the functional characterisation of proteins could happen both from an evolutionary perspective and a structural perspective, and both need to take the environment into account. Moreover, it also seems that a satisfactory account of proteins' functions should take into account both these features. This paper explores functional attribution to proteins and argues that proteins' biochemical functions correspond to a specific subset of chemical and geometrical structural properties contributing to specific evolved biological processes. This account enriches the one proposed in Bellazzi 2022, by adding the consideration of geometrical physical properties to chemical ones for protein function. Moreover, it explores also evolutionary and environmental considerations. Specifically, I will consider whether some features of proteins' shape can be taken as a trait, and then a form of evolutionary biological functions can be attributed to proteins.

From Neurophenomenology to Biophenomenology: Bringing Phenomenology, Enactivism, and the Free Energy Principle Together

Juan Diego Bogota
University of Exeter, United Kingdom

From a methodological perspective, the enactive approach to cognition is characterised by the circulation between natural science and lived experience. When it comes to the study of human consciousness, that idea is exemplified by Varela's (1997) *neurophenomenology*. In a nutshell, neurophenomenology consists of establishing reciprocal constraints between empirical and phenomenological evidence using an intermediate formal level of description (or 'generative passage') provided by the mathematical framework of dynamical systems theory. Thus, cognitive neuroscience, dynamical systems theory, and phenomenology form a 'triple braid' capable of providing a non-reductive understanding of human experience.

In my poster, I show my proposal to advance Varela's neurophenomenology to bring it closer to another idea that characterises the enactive approach: the deep continuity between life and mind. To say that life and mind are deeply continuous means that both phenomena share a basic set of organisational *and* phenomenological properties (Thompson, 2007). It is, however, somewhat unclear how our scientific understanding of life can integrate phenomenological categories without either falling into a form of anthropomorphism that attributes human experiential properties to all living systems, or a form of reductionism that reformulates phenomenological properties into mechanistic processes. In my proposal, which I call biophenomenology, I show how the enactive understanding of life and mind, on the one hand, requires phenomenological categories to connect life and cognition; and on the other hand, can be complemented with the mathematical framework of the Free Energy Principle to address both the empirical and the phenomenological properties of life and mind. I argue that the Free Energy Principle is preferable over dynamical systems theory as a generative passage when it comes to life and mind because it avoids the collapsing of objective and subjective dynamics onto each other.

Beyond epistemic goods: population health research and the epistemology of policy-relevant science

Thomas Bonnin

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A widely shared assumption in the philosophical literature is that scientific research primarily aims to produce epistemic goods, usually conceived as a combination of theoretical knowledge and empirical methods. In this view, a scientific approach is assessed by its ability to deliver such outputs. While widely applicable, this assumption doesn't hold for research that is explicitly framed to be policy-relevant. These sciences, instead, are assessed by their conjoined ability to deliver epistemic goods *and* contribute to the realisation of a socially valued output. In this poster, I use population health research as a case study of a science assessed in epistemic and applied terms. Analyses of population health research, from philosophers and scientists, have resulted in a range of positions which, I argue, all share a twinned concern with these sciences' epistemic prowess and policy relevance. They display sometimes sharply divergent views about (a) the policy relevance of a given research approach, most notably around the recent exposome studies, and (b) the type of knowledge needed to achieve population health goals.

In general philosophy of science, interest for policy-relevant research has flourished with the realisation of the pervasive roles of values in science and with analyses of evidence-based policy. These explorations have helped identify a number of challenges these sciences have to meet in order to achieve such a variety of aims. This literature centres mostly on the importance of making value judgments explicit

and bringing them in appropriate scrutiny, as well as the difficult determination of the scope of external validity for a given result.

The ambition, in this poster, is to initiate a mutually fruitful discussion between epistemological analyses of population health and general analyses of policy-relevant research. I argue that, population health, as a case study, sheds light on the issue of knowledge integration which is so far little discussed in more general discussions. In return, general philosophical discussions can help bring awareness to the pervasiveness of implicit value judgments and the usefulness of idealisations, something which is less prominent in current debates about population health research. Overall, this work displays the benefits of bringing into discussion the idiosyncrasies of individual research domains with broad-scale epistemological frameworks.

Data Sharing in Plant Space Biology: The Role of Metadata as a Form of Experimental Control

Paola Castaño and Sabina Leonelli
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The boundary between experimental artifacts and credible evidence is a concern in all biological experimentation. Plant space biology takes these complexities to new territories not just geographically but also epistemically because of the operational constraints of collecting data in the multi-stressor spaceflight environment. In consequence, a central challenge in this field is the disentanglement of the various stressors of 'space' and their biological effects on the plants. This poster examines how secondary data analysis relying on metadata curation is providing novel ways to interpret, compare, and potentially integrate results obtained in heterogeneous spaceflight experiments. We analyze the first publication of NASA's GeneLab Plants Analysis Working Group (AWG) which compared fifteen *Arabidopsis* transcriptomic datasets in the repository using a single common pipeline and cross-referencing the data to a curated metadata matrix. We argue that the curation and comparative analysis of multiple variables in the metadata can play the same epistemic function that experimental controls play in more standardized laboratory environments: providing a picture of the many intervening factors in experiments, sharpening the frame of comparison keeping some conditions constant as background and others as the targets of analysis, and pointing to ways to disentangle dependent and independent variables thus identifying plausible causal factors. This poster is part of a multi-year philosophical and sociological study of open science practices in space biology. Our analysis of the publication is also grounded on participant observation from 2022 to 2023 in the Plants AWG meetings.

Model Systems across the Lab and the Field: Organismal Samples

Emma Cavazzoni
University of Exeter, United Kingdom

This poster explores organismal samples as a type of scientific model designed for use across laboratory and field biology settings. On the basis of a detailed example, we argue that organismal samples complement other, better-recognized forms of modelling such as experimental organisms and mathematical models by: (1) fostering specific ways of framing and understanding the target phenomena; (2) supporting specific investigative strategies over others, thereby affecting research design, the choice and calibration of measurement instruments and the set-up of experiments; and (3) enabling interdisciplinary exchanges in ways that facilitate the integration of insights. First, we analyze how researchers in Haly.Id, a project in the area of pest-plant interaction studies, grow and modify pears to fit the investigation – and specifically the diverse characteristics of field and lab research environments. We illustrate how researchers addressed this challenge by developing methods to cultivate and handle the pears to ensure that they consistently display specific phenotypic traits and behaviours – in other words, making the pears into organismal samples that straddle the lab and the field. Second, we argue that such efforts significantly influence the representative power and epistemic functions of organismal samples as models. We discuss some key features, advantages, and challenges of pears as model systems, and compare them to other material models in biology such as experimental organisms and field specimens. We conclude by reflecting on the broader implications of focusing on organismal samples to foster understandings of biological research practice that extend beyond research laboratories and molecular approaches.

What the humanities and social sciences can contribute to laboratory animal science and welfare

Gail Davies, Beth Greenhough, Pru Hobson-West, Robert G. W. Kirk, and Emma Roe
Universities of Exeter, Manchester, Nottingham, Oxford, and Southampton, United Kingdom

This poster introduces key outputs from the Wellcome funded Animal Research Nexus Programme (2017- 2023). This ambitious interdisciplinary programme sought to develop new understandings of the social dimensions of animal research and embed new forms of communication across these. It was led by social scientists at the Universities of Exeter, Manchester, Nottingham, Oxford, and Southampton and carried out in collaboration with diverse individuals and organisations working to support working to support relevant and ethical biomedical research. Through these collaborations we have developed a unique body of qualitative research data that charts the changing organisation of animal research in the UK, from the introduction

of ASPA to the present, exploring how questions around the implementation of regulations, the distribution of expertise, the management of care, and the operation of openness are negotiated in practice. In this poster we introduce key aims and insights from the Animal Research Nexus Programme, which we explore in the open access book *Researching Animal Research*, published by Manchester University Press in early 2024. We foreground the creative methods for talking about care in animal research establishments, the innovative forms of public engagement, and opportunities for patient involvement that we have developed throughout the programme. These apply insights from the humanities and social sciences to generate safe and supported spaces for diverse groups of people to have open and productive conversations about animal research.

Congenital Syphilis Prevention in Western Colombia

Ana Estrada-Jaramillo
University of Exeter, United Kingdom

Why is it that a preventable disease cannot be prevented? That is the case for Congenital Syphilis (CS) in Colombia. Despite the implementation of Clinical Practice Guidelines (CPG) in 2014, there has not been a significant reduction in the incidence of CS, even more acute during the COVID-19 pandemic.

I argue that not acknowledging other ontologies (realities) besides those from science and “experts” is one of the main problems for CS prevention. In Quibdó, Manizales and Riosucio (Colombia), where this study was conducted, multiple ontologies (Mol, 1999; Mol, 2002), are enacted in a bundle of practices that clash, contradict and cooperate and make CS appear and disappear at certain moments and places, for some people.

I used online methods such as document analysis, interviews, Online Asynchronous Focus Groups (OAFG) and diaries with mobile phones or WhatsApp with healthcare workers and administrators, traditional midwives, pregnant women - recent mothers and their partners (Indigenous, Afro-descendants, migrants, Internally Displaced people).

Through the multimodal and “fragmented” data, I uncover silence, absence and discontinuity practices related to diverse care assemblages, temporalities - trajectories, stigmas and taboos. Those practices challenge the assumption of more knowledge and awareness regarding the CPG, individual and behavioural measures as effective for CS prevention.

CS prevention requires the integration of diverse care assemblages (biomedicine, traditional medicine - midwives, religion, curanderismo and online resources) to address taboos and stigmas, as well as silence and absence practices. Furthermore, it also requires the coordination of local, regional, national and international practices that stop configuring CS as neglected.

A new conceptualization of stigma emergence, mutation and prevention

Dr Hannah Farrimond
University of Exeter, United Kingdom

How do new stigmas emerge? How do they relate to existing stigma? My work moves beyond static models to articulate how stigmas emerge, mutate and are malleable to change. I offer a processual approach, suggesting change can be conceptualized along three dimensions, 'lineage' (in relation to history), 'variation' (in relation to context) and 'strength' (in relation to amplification or weakening over time) (Farrimond, 2021). More recently, with Michael (Farrimond & Michael, in press), I explore how these dimensions are interconnected in both predictable and unpredictable ways.

My work currently spans a number of case studies 1. The stigmatization of new and emergent entities (Long Covid stigma); 2. The transfer of stigma between social objects (vaping and smoking stigma); 3. How new scientific evidence shifts stigmas (how alcohol stigma is changing in relation to cancer risk); 4. How old stigmas are rearticulated (how psychedelic stigma is changing in the face of Western biomedicine).

Stigma is identified as a problem that stands in the way of effective medicine. However, although it is often said we need to 'tackle stigma', it is not always obvious how to do this. It is my aim that by better articulating how stigma emerges, changes and can be changed, we are better positioned to challenge its malign influence as a barrier to improved health-care.

Function, Capability, and Pluralism

Shane Glackin
University of Exeter, United Kingdom

Psychiatry and medicine are concerned with biological functions and dysfunctions, but not in the way functional biologists are. They are *ameliorative* disciplines; their purpose is to "make things better" for patients, and their interest in biological function is as a means to that end. The physician and the psychiatrist should therefore be understood as a species of engineer rather than of scientist. This has implications for the role biological function and dysfunction play in our understanding of disease. In a pluralist democracy, the sorts of narrow and determinate functions philosophical accounts of pathology traditionally appeal to will inevitably fail to reflect the full diversity of legitimate human interests in health and bodily wellbeing.

A common response is that that is a matter for politics, to which the natural phenomena studied and classified by science are indifferent. But engineering is not science and, as John Dupré has argued, even in science classification is not a matter

of finding the uniquely “real” set of criteria which “carve nature at the joints”, but of working out which of many equally real ways of carving up the world best suit the practical purposes for which we intend to use our classification.

A medicine or psychiatry focussed on the practical work of amelioration must therefore be able to select between a broad range of functional criteria depending on patients’ outlooks, interests, and ways of life. In fact, selection based on human interests is already implicit in one of the leading philosophical theories of function, Robert Cummins’ “causal account”. Unrestricted causal functions have been unpopular in the philosophy of medicine, because they are not thought to handle ascriptions of *dys*function well. But that turns out to be a solvable problem, meaning that a fully pluralistic and humanistic liberal philosophy of medicine is a live option.

From Neurodiversity to Cognitive Diversity: A Cross-Cultural Critique

Michael Hammbrook
University of Exeter, United Kingdom

I will put forward the concept of ‘cognitive diversity’ that I am developing, with the intention of placing the neurodiversity paradigm on more secure theoretical ground. I will outline several related issues with common interpretations of ‘neurodiversity’: individualism, neuro-centrism, and West-centrism. The metaphor of ‘brains wired up differently’ is often understood in a *neuroreductionist* (or genetic determinist) sense, reinforcing a sharp binary between neurotypical and neurodivergent minds. Without clarifying the ‘double empathy problem’, we risk *essentialising* these terms. Moreover, the concept of the ‘neurotypical’ is closely related to Western Neoliberal capitalism, in the same way ‘autism’ (despite being reclaimed as an identity label) remains tied to the bio-medical model. Both lack a fixed *essence* and have shifted meaning considerably. By universalising these terms across cultures with different social norms and conceptions of self, we may feed *epistemic injustices* whereby non-Western and intersectional neurodivergent voices are marginalised.

I will go on to describe how contemporary accounts of autism in embodied cognitive science and phenomenology have failed to escape certain core assumptions of the bio-medical model or pathology paradigm, though offering the basis for a more inclusive, relational understanding of cognitive diversity – particularly *enactive* concepts like ‘autonomy’ and ‘sense-making’. I will integrate these with Chapman’s ecological model, emphasising the need not only to focus on individual traits or accommodations, but for more radical systemic change, recognising the value of diverse cognitive styles in sustainable social ecologies. I will show neurodiversity to be *continuous with* cultural (and gender) diversity, and more broadly, biodiversity.

What is Ocean Metabolism? Exploring the Metaphysics of Biogeochemistry

Elis Jones

Ocean Frontier Institute, Dalhousie University, Canada

In this poster I present work from a short visiting fellowship project exploring the metaphysical commitments of the discipline of biogeochemistry, a field devoted to studying the interactions of living entities and chemical cycles across large-scale contexts. I focus specifically on the concept of ‘ocean metabolism’, which is employed by biogeochemists to characterise activity in the ocean. But what does ocean metabolism entail, and what do biogeochemists have in mind when employing it? An immediate question provoked by this concept is: when referring to ocean metabolism, whose metabolism is being referred to? ‘Metabolism’ is typically associated with processes occurring within organisms and living entities, but has also been used in a range of more expansive ways across ecological and social contexts. Here I offer an analysis of the way this concept has been employed in biogeochemistry, using insights from biogeochemical literature and public documents from an international biogeochemical project. I first survey some options to which I argue the notion of ocean metabolism is not obviously reducible: 1. metaphor; 2. an extension of human metabolism; 3. simply an aggregation of the individual (traditionally-conceived) marine organisms. Instead, I argue that marine biogeochemists may be committed to an inversion of the standard view of metabolism, whereby metabolisms are not things possessed by organisms, but where organisms are concentrations of metabolism. In the process I draw connections with other important concepts, both within biogeochemistry and outside of it, including the Gaia hypothesis, the ‘Redfield Ratio’ (an important founding theory of biogeochemistry), process philosophy, and the emerging ‘ocean rights’ movement. This raises several important philosophical and biogeochemical questions about the relationship between metabolism and life.

Inside the Enigma: A Predictive 4E Approach to Autism

Zamir Kadodia

University of Exeter, United Kingdom

Autism is a complex phenomenon with a heterogeneous constellation of different traits, both between autistic people and within the same autistic individual at different times. Traditional theoretical accounts of autism (such as the theory of mind account, weak central coherence account, and enhanced perceptual functioning account) have failed to capture this diversity of autistic traits in two ways: either they have i) focussed on one autistic trait (usually social) at the expense of others, or ii) failed to provide a specific mechanism for how the theory is cashed out at the cognitive and neural levels. In my PhD thesis, I argue that an emerging and ambitious framework in cognitive science – predictive processing – is better equipped to ameliorate both of these historical failures. Further, I

will weave insights from 4E cognition to argue that autistic traits should not be conceived under the deficit narrative of the medical model of disability, but rather that they are relational and distributed across the whole matrix of connections between brain, body, and world. Thus, 4EPP is not only a plausible framework with which to understand autism, but also one that aligns with and lends support to the neurodiversity movement.

Cultivating Connections: A Sociological Exploration of Tissue Culture and Participatory Crop Varietal Selections in the CSIR-Crop Research Institute.

Joyce Koranteng-Acquah
University of Exeter, United Kingdom

This poster delves into sociological dynamics of scientific practices at the CSIR-Crops Research Institute, located in Fumesua-Kumasi, Ghana, through a three-month ethnographic study during the fall of 2023. Focused on tissue culture processes and participatory crop varietal selections, research explores interactions among scientists, agriculture extension officers and farmers. Through on-site observations and interviews, the study examines successful partnerships in co-creating agricultural innovations, empowering farmers, and how mutual collaboration shapes the development and adaptation of crop varieties.

First, research examines tissue culture processes, a laboratory technique in agriculture that facilitates propagation of plant tissues outside their natural environment under sterile conditions. Process entails culturing plant tissue—meristematic cells, embryos or shoot tips—in a nutrient-rich medium for rapid multiplication and cloning. Technique conserves rare species, develops disease-resistance varieties and improves crop traits. Fieldwork explores challenges in integrating these methods into traditional farming systems. Beyond the laboratory, research investigates broader impacts of tissue culture on local communities, agricultural traditions and socio-economic landscape. It extends to participatory crop varietal selections, where breeders cultivate pre-basic seeds and actively engage farmers in the selection process—farmers choose preferred crop varieties and articulate reasons behind their choices. The process fosters dynamic exchanges, integrating farmer insights into decision-making. Significantly, chosen varieties are multiplied and returned to farmers for reproduction, fostering a sustainable cycle of knowledge exchange. This collaborative approach aims to bridge the gap between scientific innovation and on-the-ground agricultural realities, enhancing crop improvement in a mutually beneficial manner.

Promiscuous realism and the exploration of variation

James Lowe
University of Exeter, United Kingdom

John Dupré's formulation of promiscuous realism, that natural entities can be classified in multiple scientifically-valid ways, derives from his engagement with the problems of natural kinds, classification and taxonomy. I show how this concept can make sense of wider practices and conceptualisations across the life sciences. There exists a dynamic inter-relationship between the articulation of types, and the apprehension, recording and interpreting of variation inhering in that type. Types and the variation that manifest within them are mutually co-constituted. Thus, to the extent that promiscuous realism holds for the delineation of types, it also promises to illuminate the apprehension, measurement, analysis, control and interpretation of the manifold forms of variation detected and used in life science research. Elsewhere, I have referred the set of practices and concepts that researchers deploy to investigate and use different forms of variation as *variopraxis*. I inspect the development of yeast (*Saccharomyces cerevisiae*) genetic and genomic research from the outset of the Yeast Genome Sequencing Project to the 2010s. This examination ranges across the processes of abstraction used in the creation of a reference genome, through the functional analyses succeeding it, and finally to the interplay of practices characterising variation and diversity across *S. cerevisiae* with those involved in functional investigations of yeast. Through this, I highlight the radical possibilities of the concept of promiscuous realism to understanding experimental and other investigative practices in the life sciences, through the lens of *variopraxis*.

What's the 'self' in self-assembly? On the explanatory connection between spontaneity and context

Sebastian Sander Oest
University of Oslo, AssemblingLife, Norway

Self-assembly is often understood as a spontaneous process of global pattern formation that produces a final equilibrium structure through reversible interactions (Halley & Winkler, 2008). This process is ubiquitous in biological systems, being involved in everything from protein-folding and membrane-formation to social insect behavior (e.g., Barthlott et al., 2017; Carlesso & Reid, 2023). Despite this, the phenomenon has garnered little philosophical attention. In this poster I argue that mechanistic, functional, and structural explanations complement each other in the explanation of self-assembly. I argue for this by showing how the purported spontaneity of self-assembly is heavily dependent on features in their environmental context. This can be seen especially clearly in the empirical literature on driven and dissipative self-assembly in which the process is heavily regulated by context-interactions. These cases contrast with traditional cases of templated self-assembly in which environmental and contextual factors are assumed static. I then track how amenable such various cases of self-assembly are to mechanistic, functional, and structural explanations. This reveals that cases of templated self-assembly are much

more amenable to mechanistic treatment at the exclusion of other features, but as context-sensitivity increases more structural and functional aspects are needed to complement the mechanistic explanation. Reflecting on these cases I propose that self-assembly can help provide insights into both how structural, functional, and mechanistic features are jointly involved in the formation of biological structures as well as the contextual nature of scientific explanations in biology.

Abstract – Exploring the marvelous world of proteins (and our epistemic access to it)

Francois Papale
University of Sherbrooke, Canada

In the past decades, philosophers of biology have emphasized the scientific importance of previously neglected biological entities, such as microbes. With this poster, I wish to draw attention to another undertheorized level of biological organisation, namely, that of proteins. This functionally diverse category of macromolecules has mostly been tackled by philosophers concerned with classificatory or metaphysical issues. Recent developments in computational biology suggest that other aspects of protein-oriented research gain to be apprehended philosophically.

Historically, proteins have been notoriously hard to study because uncovering their three-dimensional structure experimentally is a labor-intensive process, and because no reliable method for predicting that structure was available. The situation changed following the publication (in 2021) of software (RoseTTaFold and AlphaFold) that reliably predict protein structure from amino acid sequences. Along with algorithms that measure three-dimensional structure similarity between proteins (e.g. Foldseek), these methods are already being applied to study, among other things, important evolutionary problems, such as phylogeny reconstruction. After having presented these scientific developments, I will discuss two of the numerous avenues for philosophical inquiry that arise from what I will frame as a second molecular turn (changing the focus of various disciplines from nucleic acids to proteins). Firstly, drawing on the philosophy of measurement literature, I will analyze the justificatory structure that leads researchers to claim that they can “demonstrate that structure-informed phylogenies can outperform sequence-only ones.”¹¹ Secondly, I will suggest that this new attention given to proteins may have important implications for the perennial issues surrounding levels and units of selection.

Lessons from the past, thinking in the future: artistic and aesthetic dimensions in the history of the life sciences

Luana Poliseli

Wageningen University & Research, Netherlands

Artistic and aesthetic aspects are present throughout the development of modern science; naturalistic illustrations are renowned examples of their role in representing the world to understanding life. But aesthetic properties are not exclusive to artistic objects as aesthetic appreciation is not exclusive to artistic experiences. A plethora of aesthetic aspects in science is part of the process of explaining life such as beauty, systematicity, symmetry, etc. Despite such diversity, debates on the aesthetics of science have traditionally associated the appreciation of beauty with the success of a theory or an experiment. However, this is an oversimplification and does not entirely represent the complexity of aesthetic values and experiences used in sciences to explain and understand life. By taking an intentional detour into natural history, this work draws lessons from the history and philosophy of biology combined with contemporary empirical research to understand *how* and *what types* of aesthetic engagements were present in the development of modern science and how they changed in contemporary debates of scientific research. I argue for the existence of multiple and distinct aesthetic dimensions *in* and *of* science. They are: emotional, methodological, sensorial, intuitive, and artistic. I will focus on the relation of aesthetic experiences to nature and the life sciences to expose that aesthetics and artistic aspects were and still are perennially present in scientific contexts. This strengthens the idea that aesthetic experiences and values not only play an epistemic role in science but could be formally incorporated into scientists' epistemic toolboxes to understand life and a changing planet.

Can abductive inferences be automated?

Mariana Vitti Rodrigues
São Paulo State University, Brazil

This presentation investigates the concept of abductive inference in the context of the growing automation of scientific discovery. In the history of Artificial Intelligence, attempts to develop algorithmic systems that promote scientific discovery have always received special attention, from DENDRAL in the 60s (Lindsey 1993) to AI-Descartes nowadays (Cornelio 2023). A philosophical debate emerges in this scenario discussing the extent to which inferential processes that underlie scientific discovery can be automated. To deepen this debate, we discuss the concept of abduction inquiring the extent to which abductive inferences can (and cannot) be potentially automated. Firstly, we will present the Peircean account of abduction, according to which abduction is the process of generating and selecting an explanatory hypothesis that guides future inquiry (CP 5.171; 1903). Secondly, we will introduce the contemporary concept of abduction characterized as Inference to the Best Explanation (IBE), which aim is to select a hypothesis, among a set of available hypotheses, considering their explanatory potential in terms of likelihood and loveliness (Lipton 2004). Thirdly, we will discuss IBE in relation to Bayesianism,

according to which rational agents update their degrees of beliefs in a proposition based on new evidence and explanatory considerations. We argue that the investigation of the role of explanatory considerations in scientific discoveries sheds light on the limits of automating abduction. To illustrate our investigation on the possibility (or not) of automating inferential processes that involves explanatory considerations, we will present IBM's AI-Descartes (2023) framework which aims to combine data and expert knowledge to leverage scientific discovery.

Palaeobloopers: Semiotics and fossil misinterpretation

Judyth Sassoon

University of Exeter, United Kingdom

Scientists make mistakes, and palaeontology is full of them. However, rather than being celebrated as steps along a messy and difficult path, notorious cases of fossil misinterpretation are remembered for decades. Despite this, errors are just as much part of scientific progress as the discovery of truths. So rather than berating our colleagues, should we not try to understand why errors are made?

I have been applying Peircean semiotics to track the history of research in palaeontology, especially in the interpretation of Mesozoic marine reptile fossils (e.g. plesiosaurs, ichthyosaurs and mosasaurs). Through semiotics, it is possible to access not just how historical events follow each other, but also the ways that the scientists themselves interact with the fossils, what ideas they bring to their studies and why they choose certain interpretations over others.

Here I present two case studies from the history of plesiosaur research. The first is from the 1820s and takes a semiotic perspective on William Conybeare's model of plesiosaur anatomy, based on fossil fragments from the Early Jurassic horizons of Great Britain. Conybeare produced hypothetical reconstructions of plesiosaurian limbs, pectoral girdles and pelvic girdles before the plesiosaur body plan was fully known. The second example is from the work of Beverly Tarlo in the late 1950s, who famously misinterpreted the anatomy of a large pliosaur, with consequences for the understanding of pliosaur phylogeny that are still felt today.

By taking fossils as signs of organisms from the distant past, these famous palaeontological errors can be understood semiotically and the reasons for the errors can be understood in terms of the Peircean relationship between sign, object and interpretant.

The Value of Public Participation in Ecological Research

Rose Trappes

University of Exeter, Exeter

With the rise of citizen science, scientific research increasingly involves members of the public in their homes, workplaces, and natural surroundings. What happens to science when ordinary people participate in the research process? Is the research conducted by non-professionals good science, and in what sense? This project aims to understand the epistemic value of public participation in scientific research, with a special focus on big citizen science platforms in ecology. In particular, the project investigates whether and how big citizen science contributes to epistemic diversity in ecology, and what this means for its value for ecological research. These questions will be addressed by applying qualitative empirical methods and philosophical analysis to a case study, eBird India. eBird is a very prominent global citizen science platform in which birdwatchers record species observations. The platform has been particularly successful in India, where it has led to a new generation of birdwatchers producing vast quantities of data for global biodiversity datasets. Using this case study, the project will generate new insights about how big citizen science is conducted in practice, the opportunities and limitations it creates, and what impact it has on ecology. This project centres attention on science beyond the lab and the university and contributes to understanding and assessing the diverse, disparate, and data intensive nature of contemporary ecological research.

Interdisciplinarity of Complementarity: The Case of National Agricultural Science in Crete

Fotis Tsiroukis
University of Exeter, United Kingdom

Agronomy is one of the most interdisciplinary fields. Modern research on crop science usually involves the cross-disciplinary collaboration between plant biotechnology, molecular chemistry, microbiology, entomology, bioecology, geophysics, hydrology, remote sensing, systems engineering between others. Moreover, the nature of applied agricultural research in a local setting not only involves the world of academia, but is often found on the cross-roads between government, business and farming, with the concerns of researchers being influenced by the interaction with these worlds. A crucial question then becomes: "How are these different epistemic worlds able to coordinate together in knowledge production and application"? Through my ethnographic study of the multi-departmental Institute of Olive Subtropical Crops and Viticulture (IOSV) in Crete, I've come to observe different forms of coordination at different scales, from the level of the individual researcher interacting with an epistemic environment of equipment, software and dissected fruit, to attempts at increasing the collaboration between institutes with different expertise on the national level by the Hellenic Agricultural Organization (HAO). In various levels however, effective collaborative practice tends to have a common motif which I call relational complementarity (or cross complementarity). In the level of the local department of IOSV at Chania, what streamlines good inter-lab collaborative relations is streamlined by an

organizational distinction between crop-specific and “horizontal” specialties, where researchers tend to be epistemically flexible to accommodate the rest of the expertise present in a research project. In my poster I will flesh out my framework through employing diverse visual representation formats.

Archives as...: The History & Philosophy of the Archive

Kirsten Walsh & Adrian Currie
University of Exeter, United Kingdom

Text-based archives are crucial for historical knowledge, at least as generated by traditional historians. Although archives have received plenty of attention in some disciplines, there is not yet a sustained study of how archives might matter in the philosophies of history and science. We sketch an initial shape of a “history and philosophy of the archive” by introducing four interwoven perspectives we might take on archives—four things we might understand archives *as*. First, and perhaps most familiarly, archives are *incomplete*: over time information degrades and is lost, but perhaps more interestingly, archivists and curators make decisions about what to keep and what to discard. And so, the incompleteness of an archive isn’t simply due to information decay, but to specific decisions made by the historical actors involved in the construction and maintenance of the archive. A history and philosophy of the archive, then, must analyse the forms of expertise (or claimed expertise) and practice involved in these decisions. Relatedly, archives generate the *conditions of historical knowledge*. Insofar as historian’s claims rely on archival evidence, the pool of possible evidence on which an historian might rely is limited to what evidence is available, and how it may be accessed and engaged with. Plausibly, then, archival design plays a crucial role in shaping historical research: being accommodating of some directions, hostile to others. The historian’s practical interaction with archives may turn on these limitations. Third, archives can be understood as practical “points-of-resistance” to historians’ research questions, pre-conceptions and theoretical ideas. The archive provides fruitful avenues for surprise, new directions, and deepening understanding for the historian (as well as evidence), in a mutually-supporting iterative manner. Making good use of an archive, then, requires being interested in a fourth perspective: the history of the archive itself. Telling an archive’s history is necessary for understanding its incompleteness—what kinds of knowledge the archive was constructed to support; why certain records survived while others didn’t; why decisions about retention and organisation of records went the way they went;; what points of resistance are available. To engage with an archive is to engage with the history of that archive, and knowledge of that history is necessary to confront archival hostility. We argue that understanding these perspectives on archives is crucial for understanding the nature of historical knowledge and for gaining a better grasp of the value or otherwise of digitization and other practices which aim to make archives more accessible and pluripotent.

Quantitative Genetics as Data Practice in Plant and Animal Breeding

Hugh Williamson
University of Exeter, United Kingdom

Quantitative genetics has a long history yet has been relatively neglected in the history, philosophy and social studies of biology. In recent years, historians and philosophers have begun to analyse the uses and implications of quantitative genetics in the controversial area of human behavioural genetics. Yet there remains a significant lacuna of attention when it comes to the breeding of plants and animals, despite a dedicated community of scientists and practical breeders working under the banner of quantitative genetics since the mid-twentieth century. This poster presents a framework for conceptualising the work of quantitative genetics in breeding in terms of data practices. More specifically, it conceptualises quantitative genetics as an ecology of data journeys, involving the integration of phenotypic, genetic and genomic data, that intersect in the production of statistical indicators of the genetic characteristics of individual organisms and populations. The production, circulation and use of these indicators forms a key activity of quantitative genetic practices in breeding, around which many other breeding practices are organised, with not only epistemic implications but also social and material implications for agriculture. The poster explores these implications in relation to three types of indicator: *Heritability*, which is used to establish the tractability of phenotypic traits for breeding improvement; *breeding values*, used to predict the value of an individual for breeding and rank individuals for selection; and *genetic gain*, an indicator of genetic change in a population used to monitor and govern breeding programs.

Explaining protein folding: problems of interventionism

Jietong Xu and Gry Oftedal
University of Oslo, Norway

Interventionist theory, as developed by James Woodward (2003; 2010), aims to account for causal explanation in the sciences and beyond. In Woodward's framework, causal explanation is counterfactually defined and understood as relations between variables, as modular, as change-relating, and as represented by "chains" or "paths". Whether these central ideas in interventionist theory fare well in life science explanation at the intersection of molecular biology, biochemistry, and biophysics, needs more scrutiny. We use the case of protein folding explanation as an outset for assessing interventionism at this intersection. We investigate how protein folding is currently explained in the life sciences and evaluate the interventionist framework in the light of actual cases. We identify the following problems: (a) The abstraction needed to represent causes and effects as variables that can take different values omits information relevant to the explanation and impose modularity

on relevant representations. (b) Central explanatory features in the case of protein folding are not represented well as change-relating generalizations, such as thermodynamic foundations (e.g. movement towards lower energy states/equilibrium), and physical/chemical restrictions on protein folding. (c) Protein folding depends on many, and simultaneous, interactions between components that are not easily represented as organized in chains or paths. A crucial characteristic of amino acid residues is their many weak interactions with each other and with other factors in cells. Our investigation into the interventionist account serves as an outset for developing an improved framework for understanding the explanation of protein folding and similar phenomena researched in the life sciences.

The Epistemology of Cell Culture Technologies in Comparative Biology

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Recent advances in stem cell research allow researchers to grow cells on dishes and induce them to become specific cell types and even “organoids” (i.e., tissue structures that exhibit structural and functional similarity to actual organs). These technologies have recently been applied to study the organ development and physiology of organisms that have not been amenable to laboratory experimentation for practical and ethical reasons. This approach involves various types of inferences based on newly emerging and rapidly developing research practices. The prospect and limitations of those types of inferences and practices remain to be analyzed and assessed. In this presentation, I outline my project that investigates the use of advanced cell culture technologies in studies of non-standard model organisms. It combines conceptual tools from the philosophical literature and empirical methods of social sciences to examine the following questions: (1) Reproducibility. Cultured cells are known to exhibit significant variability. What inferential and methodological approaches could help scientists overcome it? (2) Representational role. Cultured cells are studied as “models” of actual organs or living organisms. In what circumstances can scientists make reliable inferences from cultured cells to living organisms? (3) Transfer of methods. Cell culture technologies are established in major experimental systems and then applied to new systems, often with significant modifications. How does this transfer occur and what epistemological issues does it involve? (4) Social and institutional contexts. Cell culture-based comparative biology involves researchers with different expertise. What social and institutional contexts surround these studies, and how are research practices shaped by interactions among different aims, values, expectations, and interests, possibly differently in different countries?



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