

Australia/New Zealand Philosophy of Biology Workshop

June 21–23 2023, Australian National University

Program

All talks apart from the Keynote (which is on June 21st at 5pm) will be held in RSSS Lectorial 2 (Room 1.23), 146 Ellery Crescent. The Keynote will be held in the RSSS Auditorium.

Day 1: Wednesday June 21st

2:00–2:20pm	Welcome
	Session Chair: Rachael Brown
2:20–2:40pm	Carl Brusse , The Final Nail? The Diachronic Reference Class Problem for the Biostatistical Theory of Disease
2:40–3:00pm	Pietro Allegretti , Sense of Beauty and Aesthetic Predisposition in Evolutionary Aesthetic Theorising
3:00–3:20pm	Riin Koiv , A Measure of the (In)compatibility of Genetic and Social Explanations
3:20–3:40pm	Russell Meyer , Small & Simple: A Biogenic Approach to Minimal Beliefs
5:15–6:15pm	Keynote: Maureen O'Malley , Medical Microbiome Research and its Parallels with Galenic Medicine Chair: Kate Lynch

Day 2: Thursday June 22nd

9:00–9:30am	Coffee
	Session Chair: Emily Parke
9:30–10:10am	Aja Watkins , Paleocological Analogues and the Adequacy of Purposes for Data
10:10–10:50am	Olivier Delettre , One Epistemological Role of Ecological Resilience Vagueness
10:50–11:20am	Morning tea break
	Session Chair: Carl Brusse
11:20–11:40am	Jonathan Sholl , Nutrient Balancing in the Context of Evolution
11:40am–12:00pm	Emily Parke , What is a Healthy Microbiome?
12:00–12:20pm	Kate Lynch , What Should Count as a Cause of Death?
12:20–2:20pm	Lunch
	Session Chair: Charles Pence
2:20–3:00pm	Jorge Mendonca , Altruism Beyond Ultimate Desires
3:00–3:40pm	Dook Shepherd , What is it Like to Bee?
3:40–4:00pm	Afternoon tea break

Session Chair: Chris Lean
4:00–4:20pm **Alexandre Duval**, A Neurobiological Argument for the Geometric Module
4:20–4:40pm **Cristina Villegas**, Integrating Evolutionary Explanations: Developmental Repatterning as a Population-Level Mechanism
7:00pm Conference dinner (Blu Ginger, 2/5-21 Genge Street)

Day 3: Friday June 23rd

9:00–9:30am Coffee
Session Chair: Aja Watkins
9:30–10:10am **Lucia Neco**, A New Framework to Study Social Systems
10:10–10:50am **Charles Pence & Caleb Hazelwood**, Metaphysics and the Philosophy of Biology
10:50–11:20am Morning tea break
Session Chair: Alexandre Duval
11:20–11:40am **Sandy Boucher**, Functionalism and Structuralism in Biology: Stances or Explanatory Strategies?
11:40am–12:00pm **Chris Lean**, Invasive Genomes in the Age of Synthetic Biology
12:00–2:00pm Lunch
Session Chair: Maureen O'Malley
2:00–2:40pm **Katie Deaven**, A Tale of Two Propensities: Evolvability and Fitness
2:40–3:00pm **Rachael Brown**, Major Transitions and Developmental Niche Construction
3:00–3:40pm Planning meeting
3:40pm End

Abstracts

Day 1: Wednesday June 21st

The Final Nail? The Diachronic Reference Class Problem for the Biostatistical Theory of Disease
Carl Brusse

Christopher Boorse's Biostatistical Theory of health and disease (BST) is the most highly-cited naturalistic account of disease, because it is the most often critiqued and most stridently defended. It claims to identify the objective normativity of pathology in functional deviations from statistical norms among clinically-relevant reference classes (according to age, sex, etc). In this paper I present an overview of the BST and a subset of previous attacks and Boorse's responses, focusing in particular on Elseijn Kingma's arguments regarding how its reference classes are fixed. I argue that the reference

class problem which Kingma identifies can be generalised, and that the diachronic version of this problem is far more pressing for BST. Within Boorse's reference classes, statistical norms have changed dramatically over time as health outcomes have improved (or sometimes declined). But the BST is faced with a dilemma: it must either deny that health outcomes have changed over time as a matter of objective fact, or it must give up its claim to the clinical relevance that underpins its reference classes. Though this might seem like one more objection among many, I argue that the diachronic problem helps to show that the BST's purported objectivity is in fact grounded in convention, and the view should not be seen as naturalistic at all.

Sense of Beauty and Aesthetic Predisposition in Evolutionary Aesthetic Theorising

Pietro Allegretti

In this talk I argue that evolutionary aesthetics would benefit from a refined conceptual framework. I will draw attention to a case study central to the aims of evolutionary aesthetics, that is, study of the phylogenesis of secondary sexual characters. The purpose of this talk is to reestablish Darwin's account of sense of beauty (henceforth, 'SoB') as a legitimate concept of evolutionary and philosophical research, and to draw connections between Darwin's account and the work of anthropologist Ellen Dissanayake on aesthetic predispositions. I will show how this synthesis of Darwin and Dissanayake will contribute to evolutionary debates concerning the development of aesthetic characters.

Darwin's main purpose was to provide explanations for the (minimally) sense-based perceptual preferences of various species, and his work constitutes a first phylogenetic reconstruction of the components of these preferences. Dissanayake shares with Darwin the hypothesis that perceptual discrimination is associated with emotional arousal, and her account of aesthetic predispositions, while it does not explicitly connect SoB with forms of animal bodies or behaviours, ranges over the displays of animals and neurological triggers of these. I argue that their works would provide a shared comparative framework that will shed a new light on human aesthetic dimension.

A Measure of the (In)compatibility of Genetic and Social Explanations

Riin Koiv

There are explanations according to which a human trait t has social causes ("social explanations"). And there are explanations according to which t has genetic causes ("genetic explanations"). That social and genetic explanations of t need not be, and often are not, in conflict is increasingly frequently recognized and emphasized. However, amid this welcome development one should not lose sight of the possibility that some genetic explanations are in fact in tension with – and count as evidence against – some social explanations. It is thus important to have a clear view on which factors the (in)compatibility of a social and a genetic explanation depends upon. I will make explicit one such factor by applying a contrastive account of causal explanation according to which a causal explanation always makes (implicit) reference to some salient causal contrast. I demonstrate how the (in)compatibility of a social and a genetic explanation turns on what the salient contrasts are in the context of concrete explanations. For an example, I apply this framework to assess the (in)compatibility of specific types of genetic and social explanations of t : an explanation in terms of heritability and a social constructionist explanation.

Small & Simple: A Biogenic Approach to Minimal Beliefs

Russell Meyer

Living organisms are precarious, autonomous agents that act to sustain their own viability. Extending this basic picture from cells to more complex organisms and behaviours is an ongoing research challenge. My interest here is in minimal beliefs - the simplest cases of organisms using beliefs to motivate and orient their behaviours. As a pillar of analytic epistemology and the philosophies of mind and language, beliefs are synonymous with language-laden, contentful propositions, a picture that generalises from folk psychological assumptions about the human case. Per Pamela Lyon's biogenic approach, I instead begin by considering what organisms do that would require beliefs - broadly construed - to explain, rather than how beliefs must be instantiated. My aim is to explore candidate organisms that require states that constrain and maintain extended patterns of behaviour unfolding over longer timescales, and that are not easily explained by basal cognitive capacities (i.e. basic learning, anticipation, decision-making). This discussion also aims to contribute to a biologically-grounded, naturalised understanding of inborn or instinctive behaviours in organisms lacking a sophisticated nervous system, without defaulting to gene-centric explanation. A further aim is linking basic life processes like autopoiesis and agency to greater organisational complexity.

Medical Microbiome Research and Its Parallels with Galenic Medicine

Maureen O'Malley (Keynote)

My talk will examine some of the problematic concepts in microbiome research from a novel angle. Human microbiomes (the microbial communities in human bodies) have been linked to every bodily and mental illness that exists. Many of these connections are weak or contradictory, in part because of limited conceptual development in the field.

Based on work with Laura Sumrall (Wollongong), I'll show the surprising conceptual parallels that exist between medical microbiome research and the ancient Western medical tradition developed by Galen in the second century CE. This tradition bases its diagnoses and treatments on the four humours (yellow and black bile, phlegm, blood) and subscribes to notions of health that are now considered outdated in modern medicine. The parallels include shared commitments to balance, omnicausality, teleological function and holism. I'll offer some general explanations for why these parallels might exist in microbiome research and not other areas of medical research, and then focus on their implications for microbiome science research and its applications. But I'll also try to consider more broadly about what philosophers should make of such historical parallels, and whether they can truly help understand what's going on in a contemporary science.

Day 2: Thursday June 22nd

Paleoecological Analogues and the Adequacy of Purposes for Data

Aja Watkins

According to the "adequacy-for-purpose" view of data evaluation, data should be evaluated as better or worse relative to a given research purpose and corresponding research context (Bokulich & Parker 2021). In this presentation, I will apply the adequacy-for-purpose view to a novel case study - concerning the use of paleoecological data to make predictions about coral reef response to contemporary climate change - and then use the case study to suggest two extensions to the adequacy-for-purpose view. First, I argue that we can evaluate research purposes according to their productivity (how well these research purposes serve other, more ultimate purposes). Second, I argue that we can also evaluate research purposes according to their plausibility (including whether we have

access to data that are adequate for these research purposes). The relationship between data evaluation and purpose setting should be seen as an iterative one, in which both data and purposes are refined in concert over time. In closing, I reflect on how constraints on data in field-based sciences, including many life sciences and geosciences, have the potential in general to affect how the aims and purposes of science are constructed.

One Epistemological Role of Ecological Resilience Vagueness

Olivier Delettre

Uncertainties are pervasive in ecology and often hinder our capacity to describe, explain or predict the dynamics of ecological systems. The present talk focuses on a particular kind of uncertainty called “vagueness” which concerns our difficulty to set the exact position of a conceptual limit and results in the existence of borderline cases. Ecological resilience which refers to “the capacity of an ecological system to persist in the face of disturbance” is vague because “to persist” has no clear limit for an ecological system. Indeed, there is no straightforward answer to the question “what is the quantity of change beyond which an ecological system loses its identity?”. Yet, in some situations, ecologists need to define a precise limit for ecological persistence, otherwise they could not decide if an ecosystem has been conserved, restored or if it has been resilient to a given perturbation. I will show that the history of the resilience concept has been marked by the setting of four distinct limits of ecological persistence. These four limits are based on four distinct criteria of ecological systems identity and will lead me to formulate four sub-definitions of resilience in ecology. Drawing on that history of vagueness reduction, I will highlight the epistemological role played by the original extremely vague “balance of nature” notion as a precursor for the more precise resilience ones.

Nutrient Balancing in the Context of Evolution

Jonathan Sholl

While philosophers of science have marginally discussed concepts such as ‘nutrient’, ‘naturalness’, ‘food’, or the ‘molecularization’ of nutrition, they have yet to seriously engage with the nutrition sciences. In this talk, I offer one way to begin this engagement by investigating conceptual challenges facing the field of nutritional ecology and the question of how organisms construct a ‘balanced’ diet. To provide clarity, I build on the distinction between nutrient balance as a property of foods or dietary patterns and nutrient balancing as an evolved capacity to regulate nutrient intake. This distinction raises conceptual and empirical issues, such as what properties constitute this capacity and whether they are the same in all organisms. Additionally, while scientists use the term ‘balancing’, its intension and extension need further clarification. Based on the literature, the properties of external nutrient detection, internal sensing of nutrient levels, and organismal regulation could provide a basic recipe for nutrient balancing. Next, using an evolutionary lens, I examine nutrient acquisition in some prokaryotes, slime molds, simple multicellular eukaryotes, and in the quirks of multicellular metabolism to raise questions about the origins and universality of balancing. Overall, I advocate further philosophical engagement with nutrition science.

What is a Healthy Microbiome?

Emily Parke

The idea of a “healthy microbiome” features often in scientific and popular discussions of the human microbiome and its role in our health and disease. I critically interrogate this idea, building on discussions of the related microbiome concept of ‘dysbiosis’ (e.g., Hooks & O’Malley 2017). “Healthy microbiome” talk is conceptually and empirically complicated: there are various ways to conceptualise

both health and microbiomes, various ways to characterise microbiomes (e.g., taxonomically or functionally), and variation in microbiome properties across hosts and over time in the same host. Microbiomes are often conceptualised as ecosystems, and some recent discussions encourage thinking about microbiome health in light of the idea of ecosystem health (e.g., Inkpen 2019). While helpful, this comes with its own set of conceptual and empirical issues. I suggest that a particular source of confusion stems from “healthy microbiome” talk often equivocating as to whether the health in question is that of the host or of the microbiome itself (or both). I discuss both options, argue that both have problems, and suggest abandoning most talk of healthy microbiomes in favour of clarifying more precisely the relationships between microbiome states and host states.

What Should Count as a Cause of Death?

Kate Lynch

Assigning a cause of death is required on death certificates in every UN member state. Cause of death information informs national and global mortality trends, which influences research, policy, and public health initiatives. Documented causes must fall within the International Classification of Diseases, 11th edition (ICD-11) which specifies codes for over 170,000 candidate causes. Acceptable candidate causes are being continually debated and revised. These debates and revision concern which causes are explanatorily relevant to death. Current controversial examples include alcohol, climate change, medical error and ageing which many have argued are causally important, yet are not currently accepted by the ICD as causes of death. This talk will examine some of the arguments used by public health researchers for the inclusion of causes to the ICD, and compare these to philosophical approaches for determining causal explanatory relevance.

Altruism Beyond Ultimate Desires

Jorge Mendonca

Can human beings have genuine altruistic motivation or are we, deep down, always looking for what is best for ourselves? This question has inspired much discussion, and it seems that its answer will say much about how we see ourselves and others. Answering such a question, however, requires a clear understanding of what altruism is. In this presentation, I will discuss the different accounts of altruism in humans, including behavioral and motivational accounts. My main focus will be on the notion of psychological altruism, in which altruism is defined as an ultimate desire to increase the welfare of others. Philosophers and scientists have debated whether we have good reasons for believing in the existence of psychological altruism, but no consensus has been achieved. Rather than making a case for or against the existence of psychological altruism, I will argue that this is not a fruitful way of defining altruistic motivation. I will argue that psychological altruism (1) diverges from the original account of altruism; (2) is not fruitful for scientific research (differently from other accounts of altruism, such as evolutionary altruism); and (3) deflates altruism from the very properties that make it a relevant concept.

What is it Like to Bee?

Dook Shepherd

As the (historically vexed) cognitive concepts used to describe and explain intelligent behaviour are precisified and operationalised, they apply towards increasingly basal organisms. Morally considerable properties are likewise encompassing other-than-human forms of life. But this shift isn't a change in the organisms, rather it is a shift in how we relate to them. Such reconceptualisation brings with it increased sensitivities, response-ability to wellbeing interests and arguably toward non-

human phenomenal worlds. I contend that the more effective our understanding of cognitive capacities become, the better our articulations of moral properties and moral reasons become. I wish to explore the prospect that some moral and cognitive properties coincide, or in certain cases may be identical properties conceptualised through different paradigmatic lenses, perhaps serving different explanatory purposes. One upshot of this is that by attending to the ways which organisms construct their own-worlds we may better see into those worlds for-them, better understand their flourishing, and hence become better able to articulate moral reasons as we become increasingly sophisticated moral agents, discovering value rather than imposing or denying it. In this presentation I wish to provoke further discussion and exploration of the conceptual links between cognition and morality.

A Neurobiological Argument for the Geometric Module

Alexandre Duval

The idea that higher cognitive processes are partly or mainly realized by modular systems has been widely criticized in cognitive science. Many people resist it in large part due to the fact that there isn't even a single non-controversial example of a higher-cognitive module. In this paper, I try to remedy this situation by bolstering one of the most promising empirical cases in favor of positing a higher-cognitive module. It comes from the geometric-module hypothesis, which holds that many species possess a module for spatial navigation that operates only on representations of the global geometry of three-dimensional surfaces to guide search behavior. I start by considering an objection against the hypothesis that hasn't been discussed at any length in the navigation literature, even though it seems to cut right to its heart. It is that the geometric-module hypothesis can't make sense of well-known findings from neurobiology that navigation-related neurons (like place cells and head-direction cells) are sensitive to non-geometric information. To answer this objection, I provide a new cognitive architecture for spatial navigation in mammals. I then argue that any plausible model of spatial navigation will need to be committed to this architecture to account for relevant neurobiological findings.

Integrating Evolutionary Explanations: Developmental Repatterning as a Population-Level Mechanism

Cristina Villegas

Evolutionary developmental biology (evo-devo) is often portrayed by theoreticians of the field as bringing a mechanistic perspective into evolutionary biology. Usually, it is also illustrated as stressing the causal role that development plays in the evolutionary process. However, mechanistic studies in evo-devo typically refer to lineage-specific transformations and lack the generality that evolutionary explanations usually aim for. After reviewing the prospects and limits of a mechanistic view of evo-devo and their studies of homology and novelty, in this talk I propose a way to combine this mechanistic view with the population-level inclination of more classical approaches to evolution. In particular, I argue for developmental repatterning as a general mechanistic structure organized in such a way that it produces biases in the production of evolutionarily relevant phenotypic variation in populations. This structure refers to the organizational properties of all lineages that, through reproduction, development, mutations and recombinations, channel phenotypic changes through the properties of developmental mechanisms. I contend that developmental repatterning can be incorporated into the broader picture of population-level evolutionary mechanisms, which in turn helps situate better the agenda of evo-devo and its vindications on the causal role of development into our philosophical discussions of evolution.

Day 3: Friday June 23rd

A New Framework to Study Social Systems

Lucia C. Neco

Humans are social beings. However, we are not alone in the realm of social reality; we share this space with diverse entities, even more than just other animal organisms. In this presentation, I challenge the argument that supports the existence of a gap between humans and nature and rejects an expanded notion of social reality that comprises both human and nonhuman beings. I defend a new framework to describe and study social systems which fits this expanded notion of social reality. This framework is based on three basic building blocks of social systems: social units, interactions, and relationships. A social system is formed when cognitively autonomous individuals (social units) interact repeatedly and build relationships. The literature on plant interactions and cognition is used to illustrate how this framework can be applied. Finally, I briefly discuss the implications and applications of this proposal. The framework expands the concept of the social and facilitates comparative investigations, yields insight into the evolutionary and ecological importance of social behaviors, and encourages collaboration across disciplines.

Metaphysics and the Philosophy of Biology

Charles Pence and Caleb Hazelwood

The philosophy of biology has long been pervaded by internal disputes over its metaphysical commitments. Many contributions from the field's founding figures—from Fisher's indeterministic causation to Hull's account of species as individuals—do not shy away from metaphysics. Others have expressed a profound skepticism about metaphysics, leading to the importance of a "practice turn" for philosophy of biology, with some arguing that our role is thus to extract from practice the nature of biological concepts. In other words, the former camp informs biological practice with metaphysical principles, whereas, for the latter, ontology yields to pragmatism.

This tension has been evaluated in particular contexts, e.g., in debates over species concepts and natural selection—areas in which the presence or absence of connections with metaphysics has been noteworthy. But few have attempted to evaluate, in general, the conditions under which these relationships between metaphysical principles, scientific practice, and philosophy of biology are, or ought to be, understood. In this talk, we will offer a preliminary sketch of the relationship between practice and metaphysics in the philosophy of biology. More ambitiously, we will attempt to develop a normative, pluralist account, articulating the circumstances under which each approach should defer to the other.

Functionalism and Structuralism in Biology: Stances or Explanatory Strategies?

Sandy Boucher

In my (2015) I argued that functionalism and structuralism in biology should be understood as philosophical stances *sensu van Fraassen*: clusters of attitudes, values, goals and commitments, rather than factual beliefs. Only such a construal, I claimed, could account for the manifest historical continuity of these views, in particular the fact that they come in pre-Darwinian as well as evolutionary forms.

In a forthcoming book ('Structure and Function'), Rose Novick takes issue with my analysis, arguing that functionalism and structuralism should be construed as 'explanatory strategies' rather than philosophical stances. This can, she claims, capture the historical continuity of the views, while also

having the virtue of showing how function-structure disputes can be empirically decided, something the stance account struggles with.

In this paper I offer a response to Novick's argument. I suggest that the views in question are related to, but can't be reduced to, the endorsement of certain types of explanatory strategies, either in a global or local sense. While her view has certain merits, ultimately it fails as it can't do justice to the existence and function of general philosophical (dare we say metaphysical) orientations or worldviews in biology.

Invasive Genomes in the Age of Synthetic Biology

Christopher Lean

Genomes, and genes, can be transferred between organic individuals vertically from a parent to offspring, either largely intact or recombined through sexual reproduction, or smaller sections of a genome are transferred through horizontal gene transfer. Within microbes horizontal gene transfer is common but as organismal size becomes larger, it becomes less common. Large sections of life are largely genetically isolated from other lineages, with their innovations kept evolutionarily separate for millions of years. This evolutionary isolation mirrors the ecological isolation many lineages experienced prior to the age of globalisation. Ecological isolation was not absolute, but human movement increased the speed of species movement across the globe and created possibilities that would otherwise not occur. Synthetic biology creates this same dynamic on the genome level with previously isolated genetic sequences now able to transfer across lineages through human action. I explore four possible ways synthetic biology could create invasive genes: gene-mediated invasive species, transposable element release, mobile DNA introduction, and solution-oriented genetic homogenization.

A Tale of Two Propensities: Evolvability and Fitness

Katie Deaven

Evolvability has been described as a capacity to generate complex adaptations, an ability for a population to reach some particular trait space, the probability that a random mutation will be viable or improve some phenotype, or the potential of lineages to persist. What these views share is that they treat evolvability as propensity to evolve, but they disagree about the nature of the propensity. The implications of this disagreement are that it obscures the physical base(s) that contribute to a population's evolvability and the appropriate timescale for assessing evolvability. This puzzle is not altogether new in philosophy of biology; a similar problem arises in the fitness literature: Is fitness a propensity to survive? To survive and reproduce? To produce grand offspring? Moreover, dubbed the "multiple propensities problem," different timescales can lead to different conclusions about fitness, leading some to worry that fitness cannot be measured in a non-arbitrary way. I explore how fitness theorists have responded to these concerns, and what lessons may be gleaned for the case of evolvability.

Major Transitions and Developmental Niche Construction

Rachael Brown

The depth and breadth of human culture is unmatched and even more impressive for having arisen over a period of just 200,000 years or so. The great explosion of cultural diversity in our lineage has led some to argue that the human capacity for complex culture represents a major transition in evolution (Maynard Smith & Szathmary, 1995). The focus of this work has tended to emphasize the

impact of high fidelity cultural inheritance via language and social learning on the evolvability of human populations. What has driven the prodigious cultural diversity of humanity is, so the argument goes, our capacity to reliably transmit and accumulate information. In this paper, I offer an alternative picture. High fidelity cultural inheritance alone is insufficient to account for the recent explosion of culture even if necessary for it to have occurred. Just as for biological complexity, the organization of the ontogenetic niche is central to understanding trait robustness and novelty, it is also a key ingredient in explaining human cultural complexity. The implications of this line of reasoning for the role of developmental niche construction in major transitions will also be considered.