

Society *for the*
Metaphysics
of **Science**

Sixth Annual Conference

September 1 - 4, 2021

Online via Zoom

Foreword

Message from the President

On behalf of the SMS officers and the program committee, I would like to welcome you to the 6th annual meeting of the Society for the Metaphysics of Science. Following previous meetings hosted in Newark, Geneva, New York, Milan, and Toronto, this is the SMS's first online event, and the first in two years given that the 2020 meeting, originally scheduled for Bristol, had to be cancelled.

It has been a wildly unpredictable year and a half. Everyone who has contributed to this conference has managed to do so despite being affected in innumerable ways by the Covid-19 pandemic, and as such deserves a more resounding thank-you than ever for helping to make this meeting happen. But for all that it represents a 'change of plan', I myself am extremely excited about the event – excited both about the papers, which ratify the rude health of our field, and about the format. While the Coronavirus crisis will at some point be over, we still face the tsunami of the climate crisis; given that online events incur only a fraction of the carbon commitments of their in-person counterparts there must surely be more of a role for these in the future. As such, I am grateful that we at the SMS have this opportunity to try out something new.

My heartfelt thanks go to of our wonderful keynote speakers – Jo Wolff, Barbara Vetter, and John Dupré – as well as to everyone on the organizing committee who has been working behind the scenes for months to make this meeting happen. Thanks go also to the program committee for putting together such a diverse and exciting program, as well of course to the authors and presenters of the papers themselves. I hope that you all enjoy the meeting.

Kerry McKenzie

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Schedule

All times BST (GMT+1)

Wednesday, 1 September

Wed 1 Sep	ROOM A	ROOM B	ROOM C	ROOM D
1200-1300	<p><i>Chair: Joaquim Giannotti</i></p> <p>Alison Fernandes. Evidence-Based Accounts of Chance and Counterfactuals.</p>	<p><i>Chair: Katie Robertson</i></p> <p>Alexander Franklin. Bohmian Mechanics and Local Reductive Explanation. Comments: Isaac Wilhelm</p>	<p><i>Chair: Alastair Wilson</i></p> <p>Ryan Kulesa. Finkish Trait Types and the Propensity Interpretation of Fitness.</p>	<p><i>Chair: Tuomas Tahko</i></p> <p>Tyler Hildebrand. An epistemology for the metaphysics of science.</p>
1300-1400	<p>C. D. McCoy. Counterfeit Chance.</p>	<p>Vera Matarese. On the principles that serve as guides to the ontology of quantum mechanics.</p>	<p>Vanessa Triviño. A metaphysical review of the eco-immunity account of the holobiont. Comments: Margarida Hermida</p>	<p>William Hannegan. Metaphysics-Laden Observation.</p>
1400-1430	Break			
1430-1530	<p><i>Chair: Kerry McKenzie</i></p> <p>Nicholas Emmerson. Plumbing Metaphysical Explanatory Depth.</p>	<p><i>Chair: Tyler Hildebrand</i></p> <p>Nina Emery & Gabrielle Kerbel. Configuration Space Realism and Fundamentality.</p>	<p><i>Chair: Carl Gillett</i></p> <p>Sepehr Ehsani. Principled Mechanistic Explanations in Biology: A Case Study of Alzheimer's Disease.</p>	<p><i>Chair: Michael Townsen Hicks</i></p> <p>Niels Martens. Semantic Realism.</p>
1530-1630	<p>Vera Hoffmann-Kolss. Counterpossibles and Causal Exclusion.</p>	<p>Lorenzo Lorenzetti. Wave Function Realism vis-à-vis Functional Reduction.</p>	<p>Ravi Chakraborty. 'Can form cause form?': On the role of mathematics in a metaphysics of biological form.</p>	<p>Maria Regina Brioschi. Scientific Objectivity and the Community of Inquirers: C.S. Peirce on mathematics.</p>
1630-1700	Break			
1700-1830	<p>Keynote: Jo Wolff (University of Edinburgh) Quantities are Structures ROOM A</p>			

Thursday, 2 September

Thu 2 Sep	ROOM A	ROOM B	ROOM C	ROOM D
1200-1300	<p><i>Chair: Vera Hoffmann-Kolss</i></p> <p>Marta Conti Lorenzo. The QCD Phase Transition Objection to Dispositional Essentialism.</p>	<p><i>Chair: Vera Matarese</i></p> <p>Davide Romano. The Unreasonable Effectiveness of Decoherence.</p>	<p><i>Chair: Joe Dewhurst</i></p> <p>Aleksandar V. Božić. Probing the "grey area": natural kinds and extraterrestrial life. Comments: Francesca Bellazzi</p>	<p><i>Chair: Katie Robertson</i></p> <p>Silvia Bianchi & Joaquim Giannotti. Grounding-based Approaches to Ontic Structuralism .</p>
1300-1400	<p>Samuel Kimpton-Nye. How to be a Powers Theorist About Functional Laws, Conservation Laws and Symmetries.</p>	<p>Matt Farr. What's so special about initial conditions?</p>	<p>Margarida Hermida. Cats are not necessarily animals. Comments: Wai Lok Cheung</p>	<p>Ryan Miller. Priority Monism's Quantum Problems. Comments: Alastair Wilson</p>
1400-1430	Break			
1430-1530	<p><i>Chair: Michael Townsen Hicks</i></p> <p>Riccardo Baratella. Processes and Events, and the Source of Their Modal Profile. Comments: Giacomo Giannini</p>	<p><i>Chair: Nina Emery</i></p> <p>Marian J. R. Gilton. On the (dis)analogy between electric charge and color charge.</p>	<p><i>Chairs: Gunnar Babcock & Federica Bocchi</i></p> <p>Federica Bocchi. Making Global Biodiversity: from Establishing a Measurand to Assessing Accuracy.</p>	<p><i>Chair: Huzeyfe Demirtas</i></p> <p>Andrei Buckareff. Distentangling Powers from Disposition-Ascriptions.</p>
1530-1630	<p>Thomas Donaldson. A Problem for Neo-Fregean Abstractionists.</p>	<p>David Schroeren. A Fundamental Ontology for Orthodox Quantum Mechanics. Comments: Charles Sebens</p>	<p>Gunnar Babcock. Species' temporal parts.</p>	<p>Caspar Jacobs. Comparativist Theories or Conspiracy Theories: the No Miracles Argument against Comparativism.</p>
1630-1700	Break			
1700-1830	<p>Keynote: Barbara Vetter (Freie Universität Berlin) Naturalizing Modal Epistemology ROOM A</p>			

Friday, 3 September

Fri 3 Sep	ROOM A	ROOM B	ROOM C	ROOM D
1200-1300	<p><i>Chair: William Hannegan</i></p> <p>Cristian Mariani. Does the Primitive Ontology of GRW rest on Shaky Ground? Comments: Ryan Miller</p>	<p><i>Chair: Fabio Tononi</i></p> <p>Martin Calamari. The Process Metaphysics of Loop Quantum Gravity.</p>	<p><i>Chair: Giuliano Torrenco</i></p> <p>Natalja Deng. On metaphysical explanations of psychological temporal asymmetries.</p>	<p><i>Chair: Tuomas Tahko</i></p> <p>Toby Friend. Four Humean accounts of global symmetries. Comments: Heather Demarest</p>
1300-1400	<p>Josh Quirke. Fission Cases and Everettian Quantum Mechanics.</p>	<p>Andrea Roselli. Dispositional Essentialism in the Eternalist Block.</p>	<p>Thomas Blanchard. A New Causal Exclusion Problem for Interventionism (and Some Unsuccessful Solutions).</p>	<p>Callum Duguid. Symmetries as Humean Metalaws. Comments: Michael Townsen Hicks</p>
1400-1430	Break			
1430-1530	<p><i>Chair: Kerry McKenzie</i></p> <p>Qiu Lin. Du Châtelet on Mechanical Explanation vs. Physical Explanation.</p>	<p><i>Chair: Isaac Wilhelm</i></p> <p>Jorge Alberto Manero Orozco. Bohman structuralism against space fundamentality realism.</p>	<p><i>Chair: Giuliano Torrenco</i></p> <p>Marco Facchin. Extended predictive minds: do Markov Blankets matter?</p>	<p><i>Chair: Tyler Hildebrand</i></p> <p>Heather Demarest. Against the Pragmatic Humean. Comments: Chris Meacham</p>
1530-1630	<p>Óscar Antonio Monroy Pérez. The Dream-Quest of Unknown Fundamentalialia. Comments: David Glick</p>	<p>Charles Sebens. Electron Charge Density: A Clue from Quantum Chemistry for Quantum Foundations. Comments: Alexander Franklin</p>	<p>Paul Kelly. How do functional models in cognitive science represent and explain?</p>	<p>Chris Meacham. The Nomic Likelihood Account of Laws. Comments: Jennifer McDonald</p>
1630-1700	Society for the Metaphysics of Science Annual Business Meeting			ROOM B
1700-1830	<p>Keynote: John Dupré (University of Exeter) The Metaphysics of Evolution ROOM A</p>			

Saturday, 4 September

Sat 4 Sep	ROOM A	ROOM B	ROOM C	ROOM D
1200-1300	<p><i>Chair: Heather Demarest</i></p> <p>Kyley Ewing. The Passage of Time in the Block Universe. Comments: Giuliano Torrengo</p>	<p><i>Chair: Tyler Hildebrand</i></p> <p>Isaac Wilhelm. Grounds for Effective Theories. Comments: Óscar Antonio Monroy Pérez</p>	<p><i>Chair: Ravi Chakraborty</i></p> <p>Wai Lok Cheung. A choice theory of metaphysical possibility. Comments: Riccardo Baratella</p>	<p><i>Chair: Max Kistler</i></p> <p>Matthias Rolffs. Causal Pluralism and Carnapian Explication. Comments: Aleksandar V. Božić</p>
1300-1400	<p>Javier Belastegui. Kant's Law, Hierarchy and Essentialist Kinds.</p>	<p>Valia Allori. Naturalness from a Humean Perspective: A Reductio Argument.</p>	<p>James Miller. The Metaphysics of Grammar.</p>	<p>Huzeyfe Demirtas. Causation Comes in Degrees.</p>
1400-1430	Break			
1430-1530	<p><i>Chair: Alastair Wilson</i></p> <p>Giacomo Giannini. Degrees of Powers and the Source of Independence.</p>	<p><i>Chair: Giuliano Torrengo</i></p> <p>Javier Anta. Can information concepts have physical content?</p>	<p><i>Chair: Heather Demarest</i></p> <p>Safia Bano. Critique of Ellis's Microessentialism.</p>	<p><i>Chair: Max Kistler</i></p> <p>Jennifer McDonald. The Relativity of Causal Models. Comments: Matthias Rolffs</p>
1530-1630	<p>Zee Perry. There's no speed of light, so what the heck did Michelson measure?</p>	<p>David Glick. Determinacy as a desideratum. Comments: Cristian Mariani</p>	<p>Fabio Tononi. Heidegger on the Difference between Philosophy and Science.</p>	<p>Joe Dewhurst. Causal Emergence From Effective Information: Neither Causal Nor Emergent?</p>
1630-1700	Break			
1700-1830	<p>Presidential Address: Kerry McKenzie (University of California, San Diego) The Plurality of Priority. ROOM A</p>			

Abstracts

Alphabetized by first author's first name

Aleksandar V. Božić, "Probing the "grey area": natural kinds and extraterrestrial life"

In this paper I deal with the so-called "grey area", which refers to entities that lie between life and nonlife and whose aliveness is vaguely established. These entities are either subcellular (e.g., organelles, proteins) or noncellular (e.g., viruses, prions). Accounts such as the ones put forward by Forterre (2016, 2017) and Dupré & O'Malley (2009) establish the aliveness of such entities on the basis of their involvement with what is already considered to be alive on Earth. Accordingly, entities such as viruses and proteins are alive in virtue of their participation in processes within living beings. One undesirable consequence of such accounts is that the aliveness of a possible extraterrestrial "grey area" entity, belonging to the same natural kind as a terrestrial one, depends on its performance within terrestrial living beings. I will argue that the aliveness of such a "grey area" entity should be determined in a manner not constrained by terrestrial scenarios. By proceeding from the property-cluster kind (PCK*) approach to living entities proposed by Ferreira Ruiz & Umeretz (2018) I will argue that the natural kinds of the "grey area" entities are best understood as borderline or tentative subkinds of the natural kind "life". In this case, the putative aliveness of a subkind applies to all its instances, whether familiar terrestrial or unfamiliar extraterrestrial ones. For example, if we discover an extraterrestrial protein composed of dextro amino acids, its aliveness is determined notwithstanding its nonfunctionality within terrestrial living beings. I will conclude by claiming that the PCK* account of natural kindhood of life is appropriate for astrobiological research since it can provide a framework for assessing the aliveness of various phenomena in a manner not constrained by terrestrial scenarios. This includes possible novel forms of life and possible new examples of the „grey area“ entities.

Alexander Franklin, "Bohmian Mechanics and Local Reductive Explanation"

The success of science consists, in large part, in local reductive scientific explanations; however, it's far from clear how to understand these from within the framework of Bohmian Mechanics. That's because local reductive explanations in quantum theory standardly require reference not just to particle positions but additionally to features only found in the wavefunction. And yet, the wavefunction is interpreted by Bohmians as a non-local field, law, or universal disposition. In order to make sense of such explanations, the Bohmian should engage with the project of articulating an ontology of effectively localised wavefunctions. I note significant technical and conceptual challenges to the development of this project.

Alison Fernandes, "Evidence-Based Accounts of Chances and Counterfactuals"

In this paper, I develop evidential accounts of chances and counterfactuals. According to these accounts, what chances and counterfactuals are, and how they should be evaluated, are specified in evidential terms. Chances, for example, are objective worldly probabilities that allow us to reason from the state of a system at one time to the state of a system (itself or another) at another time. Counterfactuals are evaluated by considering 'branch points' where the counterfactual antecedent had a reasonable chance of occurring, given macroscopic states up to the time of the branch point. The justification for this stipulation is evidential—counterfactuals help us reason about what evidence we would have in hypothetical cases. These evidential accounts compare favourably to nearby statistical-mechanical accounts that appeal to a 'Past Hypothesis'—the particular initial macrostate the universe begun in. But these evidential accounts do better at identifying the function of distinctly modal relations and so justifying why we reason about the world in modal terms. They also do better at identifying the source of the temporal asymmetries in these relations—they are due to a probability gradient of the universe, rather than to a special initial state. For those interested in giving accounts of scientific relations by considering their function, and explaining temporally asymmetric phenomena in scientific terms, there is much to recommend evidence-based accounts of chances and counterfactuals.

Andrea Roselli, "Dispositional Essentialism in the Eternalist Block"

The connection between the metaphysics of time and the metaphysics of powers is a relatively new debate in the philosophical literature. Friebe 2017, Backmann 2018, Donati 2018 have argued that dispositional essentialism may encounter some problems when combined with (in their words) 'static' views of time, such as Eternalism. I believe this is a challenge that it is important to address. I will first briefly present (the standard version of) the four main metaphysics of time; I will then present and discuss the main objections moved to the combination of powers ontologies and the metaphysics of time; finally, I will argue that these objections fail, and that the alleged incompatibility results merely from a misconception of the staticity of Eternalism, on the one hand, and of the productiveness of powers on the other; in particular, I will show how the 'incompatibility argument' is either false or trivial.

Andrei Buckareff, "Distangling Powers from Disposition-Ascriptions"

A common assumption among powers realists is that 'power' and 'disposition' are co-referring terms, and, hence, the powers of objects are treated as identical with the dispositions of objects. In this paper, I question this assumption. I aim to disentangle powers from dispositions with the goal of getting a better sense of how they relate to one another. I present and defend a modest realism about dispositions built upon a fairly standard strong realism about powers. I contend that the truthmakers for disposition-ascriptions are built into the powers of objects. Specifically, I argue that each correct disposition ascription we can make of an object picks out one of the manifestations towards which a given power of the object is directed. To ascribe an unmanifested disposition x to an object is to pick out one of the potential manifestations towards which an unactivated power y is directed. And when power x is active in the way specified by the disposition x ascribed to the object, x is manifested.

C. D. McCoy, "Counterfeit Chance"

Objective probabilities associated with deterministically evolving systems---counterfeit chances, in Lewis's colorful phrase---are unquestionably useful and ubiquitous in everyday circumstances and in science alike. If they are not genuine chances, as Lewis maintains, what is the nature of these probabilities, and how are they justified? I argue that we should understand them as involving the imposition of random selectability on a space of objective possibilities---the grounding of these probabilities ultimately comes from us, then, rather than from any probabilistic aspect of the world. Nevertheless, these probabilities can be fully objective by being based on structural features of the system that precisely allow for such a probabilistic interpretation. I discuss two routes of justification: (1) via empirical frequencies and (2) via irrelevant arbitrariness in choice of probabilities, as in the method of arbitrary functions.

Callum Duguid, "Symmetries as Humean Metalaws"

Symmetry principles are a central part of contemporary physics, often thought to constrain the character of the physical laws. Despite this, there has been surprisingly little metaphysical work done on them. This paper develops the Wignerian treatment of symmetries as higher-order laws – metalaws – within a Humean framework of lawhood. On this approach, the metalaws are the universal generalisations present within the best systematisation of the world's events. Lange has raised two obstacles to Humean metalaws, and the paper shows that the account has the resources available to respond to both. The first, that Humean metalaws fail to be resilient under ordinary counterfactuals, can be defused through closer examination of how Humeans evaluate counterfactuals. The second, that the predicates in the metalaws do not refer to perfectly natural properties, motivates an appeal to the language-relativity of the Better Best System Account. It is argued that this framework for Humean metalaws stands as an example of naturalistic metaphysics, able to bring Humeanism into contact with the practice of actual science without giving up on the central denial of necessary connections.

Caspar Jacobs, "Comparativist Theories or Conspiracy Theories: the No Miracles Argument against comparativism"

In order to avoid symmetry-related underdetermination, many philosophers have opted for comparativist theories. The fundamental quantities of those theories are comparative; for example, mass ratios or spatial distances. However, there are certain structural facts about the instantiation of those quantities that the comparativist seemingly cannot explain. Several examples of such 'comparativist conspiracies' are known; for example, distances famously obey the Triangle Inequality. I argue that these conspiracies are a general problem for a wide class of comparativist theories, including Leibnizian relationism and mass comparativism. Meanwhile, absolutism does not face this issue, and so all else being equal we should prefer the latter

Charles Sebens, "Electron Charge Density: A Clue from Quantum Chemistry for Quantum Foundations"

Within quantum chemistry, the electron clouds that surround nuclei in atoms and molecules are sometimes treated as clouds of probability and sometimes as clouds of charge. These two roles, tracing back to Schrödinger and Born, are in tension with one another but are not incompatible. Schrödinger's idea that the nucleus of an atom is surrounded by a spread-out electron charge density is supported by a variety of evidence from quantum chemistry, including two methods that are used to determine atomic and molecular structure: the Hartree-Fock method and density functional theory. Taking this evidence as a clue to the foundations of quantum physics, Schrödinger's electron charge density can be incorporated into many different interpretations of quantum mechanics (and extensions of such interpretations to quantum field theory).

Chris Meacham, "The Nomic Likelihood Account of Laws"

An adequate account of laws should satisfy at least five desiderata: it should provide a unified account of laws and chances, it should yield natural relations between laws and chances, it should justify our numerical chance assignments, it should accommodate dynamical and non-dynamical chances, and it should accommodate a plausible range of nomic possibilities. No extant account of laws satisfies these desiderata. This paper presents an account of laws, the Nomic Likelihood Account, that does. The paper

begins by motivating the need for such an account. It presents and briefly motivates the five desiderata, and shows how a few prominent accounts fail to satisfy them. Then it spells out the account's metaphysical posits, provides a representation and uniqueness theorem showing that these posits will yield things that look like laws and chances, and uses these results to provide an analysis of laws and chances. Finally, the paper describes some consequences of the Nomic Likelihood Account.

Cristian Mariani , "Does the Primitive Ontology rest on Shaky Ground?"

Can we make sense of the idea that the primitive ontology (PO) is indeterminate? And if we do, would this idea be explanatory useful in some way, or would it simply lead us too far from the very reasons we had to posit a PO in the first place? As I will show in this paper, these issues become of crucial importance when it comes to understanding what the ontology of the Mass Density approach to GRW (GRWm) ultimately looks like. Proponents of the PO view are never explicit in claiming that the determinacy is a requirement for the notion, yet arguably this is entailed by one of the criteria for a suitable PO, namely its being always well defined in every point in 3D space. I will argue that this requirement is however not satisfied in GRWm. The conclusion I will draw is that the notion of Indeterminate PO should be taken seriously, for it is suggested by one the major interpretations of quantum mechanics.

David Glick, "Determinacy as a desideratum"

Some have alleged that quantum theory involves metaphysical indeterminacy. However, this metaphysical claim is underdetermined—there are accounts of quantum theory that posit metaphysical indeterminacy and others that do not. Fortunately, theoretical virtues can allow us to resolve this case of underdetermination. Versions of quantum theory that posit metaphysical indeterminacy will be less simple or less informative than their indeterminacy-free counterparts. Moreover, positing metaphysical indeterminacy does not provide a clear gain in explanatory power, contrary to the suggestion of Calosi and Wilson (2021). Thus, determinacy is a desideratum in an interpretation of quantum theory.

David Schroeren, "A Fundamental Ontology for Orthodox Quantum Mechanics"

A large part of the recent literature on the metaphysical implications of quantum mechanics—including debates about quantum metaphysical indeterminacy and the status of permutation symmetry and haecceitism in QM—proceeds from a framework sometimes known as 'orthodox quantum mechanics'. But the conclusions of these debates are threatened to be undermined by two facts: first, none of the extant major live interpretations are consistent with the principles that underlie this framework, so their accounts of fundamental ontology are incompatible with orthodox quantum mechanics; and second, so far there is no sufficiently detailed and precise independent account of the ontology of orthodox quantum mechanics. The goal of this paper is to fill this lacuna by developing such an account. This investigation will reveal that some, but not all, of the metaphysical conclusions that have been drawn on the basis of 'orthodox quantum mechanics' survive a rigorous elaboration of the ontology capable of underwriting this framework.

Davide Romano, "The Unreasonable Effectiveness of Decoherence"

This paper aims to clarify some conceptual aspects of decoherence that seem largely overlooked in the recent literature. In particular, I want to stress that decoherence theory, in the standard framework, is rather silent with respect to the description of (sub)systems and associated dynamics. Also, the selection of position basis for classical objects is more problematic than usually thought: while, on the one hand, decoherence offers a pragmatic-oriented solution to this problem, on the other hand, this can hardly be seen as a genuine ontological explanation of why the classical world is position-based. This is not to say that decoherence is not useful to the foundations of quantum mechanics; on the contrary, it is a formidable weapon, as it accounts for a realistic description of quantum systems. That powerful description, however, becomes manifest when decoherence theory itself is interpreted in a realistic framework of quantum mechanics.

Fabio Tononi, "Heidegger on the Difference between Philosophy and Science"

Since the emergence of Greek philosophy, the relationship between philosophy and science has varied considerably. For example, the idea of science (in relation to philosophy) in Scholasticism differs from that which took shape at the time of Galileo Galilei, or in the period of the atomic physics of Niels Bohr and Werner Karl Heisenberg. The German philosopher Martin Heidegger (1889–1976) devoted his attention to this relationship. In a series of texts – including *Being and Time* (1926); *Modern Science, Metaphysics, and Mathematics* (1936); *What is Called Thinking?* (1954); *Science and Reflection* (1954); *What is Philosophy?* (1956); and *The End of Philosophy and the Task of Thinking* (1964) – Heidegger defines the function of philosophy and that of science (*Wissenschaft*), distinguishing their respective features. Heidegger argues that philosophy deals with thinking, whereas science deals with knowledge. In this regard, Heidegger maintains that 'science itself does not think, and cannot think' precisely because 'the essential nature and origin of its sphere, the essence and essential origin of the manner of knowing which it cultivates', remains inaccessible to it. On the other hand, Heidegger continues, 'thinking does not bring knowledge as do the sciences'. In this paper, I will focus on Heidegger's view on

the difference between philosophy and science – a topic that has hitherto been little discussed – while also considering the following questions: (i) why is it relevant to address this issue today?; (ii) if philosophy and science are distinct, as Heidegger argued, why is it that in certain historical periods scholars dealing with science were also philosophers (such as in the sixteenth and seventeenth centuries)?; and (iii) does the current multidisciplinary approach – that is, the dialogue between philosophy and science – challenge Heidegger's idea?

Federica Bocchi, "Making Global Biodiversity: from Establishing a Measurand to Assessing Accuracy"

Attributing a numerical value and a relative uncertainty value to a measurand, the quantity one is interested in measuring, is a basic step in science. But what if a measurand does not, properly speaking, measure any property? In other words, can we measure, or better, can we accurately measure, something that does not correspond to any feature of the world? This talk aims to show that this conundrum applies to the measurement of global biodiversity and affects ecology and conservation biology. Biodiversity studies collect local measurements on a global scale of genetic variation, species richness and abundance, ecosystem integrity, etc., integrating diverse sources of information. Then, automation and data aggregation methods are applied to polish the data, homogenizing these measurements and thus revealing biodiversity patterns in an abstraction process that has been called "making data global" (Edwards 2013). In my talk, I make three points. I first argue that making biodiversity data global is metaphysically problematic due to the pluralistic, non-scalable nature of biodiversity. I problematize the measurand of global biodiversity estimates and I adopt a skeptical attitude towards quantifying something like "global biodiversity" based on local, heterogeneous data and non-coextensive and non-covarying measurements. Second, I tackle the question of whether global-biodiversity measurements can even be said to be "accurate" provided that there is no clear measurand, as accuracy generally depends on how a measurement approximates its measurand. Finally, I argue that these metaphysical issues impact conservation strategies and policy-making and I advocate for a solution. I suggest an adequacy-for purpose strategy to answer the question of what is the measurand of global biodiversity, although I resist a possible antirealist criticism according to which there is no fact of the matter in looking for a real property for global biodiversity measurements.

Giacomo Giannini, "Degrees of Powers and the Source of Independence"

It is common to think that (some) powers can exist unmanifested (Independence). In this paper I focus on the question: in virtue of what this is the case? I first consider the idea that Independence holds in virtue of the nature of powers, but note that the view would make it impossible to ground natural and metaphysical necessity on powers. I investigate alternative hypotheses about the source of Independence, which allow powers to ground necessities. In particular, I focus on a theory, proposed by B. Vetter, according to which Independence holds directly in virtue of the degree of powers: it holds for all non-maximal powers. I note two problems for Vetter's proposal, both revolving around the notion of a maximal power and explore how her account of degrees can overcome them. After criticising her account of degrees, I present a different degree-based theory on the source of Independence, which does not require the existence of maximal powers.

Gunnar Babcock, "Species' temporal parts"

If species are real things in nature, we might wonder what parts they have. The obvious answer is that organisms are the parts of species. But how species and their parts are related in time is not clear. Biologists have proposed various species concepts that look to criteria such as reproductive isolation (Mayr 1992) or genetic similarities (Wu 2001) to unify organisms (i.e. parts) into a whole (i.e. species). However, the degree to which the various species concepts that have been proposed by biologists and philosophers of biology successfully capture the nature of species remains a hotly debated topic (see Wilkins 2009, Richards 2010, Ereshefsky 2017). At the same time, metaphysicians have various arguments about objects and the constitutive parts that they might have. If species are individuals what are the metaphysical consequences? Reydon (2008), by comparing the debate in metaphysics over temporal parts to the species-as-individuals thesis (Hull 1976), notes that species might have temporal parts. In essence, the metaphysical problem of whether individuals have temporal parts infects the question of whether species individuals have temporal parts. Do species have temporal parts that extend through time, or is a species wholly present at a particular time? To answer this question, it would be useful to have a concept of a part. This paper aims to answer the question Reydon poses by looking to the account of parts provided in McShea and Venit (2000). I argue that this concept of parts supports a four dimensional view of species.

Heather Demarest, "Against the Pragmatic Humean"

According to the Humean, the laws of nature are nothing more than a systematization of all and only actual patterns. Recently, philosophers have embraced pragmatic reasons for this Humean view. Some of these reasons concern our goals—laws are tools to get what we want. And some concern our epistemic situation—laws must be usable by us and grounded in observations we can make. I argue against these pragmatic arguments. Some actual patterns are useless (pragmatic laws ought not systematize all actual

patterns), while some merely possible patterns are useful (pragmatic laws ought not systematize only actual patterns). I argue that this provides the pragmatic Humean with a dilemma: she can either embrace pragmatic criteria for her theory of lawhood or she can keep Lewis's characterization of laws (as systematizations of all and only actual patterns), but not both.

Huzeyfe Demirtas, "Causation Comes in Degrees"

Which country, politician, or policy is more of a cause of the Covid-19 pandemic death toll? Which of the two factories causally contributed more to the pollution of the nearby river? A wide-ranging portion of our everyday thought and talk, and attitudes rely on a graded notion of causation. However, it is sometimes highlighted that on most contemporary accounts, causation is on-off. Some philosophers further question the legitimacy of talk of degrees of causation and suggest that we avoid it. Some hold that the notion of degrees of causation is an illusion. In this paper, I'll argue that causation does come in degrees.

Isaac Wilhelm, "Grounds for Effective Theories"

I propose an account of the way in which effective quantum field theories are non-fundamental. This account combines (i) facts about the renormalization group approach, with (ii) grounding. As I show, this account complements other realist approaches to effective quantum field theories.

James Miller, "The Metaphysics of Grammar"

In this paper, I explore the under-investigated topic of the metaphysics of linguistics, and in particular consider how metaphysical distinctions may illuminate debates concerning the relationship between morphology and syntax. I will argue that the debate between the 'lexicalist' and 'relationist' within morphology significantly turns on the status of grammatical relations as 'internal' or 'external'. I argue that this indicates the value of extending our interest in the metaphysics of science to sciences such as linguistics in order to fully consider the metaphysical assumptions in linguistics, contra 'isolationist' views.

Javier Anta, "Can information concepts have physical content?"

In this paper we will analyze the physical content of the main information concepts that we find in the history of physics of the last seven decades. We will argue that this physical character should be evaluated not by appealing to analytical-linguistic confusion (Timpson 2013) or to the usefulness of its applicability (Lombardi et al. 2016), but from its capacity to allow us to acquire significant knowledge about the physical world. After systematically employing this epistemic criterion of physical significance we will conclude by rejecting the main strategies of ontological inflation and physical content of the main information concepts that we find in the thermal physics literature.

Javier Belastegui, "Kant's Law, Hierarchy and Essentialist Kinds"

Natural kinds are ordered by how specific they are. What else can we say about these specificity relations? One of the principles that can be found in the literature is the Hierarchy condition. It says that kinds are arranged forming a tree-like pattern. However, several philosophers of science have suggested counterexamples to this principle. Crossings between taxonomies are ubiquitous and make the Hierarchy condition fail. The purpose of this talk is to suggest a different principle that essentialists can appeal to in order to describe the specificity relations between essentialist kinds. This principle is Kant's Law and it was discussed first by Leibniz and Kant in the context of their theories of concepts. Loosely put, it states that how many instances a kind has is inversely related to how rich the essence is. The richer the essence of the kind, the fewer instances it will have, and vice versa. In contrast to the Hierarchy condition, this principle is not affected by the fact that some kinds overlap non-trivially. Moreover, the principle follows from essentialist assumptions about kinds. For these reasons, I suggest replacing the Hierarchy principle by Kant's Law as an explanation of the specificity relations between essentialist kinds.

Jennifer McDonald, "The Relativity of Causal Models"

A promising recent development in the philosophy of causation uses causal models, such as structural equation models, to define actual causation. There are two components to such a definition. The first is to identify how to define causation in terms of a given model or given class of models. The second is to provide an account of what qualifies models as given – or apt – such that they can be plugged into the first stage. A naïve hypothesis is that a model is apt just in case it is accurate, where a model on an interpretation is accurate of a situation just in case it says only true things about that situation. However, this paper shows that this naïve hypothesis is too simple. I first define an interpretation in the natural way – as an assignment of content to the variables of the model. I then demonstrate how a model on an interpretation is not accurate of a situation tout court, but only of a situation relative to a set of background possibilities – what I call a modal profile. This discussion therefore reveals a heretofore hidden element in how causal models represent – that models represent situations only relative to some modal profile or other. Furthermore, this discovery is not inconsequential. I conclude by illustrating a problem this raises for extant causal model theories of actual causation, and proposing a view of actual causation that resolves this problem.

Joe Dewhurst, "Causal Emergence From Effective Information: Neither Causal Nor Emergent?"

The past few years have seen several novel information-theoretic measures of causal emergence developed within the scientific community. In this paper I will introduce one such measure, called 'effective information', and describe how it is used to argue for causal emergence. In brief, the idea is that certain kinds of complex system are structured such that an intervention characterised at the macro-level will be more informative than one characterised at the micro-level, and that this constitutes a form of causal emergence. Having introduced this proposal, I will then assess the extent to which it is genuinely 'causal' and/or 'emergent', and argue that it supports only an epistemic form of causal emergence that is not as exciting as it first seems.

Jorge Alberto Manero Orozco, "Bohmian structuralism against space fundamentality realism"

It has been argued that in the context of Bohm's approach to quantum mechanics the three-dimensional primitive ontology approach (opposed to the high-dimensional wave function approach) should be preferred because it is the only interpretation that presumably blocks the pessimistic argument against scientific realism, at least in the classical-quantum transition. Under these circumstances, I will critically evaluate the tenability of this argument by means of the following philosophical and physical strategies: firstly, based on a general analysis of different interpretations compatible with a minimal Bohmian formulation, I shall undermine the assumption that only the primitive ontology approach (mistakenly regarded as an interpretation opposed to any form of wave function realism) is capable to block the pessimistic induction argument; and secondly, I shall propose a structural classical-Bohmian interpretation as a response to this argument, according to which the Bohmian laws are the fundamental relations and structures in which both the particles and the wave function stand to each other irrespective of the space where these objects live.

Josh Quirke, "Fission Cases and Everettian Quantum Mechanics"

Arguments from fission cases, most notably made by Parfit (1984), are often utilised in discussions of Everettian quantum mechanics (EQM) in an attempt to illuminate details of familiar accounts in which an agent "splits" or "branches". Whilst such imagery is often seen as an innocuous depiction of Everett's theory, it is in fact a poisoned chalice. Everettians are doing themselves a disservice when they seek to analogously employ arguments from fission cases. Citing Lewis (2007), Maudlin (2014), Vaidman (1998) and Saunders and Wallace (2008), I setup 5 examples in which the fission analogy has played a central role in each author's understanding of the probability problem in EQM. I propose that incorporating the fission model into discussions of Everettian branching results in two types of problem, categorised as the strong and weak problems of fission analogy (SPFA and WPFA respectively). I identify the SPFA in cases which actively mislead arguments to conclusions that follow in the fission model but do not follow in EQM. I identify the WPFA // in cases that function as a distraction to alternative solutions; solutions which are incompatible with fission models but available to the Everettian. I argue firstly that the fission case analogy is responsible for the conceptual foundations of probability arguments in EQM and secondly, following a number of disanalogies between fission cases and Everettian branching, I argue that the analogy is unfounded. I conclude that arguments from the past twenty years of the probability problem have been erroneously set up, and subsequently misdirected.

Kerry McKenzie, "The Plurality of Priority" (Presidential Address)

Relations of grounding, or 'metaphysical explanation', are said to 'connect the world across levels'. But by that definition both scientists and metaphysicians are in the business of providing metaphysical explanations, and this raises the question of whether those each field offers are the same in kind. By drawing on earlier work on composition with F.A. Muller, and on recent work by Barry Loewer and Harjit Bhogal, I will argue that the Humean can and must distinguish between the forms of metaphysical explanation each field offers – paving the way for an explicitly disunified metaphysics of grounding. How if at all the argument generalizes to non-Humean contexts will be reflected upon to close.

Kyley Ewing, "The Passage of Time in the Block Universe"

This paper presents an account of the mind-independent and non-dynamic passage of time that is consistent with the block universe theory and central features of our experience of time. In explaining the passage of time, I appeal to the temporal boundaries of the block universe and argue that the passage of time explains both the earlier than relation and the direction of time. Although a minimalist account of temporal passage, it provides substantial answers to the following core questions about temporal passage: What is the basis of the passage of time? What does the passage of time itself amount to? What does the passage of time explain?

Lorenzo Lorenzetti, "Wave Function Realism vis-à-vis Functional Reduction"

Wave function realism maintains that the quantum wave function - the most fundamental building block of reality - is a concrete field, inhabiting an incredibly high-dimensional space. Thus, this doctrine has to provide an explanation for the emergence of the 3-dimensional world. The main solution has been to

adopt a functionalist approach, according to which 3-dimensional objects are real as long as there is something that plays the functional role associated with them. But the bare appeal to functionalism leaves some open issues: what is the metaphysical relation between the fundamental ontology and the 3-dimensional one? And what is the ontological status of the derivative entities? To tackle these issues, I will combine wave function realism with a form of functional reductionism à la Lewis (1970), that entails identity relations between wave function and 3-dimensional ontology. However, identity (thus, symmetrical) relations seem at odds with the intuition that the relation between the two categories is asymmetrical, since the wave function is taken as more fundamental than the 3-dimensional ontology. Thus, my secondary aim will be to show how identity relations in this context can be reconciled with a description of reality as hierarchically layered. I will sketch a strategy based on List's (2019) formal account of levels, in which he distinguishes between ontological levels and levels of description. I will suggest that, even within the Lewisian functional reduction model, there is still room for saying that reduction embeds asymmetrical relations: it is not ontological asymmetry, but asymmetry of description.

Marco Facchin, "Extended predictive minds: do Markov Blankets matter?"

The extended mind thesis claims that a subject's cognitive system sometimes encompasses the environmental props the subject interacts with while solving cognitive tasks. The recent surge of popularity of Friston's free-energy principle has shifted the focus of the debate over the extended mind on Markov Blankets: statistical boundaries separating the agent from the environment. Here, I urge for a change of focus, claiming that Markov Blankets neither adjudicate nor help adjudicate the truth of the extended mind thesis. My plan is as follows. In section 2 I briefly introduce the free-energy principle, focusing on Markov Blankets. In section 3, I claim that, on their own, Markov Blankets cannot adjudicate whether the extended mind thesis is true, for that would either beg the question against the extended mind or force us to circular reasoning, depending on how Markov Blankets are interpreted. In section 4, I claim that Markov Blankets do not even help us adjudicate whether the extended mind thesis is true. In fact, using Markov Blankets as a statistical tool do determine whether the mind extends provides us with extensionally inadequate results, violates the "parity principle" (arguably, the linchpin of the extended mind thesis) and forces us to adopt a definition of "internalism" that is far too broad. A brief concluding paragraph will then close the essay.

Margarida Hermida, "Cats are not necessarily animals"

Some plausibly necessary a posteriori claims include "water is H₂O", "gold has atomic number 79", and "cats are animals". My aim in this paper is to challenge the necessity of the third claim. I will argue that there are possible worlds in which cats exist, but are not animals. Under any of the species concepts currently accepted in biology, organisms do not belong essentially to their species. This is equally true of their ancestors. In phylogenetic classification, monophyletic clades such as the animal kingdom are defined by their ancestral stem species. If the stem species had not existed, neither would the clade. Thus it could have been the case that all the organisms which currently belong to the animal kingdom might have existed, but would not have been animals.

Maria Regina Brioschi, "Scientific Objectivity and the Community of Inquirers: C.S. Peirce on mathematics"

It is well known that Peirce was a great scientist and logician, as well as the founder of pragmatism and semiotics. The massive four volumes of his writings edited by C. Eisele in 1976 – *The New Elements of Mathematics* –, testifies to his recurrent reflections upon mathematics (more recently, cf. Peirce/Moore 2010, Peirce/Pietarinen 2019, 2020). Apart from the place attributed to Peirce in the history of mathematics, his view of mathematics has been often investigated, both from Peirce's scholars (cf. Haack 1979, Rosenthal 1984, Tiercelin 1993, 2010, De Waal 2005, Campos 2009, Oostra 2006, 2009, Cooke 2010, Zalamea 2012a, 2013) and philosophers of mathematics, in particular with reference to his conception of mathematics as the science of hypotheses (cf. Zalamea 2012b, Ferreirós 2016). Besides, from Dewey onwards it has been widely recognized the role played by intersubjectivity in Peirce's thought (the so-called "community of inquirers"), with special reference to the concept of self (cf. Colapietro 1989, Kockelman 2010, Fabbrichesi 2012). However, less frequented is the issue of Peirce's view of intersubjectivity with reference to the rise of mathematical concepts and theories, and their objectivity. Accordingly, the present paper aims to investigate the connection between the status of mathematical objects and the scientific community of inquirers according to Peirce. To reach this goal, it (a) first illustrates what is the definition of mathematics proposed by Peirce; (b) explains how he conceives the community of inquirers as inalienable factor of science, generally understood; (c) shows how Peirce's peculiar realism offers an original, metaphysical perspective that allows him to emphasize the objectivity of mathematics (and science in general) without denying the relevant role of intersubjectivity, therefore avoiding the classic dichotomy between realistic and idealistic stances in philosophy of mathematics (cf. Shapiro 2000).

Marian J. R. Gilton, "On the (dis)analogy between electric charge and color charge"

Philosophers and physicists alike introduce color charge as a new kind of charge that is somehow 'like' electric charge. There is good reason for this. It is sensible to begin with the case of electric charge in the

simpler theory of electromagnetism and then introduce the more complicated theory of chromodynamics and its associated color charge in reference to what is already understood from the simpler theory. Moreover, the theorists who first constructed chromodynamics did so with a conscious effort to generalize the methods of electromagnetism. However, it is unclear exactly how the analogy between electric charge and color charge is supposed to go. Electric charge is measured in laboratories; it is given in positive and negative rational numbers; it is gauge invariant. None of these features apply to the properties of (anti)red, (anti)blue, and (anti)green that we usually think of as color charge. I argue that these foundational differences point toward significant divergences between the metaphysics of charge attribution for electromagnetism and for chromodynamics: ascriptions of electric charge are empirically measurable ascriptions of essential properties, whereas ascriptions of color charge states are empirically inaccessible ascriptions of accidental properties. Nevertheless, I show how the analogy between electric charge and color charge may be recovered, and how these disanalogies may be accommodated, using the framework of determinables and determinates. As determinables, electric charge and color charge categorize particles and fields according to their eligibility to participate in fundamental interactions. All and only those particles with electric charge participate in the electromagnetic interaction, and exactly analogously, all and only those particles with color charge participate in the strong/chromodynamic interaction. But as determinates, specific ascriptions of color charge and electric charge metaphysically diverge.

Marta Conti Lorenzo, "The QCD Phase Transition Objection to Dispositional Essentialism"

In this paper I introduce the Quantum Chromodynamics (QCD) Phase Transition Objection to dispositional essentialism. According to dispositional essentialism all fundamental natural properties are essentially dispositional, however particle physics allows for a fundamental property, that of colour charge, to have drastically different relations with other properties beyond a certain temperature due to the QCD Phase Transition. This means that colour charge has different dispositions depending on temperature. Hence, either it is not a fundamental property, or it is not essentially dispositional, thus dispositional essentialism is false. The structure of the paper is as follows. First, I briefly explain Alexander Bird's dispositional essentialism. Second, I introduce the physical phenomenon of phase transitions. Third, I introduce the QCD Phase Transition Objection. The main aim of the QCD Phase Transition Objection is to show that colour charge disposes quarks to behave differently depending on temperature. After the QCD phase transition colour charge disposes quarks to interact with gluons and with each other forming hadrons, while before the phase transition quarks move freely in what is known as the quark-gluon plasma. The upshot is that either colour charge is not a fundamental property, or that it is not essentially dispositional, so dispositional essentialism is false. I will argue that the former is not a response available to the dispositionalist, and I will also argue against two other possible solutions: 1) changes in temperature should be considered as antidotes as in *ceteris paribus* laws, 2) colour charge is an impure disposition.

Martin Calamari, "The Process Metaphysics of Loop Quantum Gravity"

Dupré and Nicholson (2018) defend the metaphysical thesis that the 'living world' is not composed of things or substances, as traditionally believed, but of processes. They advocate a process – as opposed to a substance – metaphysics and ontology, which results to be more empirically adequate to what contemporary biology suggests. Their ultimate view, however, is that there are compelling reasons to believe that contemporary physics, too, strongly suggests an analogous process-based conception as to the 'physical world'. Consequently, they argue that if this were the case, then the whole nature should be understood as consisting of 'processes all the way down'. The aim of this paper is to provide some further reasons supporting the correctness of this view in the framework of contemporary fundamental physics. To this end, I examine the metaphysical and ontological underpinnings of Rovelli's view of loop quantum gravity. I show that it consists of a timeless yet dynamical, radically relationalist, conception ultimately based on an event and process metaphysics and ontology according to which the 'physical world' is, fundamentally, a network of interacting quantum dynamical processes. Therefore, this suggests that at least 'all the way down' to the Planck scale, nature appears indeed to be composed of processes rather than things or substances.

Matt Farr, "What's so special about initial conditions?"

The early universe is thought to be extremely low probability in a way that calls for explanation. Some have used the 'initialness defence' to argue that since initial (as opposed to final) conditions are intrinsically special in that they don't require further explanation. Such defences commonly assume a primitive directionality of time to distinguish between initial and final conditions, and so rely on the time-directed B-theory of time. I outline and support a deflationary account of the initialness defence in the context of the temporally adirectional C-theory of time, and argue that although there is no intrinsic difference between initial and final conditions, once we have sufficient structure to discern them we should not seek explanations of low-probability initial conditions.

Matthias Rolffs, "Causal Pluralism and Carnapian Explication"

The Multiple Concepts View (MCV) about causation can roughly be characterized as the thesis that there are multiple concepts of causation. For example, Hall (2004) maintains that there are two concepts of causation: production and dependence. There are at least three plausible objections to this view: The Problem of Unity, according to which it is unclear why the multiple concepts count as concepts of causation. The Problem of Ambiguity, according to which there is no evidence that the pre-theoretic term 'cause' is ambiguous. And the Problem of Further Counterexamples, according to which there are intuitive cases of causation that are neither cases of production nor cases of dependence. I argue that MCV can be defended against these three objections if we interpret it as a thesis that is put forth in the context of a Carnapian explication of causation. Within an explication, there are at least two points at which a pluralist thesis can be defended: One can be a pluralist about explicanda, or one can be a pluralist about explicata. I argue that pluralism about explicata of causation is not affected by the three problems. This speaks in favour of an interpretation of MCV as pluralism about explicata.

Natalja Deng, "On metaphysical explanations of psychological temporal asymmetries"

What is the relation between metaphysical and psychological insights into temporal asymmetries? This article examines that question on the basis of a case study concerning the temporal Doppler effect (Caruso, Van Boven, Chin, & Ward, 2013). Caruso et al. propose that future events seem closer than past ones at an equal objective temporal distance because we experience subjective movement through time. I explore ways of interpreting their discussion in the light of the debate between A- and B-theorists over whether time really passes and whether the future is genuinely 'open' while the past is 'fixed'. I argue for the following claims: (1) Caruso et al.'s talk of a subjective movement through time seems best interpreted as concerning our longer term cognitive relationship to time; (2) both A- and B-theoretic interpretations of their discussion are viable as interpretations; (3) if combined with Priorean arguments for the A-theory, it takes some work to make sure the A-theoretic interpretation respects Van Boven and Caruso's constraint that the objective temporal distance cannot directly influence psychological outcomes without influencing psychological intermediaries.

Nicholas Emmerson, "Plumbing Metaphysical Explanatory Depth"

The aim of this paper is to provide a novel account of depth in metaphysical explanation. I argue that metaphysical explanatory depth (MED) is, like depth in causal explanation, connected to the range of same-object counterfactuals under which an explanatory generalization remains invariant (Hitchcock & Woodward 2003b). I begin by providing an overview of the interventionist characterization of explanatory depth, and the theoretical benefits this approach holds over rival deductive-nomological accounts. I then highlight how this notion of depth can be fruitfully applied to a toy example of metaphysical explanation. With the preliminaries out of the way, I put MED to more serious work, demonstrating how it provides the tools to characterise live debate within metaphysics itself. I focus upon a novel approach to explaining the identity and distinctness of objects, the quantitative properties proposal, put forward by Erica Shumener (2020). I argue that Shumener's thesis is progressive with respect to prior proposals in terms of qualitative properties (Black 1952, Rocca 2005) and weak discernibility (Saunders 2006), precisely because it provides the greatest metaphysical explanatory depth. I shall conclude with some brief comments regarding possible further application of this methodology, to debate within metaphysics surrounding the nature of explanation itself.

Niels Martens, "Semantic Realism"

Scientific realism about unobservable entities has three dimensions; it requires three types of commitment. The first, metaphysical dimension is concerned with belief in a mind-independent external world. The second, semantic dimension, is concerned with whether the unobservable terms postulated by scientific theories, say electrons, are a) well-defined, and b) should be understood literally. The third, epistemological dimension considers, roughly speaking, whether we should be optimistic or pessimistic about science being able to determine the truth of claims about specific unobservables. Much of the literature a) assumes that it only makes sense to consider the epistemological dimension once the semantic dimension has been affirmed; b) focuses on principled, universal, non-naturalistic motivations for semantic anti-realism (i.e. violation of the semantic commitment), and c) focuses on issues of reference change that threaten semantic realism, rather than on the prior issue of whether the reference was ever well-defined. In this paper I push back against all three claims by considering a range of case studies: dark matter, dark energy, genes, singularities and symmetry-to-reality inferences. Each of these cases constitute an example of a well-confirmed theory with a central unobservable entity or structure that is semantically lacking, albeit in different ways in each of the case studies. I contend that the specific empirical and theoretical contexts of each of these unobservables should commit us to selective (potentially only temporary) semantic anti-realism about those unobservables (contra, for instance, Dewar's qualified realism). At the same time we will see that this failure to satisfy the semantic dimension as of right now is compatible with either affirming or violating the epistemological dimension of realism about those same unobservables.

Nina Emery & Gabrielle Kerbel, "Configuration Space Realism and Fundamentality"

Configuration space realism is an account of quantum ontology according to which the wavefunction represents a field in a high-dimensional space. We present a version of configuration space realism that has largely been overlooked in the literature and argue that this version should be taken just as seriously as the version that is standard. On the standard way of thinking about configuration space realism, which we call configuration space fundamentalism, the field that the wavefunction represents (and the space in which it exists) are fundamental. Three-dimensional entities depend on the wavefunction field. But this is not the only way of making sense of configuration space realism. According to configuration space non-fundamentalism, it is the three-dimensional entities that are fundamental; the wavefunction field in high-dimensional space depends on the three-dimensional. We argue that discussions of configuration space realism should not simply assume that the view should be spelled out in terms of configuration space fundamentalism. Part of our motivation here is to correct what seems to us to be an important oversight in the literature. But our view is also that once configuration space non-fundamentalism is clearly articulated as an option, it forces all of us—whether we are configuration space realists or not—to more carefully interrogate our motivations for the version of quantum ontology that we favor. In particular, we think the choice between configuration space fundamentalism and configuration space non-fundamentalism forces metaphysicians and philosophers of physics to confront significant questions about the structure of grounding relations, the importance of locality and separability, and the nature of scientific explanation, that are otherwise too easy to brush aside.

Óscar Antonio Monroy Pérez, "The Dream-Quest of Unknown Fundamentalism"

According to an influential view, when it comes to representing reality, some words are better suited for the job than others. This is /elitism/. It is often expected that the set of the best (or perfectly elite) words will be minimal, non-redundant. I argue that pushing the requirement of non-redundancy typically leads to arbitrariness, and that arbitrariness is a theoretical vice worse than redundancy. I show that there is nothing wrong with accepting a particular kind of redundancy based on adopting kinds of terms as elite. Before taking this route, I will want to resist both arbitrariness and redundancy by reforming our representational devices in ways that appear unorthodox. I examine the virtues and limitations of these approaches.

Paul Kelly, "How do functional models in cognitive science represent and explain?"

Mechanists often claim that functional models in cognitive science are a type of "mechanism sketch," and that, given this status, it is doubtful that they can be explanatory. I respond to these claims by advancing and motivating an alternative account of model-based representation. This alternative account, I submit, implies two key things: first, that it is almost always a mistake to view functional models as "mechanism sketches," and second, that there is a straightforward way in which functional models in cognitive science can be explanatory.

Qiu Lin, "Du Châtelet on Mechanical Explanation vs. Physical Explanation"

In her second edition of the *Foundations of Physics*, Du Châtelet advocates a three-fold distinction of explanation: the metaphysical, the mechanical, and the physical. While her use of metaphysical explanation (i.e., explaining via the Principle of Sufficient Reason) has received some attention in the literature, little has been written about the distinction she draws between mechanical and physical explanations, including their demand, scope, and use in physical theorizing. This paper aims to fill this void, arguing that making this distinction is a crucial piece of Du Châtelet's scientific method. According to Du Châtelet, a mechanical explanation is one that 'explains a phenomenon by the shape, size, situation, and so on, of parts', whereas a physical explanation is one that 'uses physical qualities to explain (such as elasticity) ... without searching whether the mechanical cause of these qualities is known or not' (Du Châtelet 1742, 181). I will analyze Du Châtelet's views regarding (1) What counts as a good physical explanation, (2) Why a mechanical explanation is not necessary for answering most research questions in physics, and (3) Why a good physical explanation, instead, is sufficient for answering those questions. In so doing, I argue that Du Châtelet is proposing an independent criterion of what counts as a good explanation in physics: on the one hand, it frees physicists from the methodological constraint imposed by mechanical philosophy, which was still an influential school of thought at her time; on the other, it replaces this constraint with the requirements of attention to empirical evidence, for that alone determines which physical qualities are apt to serve as good explanans.

Ravi Chakraborty, "'Can form cause form?': On the role of mathematics in a metaphysics of biological form"

D'Arcy Thompson, one of the pioneers of a mathematical approach to biology, articulated a geometrical understanding of the relationship between the shapes and forms of species as transformations. In this paper, I seek to clarify the role of metaphysics in developing a mathematical understanding. If we follow the use of coordinate transformation as an explanation in itself, then one can evade the question of metaphysics as being redundant. However, Thompson seems to be employing the mathematical tool to encode a metaphysics of causality that is captured verbally by the maxim, 'form causes form'. We are led to question the role of mathematics in encoding such a metaphysics. Does mathematics play a merely supplementary role of illustration? Instead, in Thompson's thought, we see the possibility of asserting

that mathematics is necessary to articulate a metaphysical view with precision. But I argue that this doesn't mean that metaphysics is reducible to mathematics either. The broader argument is that while mathematics provides an efficient way of encoding and enumerating a plurality of different kinds of metaphysics, mathematics then is inherently contaminated by metaphysical and even physical notions. Such a view of mathematics allows us to have greater clarity about what the notions of mathematical and geometrical could mean without being confined to any particular piece of mathematics. I argue that the metaphysical statement, 'form causes form' is not just necessary for an explanatory framework in the particular case of biology but also essential to a notion of the geometrical itself.

Riccardo Baratella, "Processes and Events, and the Source of Their Modal Profile"

Fine (2008) holds that a thing's modal profile is in need of explanation – where such an explanation should not rely on further modal facts - (Thesis 1), for short. Moreover, he argues that an account of objects in terms of his theory of variable and rigid embodiments explains their modal profile in non-modal terms – thereby, satisfying (Thesis 1). However, Fine (1999, 2006, forth) also suggests that his theory of variable and rigid embodiments accounts for the nature of processes and events – call it "(Thesis 4)". In this article, I argue that (Thesis 4) is incompatible with (Thesis 1) in so far as this last thesis concerns processes and events. Finally, I suggest that the rejection of (Thesis 1), in so far as it focuses on processes and events, is rather costly. Thus, I conclude that one's better option is to give away (Thesis 4).

Ryan Kulesa, "Finkish Trait Types and the Propensity Interpretation of Fitness"

The propensity interpretation of fitness – from here on, PIF – is a popular way of understanding the fitness of a trait type which, under certain views (Brandon 1978; Beatty and Mills 1979; and Pence and Ramsey 2013), roughly asserts that, given a certain environment, a trait type will lead to an average expected number of offspring. As suggested by the foregoing definition, propensities in this view are probabilistic dispositions. In other words, in some environment, the fitness of a trait is its disposition to produce, on average, a certain number of offspring. The literature on issues presented for conditional analyses of dispositions has been surprisingly neglected. In particular, finkish dispositions provide counterexamples to understanding dispositions as conditional causal statements. In this paper, I suggest that an example of plant disease and resistance genes provide instances of biological finks with regard to trait fitness, thereby providing counterexamples to PIF. In short, I argue, the statement 'if an organism, x , is in environment, E , then x will produce O number of expected offspring' is false; thus, PIF cannot accurately determine fitness values in biological fink cases.

Ryan Miller, "Priority Monism's Quantum Problems"

Schaffer's priority monism is motivated by quantum considerations, but intended to be interpretation-neutral. In fact, however, it relies on features that are absent from leading Pilot Wave and Objective Collapse accounts, making it reliant on the Many Worlds interpretation. Unfortunately, priority monism compounds Everettianism's existing challenges with recovering the Born Rule and local beables, by insisting that both decision-theoretic agents and local beables are all parts of the same quantum whole in a strict sense.

Safia Bano, "Critique of Ellis's Microessentialism"

Brian Ellis takes his theory of scientific essentialism as a notion of natural kinds which is informed by a posteriori considerations. He considers chemical kinds as the paradigmatic examples of this notion, but scientific description of such kinds does not substantiate this claim. One of the problematic aspects of his view is the requirement of intrinsicity for all essential properties of a kind. This paper problematizes the notion of intrinsic properties in the context of chemical kinds at two levels: i) at the level of extrinsic properties outside the individual and, ii) at the level of extrinsic properties inside the substance but outside the microstructure. The paper concludes that Ellis' microessentialist account, in its present form, does not present a successful explanation of chemical kinds. His account must include extrinsic properties along with intrinsic ones for a better explanation of chemical kinds.

Samuel Kimpton-Nye, "How to be a Powers Theorist About Functional Laws, Conservation Laws and Symmetries"

I defend an anti-Humean account of the laws of nature in terms of powers from the threat posed by functional laws, conservation laws and symmetries. I thus show how powers theorists can avoid ad hoc explanations and resist an inflated ontology of powers and governing laws. The key is to understand laws not as flowing from the essences of powers, as per Bird (2007), but as features of a description of how powers are possibly distributed, as per Demarest (2017), Kimpton-Nye (2017) and Williams (2019); call this the Powers-BSA. This underappreciated powers-based account of laws is continuous with actual scientific practice and thereby quite naturally accommodates functional laws, conservation laws and symmetries. This paper thus positions the Powers-BSA as the leading anti-Humean account of the relationship between laws and properties.

Sepehr Ehsani, "Principled Mechanistic Explanations in Biology: A Case Study of Alzheimer's Disease"

Following an analysis of the state of investigations and clinical outcomes in the Alzheimer's research field, I argue that the widely-accepted 'amyloid cascade' mechanistic explanation of Alzheimer's disease appears to be fundamentally incomplete. In this context, I propose that a framework termed 'principled mechanism' (PM) can help with remedying this problem. First, using a series of five 'tests', PM systematically compares different components of a given mechanistic explanation against a paradigmatic set of criteria, and hints at various ways of making the mechanistic explanation more 'complete'. These steps will be demonstrated using the amyloid explanation, and its missing or problematic mechanistic elements will be highlighted. Second, PM makes an appeal for the discovery and application of 'biological principles' (BPs), which approximate *ceteris paribus* laws and are operative at the level of a biological cell. As such, although thermodynamic, evolutionary, ecological and other laws or principles from chemistry and the broader life sciences could inform them, BPs should be considered ontologically unique. BPs could augment different facets of the mechanistic explanation but also allow further independent nomological explanation of the phenomenon. While this overall strategy can be complementary to certain 'New Mechanist' approaches, an important distinction of the PM framework is its equal attention to the explanatory utility of biological principles. Lastly, I detail two hypothetical BPs, and show how they could each inform and improve the potentially incomplete mechanistic aspects of the amyloid explanation and also how they could provide independent explanations of the cellular features associated with Alzheimer's disease.

Silvia Bianchi & Joaquim Giannotti, "Grounding-based Approaches to Ontic Structuralism"

Ontic structuralists approaches claim to offer the most befitting ontology for our best physics. Despite specific differences, views that gather under the banner of ontic structuralism share the commitment to two metaphysically flavoured theses: (1) structures are fundamental, and (2) structures are prior to objects if these exist. The concepts of fundamentality and priority are amenable to a variety of interpretations. Thus, (1) and (2) stand in need of clarification. Our aim is to show that the popular notion of grounding is extremely serviceable to demystify both theses: it permits us to reformulate them in a desirable unified way as theses about what grounds what. To corroborate the merits of this proposal, we reinterpret three standard versions of ontic structuralism that can be found in the literature—eliminative, priority-based, and moderate—as grounding views. We conclude by illustrating how this grounding-based approach gives rise to a novel taxonomy of ontic structuralist theories, which can be classified in terms of the grounding principles that characterize them.

Thomas Blanchard, "A New Exclusion Problem for Interventionism (and Some Unsuccessful Solutions)"

Michael Baumgartner has argued that the interventionist account of causation runs into Kim's exclusion problem: it entails that multiply realized properties are made causally inefficacious by the causal work of their supervenience bases. In this talk, I will argue that interventionism faces another, more wide-ranging exclusion problem: it entails that macro-entities (whether multiply realizable or not) are rendered causally impotent by the causal work of their parts. Just like in Baumgartner's argument, this exclusion problem arises by applying the original interventionist framework to a context involving variables standing in relationships of non-causal dependence. (Though by contrast to Baumgartner's argument, the relevant dependence relationships are weaker than supervenience.) Interventionists who want to defend the causal efficacy of macro-entities may thus respond in the same way that they have resisted Baumgartner's argument, namely by insisting that the original interventionist account is not meant to apply in contexts involving relationships of non-causal dependence. The challenge for that line of response is then to explain how the interventionist framework can be extended to cover such contexts, and to show that the resulting account escapes exclusion worries. I will argue, however, that it is not obvious what such an account might be. I will do so by considering several proposals for extending interventionism to contexts involving metaphysically related variables, and arguing that none of them provide a satisfactory solution to the exclusion problem I identify.

Thomas Donaldson, "A Problem for Neo-Fregean Abstractionists"

Neo-fregean abstractionism is a theory about the relation between types and tokens. The abstractionist claims (a) that our ability to refer to types, and to understand claims about their identity and distinctness, is based on a prior ability to understand claims about tokens; (b) that certain basic principles ("abstraction principles") describing the relation between types and tokens are *a priori*; and (c) that facts about types are grounded by facts about tokens. Abstractionism has been much discussed in the philosophy of mathematics since the publication of Crispin Wright's *Frege's Conception of Numbers as Objects* in 1983. So far, there has been very little discussion of how abstraction works in temporal and modal contexts. (Bob Hale's *Necessary Beings* is an exception.) In this paper, I aim to convince the reader that this is an important gap in the discussion, because modal and temporal contexts raise serious difficulties for the abstractionist. In particular, it is hard for the abstractionist to deal with statements like "The new house has the same shape that the old house once had" and "This church has the same shape

that the other church would have had". I argue that components (a) and (c) of abstractionism conflict with serious presentism and serious actualism.

Toby Friend, "Four Humean accounts of global symmetries"

I describe three attempts to identify the global symmetries within a Humean framework with theorems of some deductive systematisation of the world: respectively the best system, a meta-best system and a maximally simple system. Each has merits, but also serious flaws. Instead I propose a view of symmetries as consequences of the structure of world-making relations.

Tyler Hildebrand, "An epistemology for the metaphysics of science"

How should we practice the metaphysics of science? Some philosophers hold that empirical sources of justification are indispensable--that there can be no justification at all that is not deeply informed by experience. This is a typical commitment of "naturalized" epistemologists. Others hold that rational intuition, a non-empirical source of justification, is indispensable for the justification of significant beliefs--that there can be no justification that is not deeply informed by rational intuition. While both approaches are compatible with a metaphysics that is informed by the natural sciences, they seem to be at odds with one another. I argue that in fact they are compatible. I do so by articulating an epistemology that accommodates both of the above indispensability claims, and I sketch some preliminary advantages of the theory.

Valia Allori, "Naturalness from a Humean Perspective: A Reductio Argument"

In this paper I propose an argument against those Humeans who argue that the low entropy initial state of the universe postulated in Boltzmannian Statistical Mechanics needs no further explanation. I argue that the status of this initial state is analogous to the values of the Higgs mass and the cosmological constant in the Standard Model, so that if someone maintains that the initial state of the universe needs no explanation then one would also have to maintain that the Higgs mass and the cosmological constant need no explanation as well. However, I show that arguing for this conclusion in the Standard Model actually amounts to arguing against reductionism. This produces a serious problem for the Humeans if we transfer the argument back to Statistical Mechanics: someone cannot consistently argue that the initial state of the universe needs no explanation because this contradicts reductionism, which is the starting assumption of a Boltzmannian Statistical Mechanical analysis of the phenomena.

Vanessa Triviño, "A metaphysical review of the eco-immunity account of the holobiont"

In this talk, I metaphysically approach the debate in philosophy of biology concerning the status of holobionts (host –plant or animal- + its symbiotic microbiota) as biological individuals. In particular, I pay attention to the so-called eco-immunity account of the holobiont (Chiu and Eberl 2016) that claims that holobionts are not biological individuals but hybrids between a host and its microbiota, insofar as the microbiota is not a proper part of the host. I will argue that this conclusion is not properly metaphysically grounded. The authors presuppose controversial metaphysical assumptions regarding mereology and parthood relations that have counterintuitive conclusions, such that organs are not proper parts of the host. Furthermore, I will also argue that the metaphysical approach to this debate is an example of a form of interaction that takes place between metaphysics and biology and that I will term Metaphysics in Biology.

Vera Hoffmann-Kolss, "Counterpossibles and Causal Exclusion"

In this paper, I explore whether counterpossible reasoning can solve the causal exclusion problem. According to the interventionist version of this problem, higher-level variables occurring in an interventionist causal model are causally pre-empted by the lower-level variables upon which they supervene because it is metaphysically impossible to intervene on the higher-level variables and keep the values of the lower-level variables fixed. The recent debate has shown, however, that there are several reasons to allow for counterpossible interventions as well. But once counterpossible interventions are permitted in certain metaphysical contexts, there is no good reason to ban them from causal exclusion contexts. I argue that this paves the way to a new approach to the causal exclusion problem. The autonomy of higher-level properties can be vindicated by showing that higher-level properties and lower-level properties enter into different counterpossible dependence relations.

Vera Matarese, "On the principles that serve as guides to the ontology of quantum mechanics"

Which ontology for non-relativistic quantum mechanics? This paper discusses two principles, proposed in (North 2013) and (Emery 2017), which are supposed to guide us to the 'true' quantum ontology. The first, the dynamical matching principle (DMP), states that the fundamental structure of the world should match the structure of the dynamical laws of the theory, in this case the Schrödinger equation. The second, the minimal divergence norm (MDN), states that insofar as we have multiple empirically adequate theories, we ought to choose the one that minimizes the difference between what the theory says the world is like and how the world appears. While the former is used to argue in favour of a quantum 3ND-ontology and the latter to argue in favour of a quantum 3D-ontology, I show that both principles can in fact be used to support either view. This casts doubt on their role and legitimacy as

guides to the 'true' quantum ontology. I suggest instead that they are best regarded as useful principles to construct and 'regiment' the space of plausible quantum ontologies.

Wai Lok Cheung, "A choice theory of metaphysical possibility"

Metaphysical determinism entails that all events have sufficient cause. I hypothesise metaphysical indeterminacy, with a corresponding measure of objective chance, that is possible on freewill. It is compatible with metaphysical determinism because the indeterminate event, such as an action, is sufficiently caused by a decision. Prior events underdetermine decision of an agent with freewill, and it is with one decision instead of another that some posterior event instead of some other caused. A possible world theory of modality describes metaphysical indeterminacy with possible world; at some time, the actual world could have been otherwise, but, given the metaphysics of object that it is self-identical, and the metaphysics of identity that it is necessary, the actual world could not have been another object, such as another world. Things are the way they are, although they could have been otherwise. The interaction between epistemology and metaphysics with regard to indeterminacy is discussed with Gareth Evans' work on the impossibility of vague objects, and two footnotes from Saul Kripke's *Naming and Necessity*, containing ideas developed in Timothy Williamson's epistemic theory of vagueness, and Alastair Wilson's possible world theory of metaphysical indeterminacy. It is epistemically indeterminate relative to us at present which one, among possible worlds with various different futures, is the actual world, and, even though the actual world is what it is, with its individuality and essence, how it is could have been otherwise, and is thus metaphysically indeterminate. I will thus propose my modal logic, with temporality, such that it is metaphysically possible that I did not submit this abstract from 2021.2.26, but metaphysically impossible that I did not submit this abstract from 2021.4.4, and my epistemic counterpart theory in relation to Kripke's book. An improvement is Alexander Bird's metaphysical conception of science, on which metaphysics does not outrun physics.

William Hannegan, "Metaphysics-Laden Observation"

Thomas Kuhn (1962), Paul Feyerabend (2010), Paul Churchland (1979), have given influential arguments for the theory-ladenness of observation in science. Their arguments have convinced many philosophers of science. In this paper, I show that the classic argument given by Thomas Kuhn (1962), Paul Feyerabend (2010), and Paul Churchland (1979) in favor of semantic theory-ladenness also supports semantic metaphysics-ladenness. In other words, their argument, if successful, would show that scientific observation reports are laden with ontological categories and other metaphysical concepts and assumptions. I show, furthermore, that the arguments against broad theory-ladenness that are drawn from experimental practice, such as those arguments given by Ian Hacking (1983) and Friedrich Steinle (1997), may be successful against broad theory-ladenness, but are not equally successful against broad metaphysics-ladenness. I also suggest two important philosophical consequences of metaphysics-ladenness. Metaphysics-ladenness it seems would undermine the standard accounts of ontological commitment in meta-ontology, and undermine naturalized metaphysics.

Zee Perry, "There's no speed of light, so what the heck did Michelson measure?"

Here are two claims, both of which (I maintain) are very plausibly true: (1) A. A. Michelson measured the speed of light in the late 1870s to within 99% accuracy; and, (2) Strictly speaking, in special relativity, there is no such thing as the speed of light. These claims are clearly in tension, and this paper resolves that tension. The first part of the paper is concerned with defending the truth of (2). I argue that any controversy around (2) is due to a confusion about the role of co-ordinate representations in characterizing different theories of space-time. Once this confusion is resolved, it becomes clear that the claim that light has a speed at all is nothing more than an artifact of our representational scheme, and not reflective of the underlying space-time structure. The second part of the paper explains how this tension can be resolved. Specifically, I argue that the value measured by Michelson is neither a speed nor a purely conventional fact. Rather, it corresponds to an a posteriori ratio relationship between our spatial and temporal units, which obtains because the structure of Special Relativity makes an independent unit of spatial distance redundant.

Practicalities

Registration

Our 2021 Conference will be held online via Zoom. **Registration is required.** Anyone can register for free, but the \$25 option is available for those with ample conference funding who would like to provide financial support for the Society. The registration page is here: <https://socmetsci.org/2021-conference-registration>

You will need a Zoom account to participate in the conference. You can create a free account at Zoom.com. To join a session, please consult the *SMS Zoom Guide for Participants* document, to be distributed to registered participants by email on 31 August, and click on the link for the session room you wish to join. Please do *not* share the links.

Guidelines for session chairs

Please log in to your session 10 minutes early. Keep time. Manage the queue during Q&A. Make an effort to call on people who have yet to ask questions, etc. See the *Zoom Guide for Chairs & Speakers* (to be distributed directly by email) for detailed instructions.

Guidelines for speakers

Audiences appreciate the use of handouts and/or slides. Talks should be no more than 30 minutes. Brevity is a virtue. See the *Zoom Guide for Chairs & Speakers* (to be distributed directly by email) for detailed instructions.

Guidelines for commentators

Commentaries should be approximately 5 minutes. Brevity is a virtue. Please bear in mind that your primary role is not to present objections (though of course you may do so), but to stimulate philosophical discussion.

Guidelines for audience

To be added to the question queue, please use the “raise hand” function in Zoom. Please do not speak until directed by the session chair. When it is your turn, please be concise. (Brevity is an even greater virtue during Q&A.)

General Zoom decorum

Please keep your microphone muted when not speaking. Do not interrupt. If you’re comfortable doing so, please keep your camera *on*, as this improves the experience for other participants. (No one likes speaking into the void.)

Socializing

There are two ways to socialize: (1) remain in a Zoom meeting after its official conclusion; (2) join the SMS Gather site (a virtual environment for socializing) after the conclusion of a session. For instructions, please consult the *Zoom Guide for Participants* document.

Technical support

Regrettably, our ability to provide technical support is limited to assisting session chairs host their meetings. See the *Zoom Guide for Chairs & Speakers* for information.

Business meeting agenda

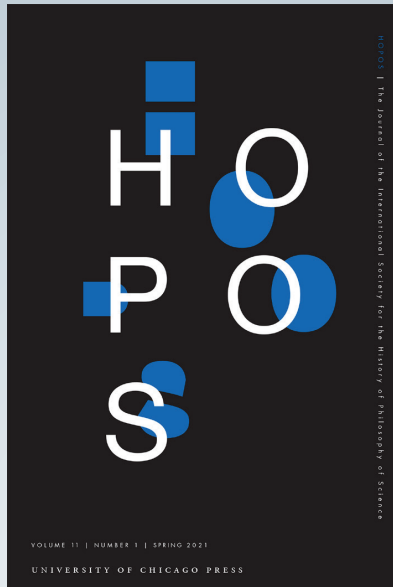
1. Report from Secretary
2. Report from Treasurer
3. Elections
 - a. Two Council Members
 - b. President-elect

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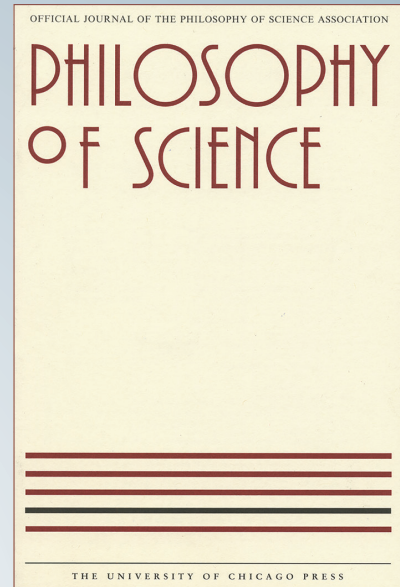


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