EPSA23

Program

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	Hall (200)	Josif Pancic Hall (100)	Music Gallery (80)	Milan Grol Hall (60)	Library (25)	Classroom 2 (25)	Classroom 1 (25)	Classroom 4 (25)
Wednesday								
09:00-11:00		Roundtable on The State of Philosophy of Science in East and Central Europe EENPS at the EPSA 2023, Belgrade						
11:30-13:00	Plenary 1. Miklos Redei: On probability theory (St)							
14:30-15:30	Symposium: The Nature of Research Environments	Symposium: Modalities in Scientific Representation	Philosophy of physics: Quantum semantics	AI, machine learning and big data: Prediction and explanation	Philosophy of medicine	General philosophy of science: analogy	Scientific realism	
15:30-16:30	[continuation of symposium]	[continuation of symposium]	Philosophy of physics: Spacetime	AI, machine learning and big data: Prediction and explanation	Philosophy of medicine: Health and Disease, continued	General philosophy of science: analogy	Scientific realism	
17:00-18:30	Credit, Productivity and Peer Review	Philosophy of biology: Species, Inheritance and Populations	Philosophy of physics: Relativistic quantum physics	General philosophy of science: formal and linguistic considerations	Philosophy of medicine: Understanding Diseases	Explanation, prediction and inference in cognitive and behavioural sciences	Scientific metaphysics	

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Thursday								
09:15-10:40	Plenary 2. Uljana Feest: Context-Sensitivity and the Problem of Evidence in the Human Sciences							
11:00-13:00	Assessment and Application of Scientific Research	Symposium: Rethinking biological lineages	Symposium: Agent-centred approaches to quantum theory	Science & Policy	Symposium: Transparency in pharmaceutical research	Philosophy of expertise	Ontology and Scientific Explanation	Modelling and Simulation
13:00-13:30	Meet the editors of EJPS							
13:30-14:30	Meeting for PhD Students / Junior Scholars, and Student Representatives at EPSA	Meeting on Open Access						
14:30-16:30	Symposium: Towards a dualist model for the metaphysics of laws and nature	Symposium: Biodiversity conservation	Physical time	AI, machine learning and big data	Ethics and Epistemology	Integrity, Responsibility and Reproducibility	Scientific Explanation and Under-standing	Science dynamics
17:00-18:00	Experimentation and Measurement	Philosophy of biology: Evolution	Physical time	AI, machine learning and big data in the life sciences: AlphaFold	Sustainability and Resilience	Pluralism and Inter-disciplinarity	Modal explanation	Shape dynamics in physics
18:00-19:30	General Assembly							
20:00-22:00	PhD Students / Junior Scholars event							

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Friday								
09:15-10:40	Plenary 3. Carl Hoefer: Are some general causal questions unanswerable? The case of face-mask mandates & covid-19							
11:00-13:00	Symposium: Explainable AI in Scientific Research	Philosophy of biology: Evolution	Symposium: Overcoming the Fundational-Pracmatic Divide. Philosophical Lessons from Early Quantum Field Theory	Symposium: Climate storylines	General philosophy of science: scientific inference (formal aspects)	Philosophy of the Cognitive Sciences	Laws and Principles	Symposium: Time, causation and metaphysics
13:00-14:30	Women's Caucus Lunch meeting							
14:30-16:30	AI, machine learning and big data	Philosophy of biology: Plants and Animals	Symposium: Complexity, prediction and understanding in climate Science	Philosophy of physics: Quantum mechanics	Reproducibility and Objectivity	General philosophy of science: representation content and convention	Reduction and emergence	General philosophy of science: Causation
17:00-18:30	Poster session							
19:00-21:00	Conference dinner							

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Saturday								
09:15-10:40	Plenary Women's Caucus: Epistemic Pluralism, Ignorance, and Nonideal Philosophy of Science							
11:00-13:00	Symposium: Qualitative research methods in and for philosophy of science	Symposium: Philosophies of the environment in organ technologies	Philosophy of social science and economics	Science and Values	General philosophy of science: Understanding	General philosophy of science: Causality		
14:30-16:30	Symposium: Framing Digital Philosophy of Science	Symposium: Deliberating about Organismic Agency	Symposium: Open and Closed Systems in Quantum Physics and Cosmology	Symposium: Discrimination, Measurement and Normative Theory	Navigating, Assessing and Embracing Scientific Literature	Symposium. Causation and causal models - how to overcome the standstill		

Philosophy of AI	Causality
Philosophy of biology	Ethics, values and norms
Philosophy of cognitive sciences	Explanation and understanding
Philosophy of medicine	Philosophy of science in practice
Philosophy of physics	Topics in general philosophy of science, formal philosophy of science
Philosophy of social science and economics	
Philosophy of climate science, sustainability and related fields	

Content

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Symposium: The Nature of Research Environments (Main hall)

Matteo De Benedetto, Ruhr University Bochum
Michele Luchetti, Max Planck Institute for the History of Science
Rose Trappes, University of Exeter
Sabina Leonelli, University of Exeter
K. Brad Wray, University of Aarhus
Nancy J. Nersessian, Harvard University

This symposium focuses on research environments: the conditions under which research is conducted. We aim to identify and debate the various ways in which research environments can be conceptualised, with a particular focus on the relation between conceptual and socio-material components. We also explore the implications of these conceptualisations of research environments for understanding research, including scientific change, the division of labour, agency and related cognitive work within science. Hence, rather than solely using assumptions about how research environments work to investigate science, we also expose these assumptions to critical interrogation in light of studies of cognitive, social and material aspects of science. By complementing approaches to scientific change focused on conceptual issues with approaches that consider the relation between what researchers conceptualise and intervene in the world and the material and social conditions under which they work, we create a dialogue with the overall aim to better understand scientific practice and knowledge production.

Symposium: Modalities in Scientific Representation (Josif Pancic Hall)

Quentin Ruyant, Universidad Complutense de Madrid
Mauricio Suárez, Universidad Complutense de Madrid
Michela Massimi, University of Edinburgh
Andrea Loettgers, University of Vienna
Tarja Knuuttila, Unversity of Vienna

A recent trend consists in examining how scientific models are used to explore possibilities. But different kinds of modalities (epistemic, conceptual, natural) and aims (explanation, exploration, engineering) are involved. Our aim is to examine their articulation. We can distinguish three cases: (1) the represented system is hypothetical. It sometimes leads to applications, as in synthetic biology. Knuuttila and Loettgers ask whether the possibilities involved are combinatorial. (2) The target is actual, but model accuracy is hypothetical. Massimi examines the role of perspectival models in this context. (3) The characteristics attributed by the model are potential. Suárez explores the complex relations between probabilities, dispositions and frequencies. Is there a framework that could unify all uses? Possible-worlds do not seem apt. Ruyant sketches an alternative possible situations semantics and explores its advantages.

Philosophy of physics: Quantum semantics (Music Gallery)

A Categoricity Problem For Quantum Inferentialism

Iulian D. Toader, University of Vienna

This paper raises an objection against inferentialism as a metasemantics of standard, infinite-dimensional quantum mechanics. The objection is based on a categoricity problem, analogous to that formulated by Carnap and already familiar from the debate on logical inferentialism.

Perspectivist Account of Truth-Theoretic Semantics In Quantum Mechanics

Vassilios Karakostas, Department of History and Philosophy of Science, University of Athens

According to a variety of no-go results in quantum mechanics, for any system associated to a Hilbert space of dimension higher than two, it is not possible to assign definite truth values to all propositions pertaining to the system. In this respect, the Bub-Clifton uniqueness theorem is utilized for arguing that truth-value definiteness is consistently restored with respect to a determinate sublattice of propositions defined by the state of the quantum system concerned and a particular observable to be measured. On this basis, we produce a perspectivist/contextual account of truth valuation in the quantum domain that satisfies Tarski's criterion of material adequacy for a theory of truth. The philosophical implications of the resulting account are extensively analyzed. Such an account essentially denies that there can be a universal context of reference or an Archimedean standpoint from which to state the totality of facts of nature.

AI, machine learning and big data: Prediction and explanation (Milan Grol Hall)

How To Justify A Decision? The Difference Between Epistemic and Non-Epistemic Justification In Algorithmic Decision-Making

Markus Ahlers, Leibniz University Hannover

Explainable AI (XAI) methods are used to better explain machine learning models and to epistemically justify the resulting algorithmic evidence. The idea behind XAI in this context is to also support and thus justify social decision-making through better explainability. In my talk I argue that different notions of justification apply here and that the justification of social decision-making does not necessarily depend on the epistemic justification of the algorithmic evidence used. This important distinction has so far been overlooked by representatives of XAI.

Making A Murderer – How Risk Assessment Tools May Produce Rather Than Predict Criminal Behavior

Donal Khosrowi, Leibniz University Hannover
Philippe van Basshuysen, Wageningen University & Research

Algorithmic risk assessment tools (RATs) are used to predict criminal defendants' risk to reoffend and determine their sentences. We highlight an underrecognized problem when RATs are performative, specifically, when a defendant's risk is predicted as high, the defendant is subsequently incarcerated, but where incarceration itself is the primary cause that induces the defendant's future criminal behavior. Here, a RAT predicts the right outcome, but in a self-fulfilling way, creating serious concerns. First, because performativity imposes significant injustices on defendants and harms to society at large. Second, because standard evaluation practices fail to recognize performativity. To address these problems, we argue that evaluating RATs should aim for explainability-in-context (EIC), i.e. elucidating how AI systems causally interact with the outcomes they serve to predict. EIC grounds underappreciated epistemic-ethical responsibilities on the part of developers and users of RATs: unless they can rule out problematic forms of performativity, they may be unjustified in deploying RATs in practice.

Philosophy of medicine (Library)

The Epistemic Importance of Standardised Quality Assessment As A Technology of Transparency

Simon Brausch, Max Planck Institute for the History of Science

Standardised quality assessment of clinical trials is a mandatory step in practices of evidence amalgamation. Because assessing quality requires many judgements, it has been argued that the epistemic importance attributed to standardised quality assessment in evidence-based medicine is unjustified. In this paper, I argue that we should not give up on its epistemic importance just yet. To do so, I develop a social epistemology of quality assessment that sheds light on how standardised quality assessment could be used as a technology of transparency to uncover the reasons for subjective differences that would otherwise have remained hidden.

What Is The Role of Randomization In Causal Inference? Revisiting The Old But Wrong Criticism

Mariusz Maziarz, Jagiellonian University

We revisit John Worrall's still prominent argument against the view that randomization balances the impact of both known and unknown confounders across the treatment and control arms. We argue that his argument is at odds with statistical theory. We put forward the statistical sense of the balance claim. It involves the following three commitments: (1) randomization balances confounders in expectancy, (2) the balance in the average effect of all confounders and not balancing each confounder is sufficient, and (3) randomization allows for calculating the probability of deviating from the balance.

General philosophy of science: analogy (Classroom 2)

<u>The Formal Structure(s) of Analogical Inference</u>

Alexander Gebharter, Marche Polytechnic University
Barbara Osimani, Marche Polytechnic University

Recently, Dardashti, Hartmann, Thébault, and Winsberg (2019) proposed a Bayesian model for analogical inference. In this talk we investigate how their model performs when varying the degree of certainty about the similarity between the source and the target system. We show that there are circumstances in which the degree of confirmation for the hypothesis about the target system obtained by collecting evidence from the source system goes down when increasing the degree of certainty about the similarity between the source and the target system. We then develop an alternative Bayesian model for analogical inference and show that the direction of the variation of the degree of confirmation always coincides with the direction of the degree of certainty about the similarity between the two systems in this model.

<u>Thought Experiments and Modal Logic</u>

Ruward Mulder, Cambridge University

There are three main modal-logical schemas in the literature that attempt to capture the structure of destructive thought experiments and categorise generic philosophical positions. R.A. Sorensen (1992) has provided two modal-logical schemas – the Necessity Refuter and the Possibility Refuter – and S. Häggqvist (2008) has provided a third, which I call the Counterfactual Refuter. The schemas consist of sets of propositions which the authors claim to be inconsistent. Yet, neither author proves this, and indeed: I show that for all three schemas the sets of propositions are in fact not inconsistent. By adding a premise (and a logical truth), following counterfactual semantics in the spirit of Lewis (1973), I prove that these defects can be restored. I illustrate the now rigorously correct schemas to the Chinese Room Argument (the destructive thought experiment aimed at undermining the thesis of Strong A.I.) and the zombie argument (aimed at undermining materialism).

Häggqvist, S. (2009). `A Model for Thought Experiments.' Canadian Journal of Philosophy 39.1, pp. 55-76.

Lewis, D. (1973). Counterfactuals. Malden, Massachusetts: Blackwell Publishers Inc.

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Sorensen, R.A. (1992). Thought Experiments. New York: Oxford University Press.

Scientific realism (Classroom 1)

Two Species of Realism

>Vicente Raja, Univesidad de Murcia
>Guilherme Sanches de Oliveira, Technische Universität Berlin

In the last few decades, different species of realism have been proposed in the scientific and philosophical literature. Direct realism is a form of perceptual realism proposed by ecological psychologists in cognitive science. Causal pattern realism has been recently proposed in philosophy of science. Both are species of realism able to accommodate the main tenets and motivations of instrumentalism. The first aim of the paper is to explore the conceptual moves that make both direct realism and causal pattern realism tenable positions in their different contexts. The tenability of direct realism and causal pattern realism entail the dissolution of the dichotomy between realism and anti-realism. The second aim is to show that the conceptual moves that make direct realism and causal pattern realism possible are instances of the main conceptual moves of a common realist genus labeled as pragmatist realism: (i) abandoning truth as central concept and (ii) re-framing the target phenomena. The paper articulates how pragmatist realism provides the basis for direct realism in cognitive science and causal pattern realism in philosophy of science.

Theory Change Is Irrelevant To Scientific Realism: The Case of The Future Philosopher

>Katie Morrow, Bielefeld University

Much of the scientific realism debate is premised on a false assumption that the degree of scientific change or constancy over time is relevant to how likely scientific theories are to be true. I show that the history of scientific theory does not alter the tenability of realist and antirealist views. To make this argument, I consider the perspective of a Future Philosopher. I show that Future Philosopher can reasonably argue for realism even if some of our most important scientific views get overturned; and that Future Philosopher can reasonably argue for antirealism even if our important scientific views are retained. If future scientific change or constancy does not alter the scientific realism landscape, then we should assume that we cannot now resolve the scientific realism debate based on information about past science. Section: 1. General Philosophy of Science

Philosophy of physics: Spacetime (Music Gallery)

<u>Inertial Spacetime Functionalism and Its Roots</u>

Radmila Jovanovic Kozlowski, Faculty of Philosophy, University of Belgrade
Andrej Jandric, Faculty of Philosophy, University of Belgrade

In this paper we compare a functionalist approach to spacetime, as advanced by Eleanor Knox, with Leibniz's metaphysical account. Knox's account of spacetime is inspired by Brown's dynamic approach to relativity, which is typically used to support relationism, yet she uses it to defend a view which she characterises as "simple realism about spacetime", "substantivalism-lite" or "substantivalism stripped off the containment metaphor". In her view, spacetime is defined via its functional role in a physical theory: to determine local inertial frames. Leibniz, on the other hand, is usually classified as a relationist, although there is an ongoing debate about what type of relationism should be ascribed to him: non-modal or modal. In non-modal relationism, space and time are simply an assemblage of relations which actually obtain between objects; in modal relationism, space and time form a geometrical network of all possible positions that objects may take, even if no object actually does. We argue that the modal interpretation of Leibniz better fits the textual evidence, and that it represents a proto form of functionalism in the sense advanced by Knox.

<u>From Local To Global Hyperbolicity</u>

Lucy James, Lancaster University

What is the connection between locally defined, system-relative, physical laws expressed as partial differential equations (PDEs) with hyperbolic structure, and the structure that the universe is thought to have at cosmological scales? A naturalised approach to metaphysics recommends using metaphysical interpretations of known physics to guide investigation into the physics of the unknown. Callender's claim of a link between hyperbolic PDEs and the metaphysics of time (Callender 2017) could thus be used to support the assumption that the universe is globally hyperbolic. However, combining a perspectival interpretation of Callender's claim (Baron and Evans 2020) with the thesis of scale-relative ontology (Ladyman et al. 2007), I argue in this talk that this support dissolves. Taking into account certain nuances, this discussion removes some of the motivation, typically offered, for the assumption of global hyperbolicity.

AI, machine learning and big data: Prediction and explanation (Milan Grol Hall)

<u>What Explanation Does A Machine Learning Model Prediction Need?</u>

HyeJeong Han, Korea Advanced Institute of Science and Technology (KAIST)

Machine Learning (ML) models are characterised by their high predictive accuracy and low explainability. An underlying idea of this paper is that when discussing the issue of explanation and prediction of ML models, we should be more cautious about the kinds of explanations required. I argue that specific kinds of explanations are required to use ML model predictions appropriately for investigating hypotheses, and that the types of explanations required depend on the context in which the model prediction is used, namely the context of hypothesis pursuit or acceptance. Based on this context distinction, I suggest concentrating on causal-mechanistic and unifying explanations for the contexts of hypothesis acceptance and pursuit, respectively. As a case study, I look into the uses of Quantitative Structure-Activity Relationship (QSAR) models, which predict the biological activity of substances based on their chemical structure, for drug design and regulatory purposes. (6. Philosophy of Technology and Philosophy of Interdisciplinary Research)

<u>Pragmatics For Explainable Ai</u>

Daniel Kostic, Leiden University

Most of the research programs in Explainable AI (XAI) assume that the opacity problem stems only from the complexity of Machine Learning Algorithms (MLA). I argue that there is a pragmatic aspect of the opacity problem as well, because, on the one hand, different stakeholders have different interests, and on the other, different approaches to XAI suggest different explanatory norms. In the absence of an account of pragmatics of XAI, that could provide relevance criteria for connecting stakeholders' interests and appropriate explanatory norms in XAI, it seems unintelligible why would one set of explanatory norms be relevant for an MLA rather than the other. I aim to fill this gap by providing an account of pragmatics of XAI, which regiments the idea that a set of propositions, that encapsulates stakeholders' interests, determines explanatory relevance of an answer to a XAI question just in case that set of propositions erotetically implies the XAI question.

Philosophy of medicine: Health and Disease, continued (Library)

<u>The Binocular Model: Towards Plural Medicine</u>

Yael Friedman, University of Oslo

In this article, I present the binocular model of plural medicine as a new analytical tool for an improved understanding of the multiple facets of medicine. The binocular model is inspired by the biopsychosocial model of medicine introduced by George Engel and the triad model of disease, illness and sickness introduced by Andrew Twaddle and refined by Bjørn Hofmann. However, the new model differs from its predecessors by opening for a less harmonic and more encompassing picture of medicine. The binocular model of plural medicine is based on a distinction between plural perspectives (the different subjects of medicine) and plural aspects (the different objects of medicine) and follows their reciprocal effect on each other over time. By including more features of medical reality in the analytical framework, the model allows us to conduct a more fine-grained analysis of the medical phenomena and concepts and reduce epistemic injustice. The paper presents the binocular model in detail and shows its advantages through the case study of COVID-19, and highlights its productivity as an educational tool in new interprofessional health programs.

<u>Actionability In Type 2 Diabetes: Between Diagnostic and Discovery</u>

Sarah Yvonnet, Medical Museion and Novo Nordisk foundation CBMR, Copenhagen University

Actionable knowledge (broadly defined as knowledge having implications for clinical actions) has become a topic of much discussion in biomedicine. Previous work in philosophy of science established that actionability is not a property of the data themselves but is constructed through the articulation of omics with data structure, clinical routines, and trials. Most analyses have focused either on the impact of actionability on the emergence of "bio-clinical decision making" (clinical practice) or on criteria used to decide about the actionability of specific datasets (research). We propose to explore how the concept of actionability underlines a tension between the aim of understanding a biological system and the aim to act upon it. We analyze how these aims are mobilized by different stakeholders through the development of a "diagnostic and discovery loop" in type 2 diabetes. We will draw on philosophy of science in practice method. We hope to 1) offer new insights on how the concept of actionability is mobilized by different stakeholders at

the interface of research and clinical practice, 2) provide some clarifications on the concept of actionability.

General philosophy of science: analogy (Classroom 2)

<u>Probability and Analogies In Maxwell's Dynamical Theory of Gases</u>

Nicholas Rebol, Ruhr-Universitaet Bochum

In this paper I argue for an understanding of probability in Maxwell's dynamical theory of gases in light of the role that analogies play in his scientific method. Maxwell was often unclear on the interpretation of the probability distributions in his theories . On the one hand, he often invoked epistemic considerations, suggesting the classical interpretation and a subjective character. On the other hand, the probability distributions in his derivations were defined in terms of relative numbers and are otherwise generally taken to be properties of the gas, so they also seem to have an objective character. I argue that this supposed tension can be resolved if we understand the sense in which Maxwell's dynamical theory of gases provided what is called a 'physical analogy', and is not meant to be taken as providing a physical hypothesis of the actual inner workings of a gas. I draw on the work by Mary Hesse and Joseph Turner on the logic of analogies in Maxwell's scientific method to support this argument. Because the dynamical theory of gases is best understood as a physical analogy, the probability distribution should not be understood as a reflecting objective features of the world.

Analogies Between Artifacts and Biological Phenomena Frame Measuring and Modeling Via Epistemic Circularity: The Case of The "Brain's Compass"

José Antonio Pérez-Escobar, École Normale Supérieure Paris, PSL University

Functional artifact analogies are useful at initially making sense of complex biological phenomena. I formalize the logical structure at the base of these analogies and make the case that they involve a sort of epistemic circularity: the analogous function ascribed to the biological phenomenon in turn places expectations on traits (their individuation, characteristics, etc.). I use this formal structure to analyze the case of the brain's "compass", a system believed to provide a cognitive sense of angular direction. This system was framed by a compass analogy from the beginning. I show how 1) the compass analogy competed with other analogies, 2) compass-derived functional expectations framed the initial measurement and modeling of the neural components of the brain's compass, and 3) the mathematical model is used not just descriptively but also normatively concerning further measuring (discarding counterexamples and tuning electrophysiological signals to fit the model's expectations). It also shows the pervasiveness of the initial compass analogy.

Scientific realism (Classroom 1)

Middle Path Realism, Instrumentalism, and Future-Proof Science

Chryssi Malouchou, University of Edinburgh

The increasing inclusion of the history of science within the realism debate seems to have had the effect of bringing realists and instrumentalists closer, contributing to a "Middle Path" shared by the two sides in Stanford's words (2021, 216). In this paper, I argue that realist positions that tend to approach the 'Middle Path' may run the risk of being accounted for by a purely instrumentalist narrative, if they fail to sufficiently ground their position in truth. In order to showcase that claim, I examine Peter Vickers's proposal in Identifying Future-Proof Science (2023). After showing why Vickers's future-proof science can be read as a 'Middle Path' realist position, I argue that, despite it being intended as a counterargument to instrumentalist views, Vickers's future-proof science contains gaps that can be filled in by instrumentalist   concepts.

Reality-Drag: Scientific Realism As A Set of Practices That Achieve Realness

Sophia Efstathiou, NTNU
Catherine Kendig, MSU

We propose that reality is not the sort of thing that is out there in the world waiting to be discovered by scientists but is instead performatively constituted. What we mean by something being performatively constituted borrows from drag. We suggest that the reality relied upon as the basis for experimentation and technological interventions exists as a performative project, and analyse the work of science as reality-drag. We posit that performing and achieving realness happens as part of drag, but also in scientific practice and in particular through devising scientific categories and concepts. For instance, science-drag is performed in the making of scientific kinds and categories that aim to capture the ontological structure of the world (kinding). Science-drag is also performed in the generation of scientific concepts from everyday ideas (founding). We explore these performances in the case of food and agriculture, especially in the generation of plant-based meats.

Credit, Productivity and Peer Review (Main hall)

<u>Peer Review Errors and The Gender Productivity Gap</u>

Remco Heesen, London School of Economics and Political Science

The gender productivity gap (GPG) is the phenomenon that in academia, women publish fewer articles than men. A recent proposal highlights women's expectation of gender bias in peer review – motivating them to put more effort into each article – as a potential explanation. Using a rational choice model in which academics act as credit seekers, I investigate when such expectations predict a GPG. I show that whether a GPG arises depends on academics' expectations of credit from their weakest published articles. Drawing a connection to previous modelling work on the replication crisis, I also suggest a normative conclusion: men should publish less, rather than women publishing more.

<u>The Tasks and Practices of Peer Review</u>

Ina Gawel, Leibniz University Hannover
Jamie Shaw, Leibniz University Hannover

The purpose of this paper is to reevaluate the tasks assigned to peer reviewers for journal manuscripts and interpret qualitative studies on reviewer reports. While peer review is often thought to be a gatekeeper of scientific rigor, recent scholarship has questioned its ability to do so reliably. We provide an explanation for this via the distinction between "task expertise", or the ability to write quality reviewer reports, and "theoretical expertise" or knowledge of an area of research. We show how this distinction provides a better explanation of deviance in reviewer scores and also provides key insights for the norms of peer review. We further show that many of these norms must be reevaluated in the context of digitization and that our understanding of peer review is still tied to an outdated mode of publishing journal papers on paper.

<u>What Is Credit In Science? A Value-Based Interpretation of The Credit Maximisation Approach To The Social Philosophy of Science</u>

Thijs Ringelberg, University of Groningen

Questions in philosophy of science are addressed increasingly often by means of what might be called the Credit Maximisation Approach (CMA). This approach employs computational techniques to model the behaviour of scientific communities on the assumption that scientists act in pursuit of

"social credit", and thus face an incentive structure called the "credit-economy". This paper establishes how these formal models should be interpreted. The most plausible interpretation explains the credit-economy as an interplay between attitudes of esteem and a specific type of institution I call a "praise-institution". Underlying this process is a (partial) normative consensus on what it means to be a good scientist; the best interpretation of the CMA, I argue, is value-based. I conclude by arguing that this value-based explanation of the credit-economy restricts the ways in which the CMA can be employed to give policy advice.

Philosophy of biology: Species, Inheritance and Populations (Josif Pancic Hall)

A Pragmatist View of The Debate On Inheritance

Mariano Martín-Villuendas, University of Salamanca

Our aim in this talk is to carry out a conceptual analysis of the concept of inheritance. We will focus on the challenges raised by a particular kind of non-genetic inheritance: epigenetic inheritance. We will show that the reluctance to recognize alternative mechanisms to genetic transmission derives from a genetically biased conceptualization of inheritance. To overcome this situation, we will propose a new approach to inheritance. First, we will restore the distinction between "heredity" and "mechanism of inheritance" and adopt the former as conceptually primary. Second, we will assume an inclusive notion of mechanisms of inheritance. Since we think the pluralism derived from this concept cannot be taken for granted, we suggest two ways of legitimizing it: an ontological and an epistemic one. We exemplify the inadequacy of the former by analyzing the proposal of DST. Drawing on the reflections established by pragmatism, will show how the latter allows for such legitimation.

Species Is A Unit of Measurement

Aline Potiron, Johannes Kepler University

The paper explores the use of the species concept in the context of diversity-as-a-measurement, specifically in microbial ecology using DNA sequencing, and examines its implications for the practical, epistemological, and theoretical dimensions of the species problem. The analysis considers the idealisation and de-idealisation procedures of measurements understood under model-based accounts. This analysis shows that the species concept is one of many sources of uncertainty in the diversity measurement process. The paper also discusses the practical implications of this analysis in microbial ecology and the broader context of conservation biology, as well as the epistemic role of the species concept as a unit of measurement and its relationship with the homonymy thesis. Finally, it explores the theoretical assumptions of the use of the species concept in diversity measurements and suggests that its explanatory importance in these contexts needs further exploration.

Populations In Mechanisms

Viorel Pâslaru, University of Dayton

In this paper, I argue that populations of loosely aggregated organisms that lack organization can be viewed as components in ecological mechanisms. I motivate by investigation by showing that influential and comprehensive treatments of mechanisms have not examine at all or in detail the case of populations in mechanisms. I develop then the reasons supporting my thesis. First, I show that limiting mechanism components only to integrated populations does not account for populations that are individuated and causally effective. Second, I argue that such populations of loosely aggregated organisms exhibit population level activities that are different from the activities of their component organisms. Third, identification of wholes in terms of their characteristic behavior shows that such populations are individuals. Thus, they should be rightly understood as components of ecological mechanisms. My approach has the advantage of accounting for the use of population ecology.

Philosophy of physics: Relativistic quantum physics (Music Gallery)

<u>Theories, Models and (non) Theoretical Models: The Example of Perturbative Quantum Field Theory</u>

Antonis Antoniou, University of Bonn

The primary aim of this article is to show that the importance of theoretical models in physics, as described by van Fraassen (2008), is significantly undermined by the modelling practice of perturbative Quantum Field Theory. By mapping out some of the central aspects of this practice, i.e. regularization and renormalization, it is shown that the final models of perturbative Quantum Field Theory are in fact non-theoretical. This conclusion follows from the fact that certain steps during the construction of empirically relevant models in perturbative QFT are detached from their corresponding theoretical models, in the sense that some of the introduced assumptions for the construction of these models are mathematically and theoretically unjustified, i.e. they are – what Sklar (2000) calls – 'non-controllable idealizations'. The presence of non-theoretical models in Quantum Field Theory thus poses a challenge both to van Fraasen's commitment on theoretical models and the Semantic View of scientific theories which takes centre stage in constructive empiricism.

<u>Effective Realism Made Effective</u>

Richard Dawid, Stockholm University
Michael Stöltzner, University of South Carolina

The talk discusses the status of effective realism in the context of high energy physics. It presents and defends two core claims. First, effective realism is a coherent and convincing position about the standard model of particle physics or its future extensions within the framework of gauge field theory. It can withstand criticism of the kind put forward by Ruetsche according to which any interpretation of a theory requires a specified space of possibilities at the fundamental level. The existence of a scale describing the limits of the theory and the place for possible extensions suffices. Second, however, we argue that effective realism, while an adequate basis for realist commitment in effective QFTs, is itself an effective concept: its range of applicability ends at the Planck scale, where discussions of realism, if meaningful, need to be of a fundamental kind.

Epistemic Virtues and The Pursuit of Ugly Models

Martin King, LMU Munich

The lack of new physics discoveries at the LHC has changed the field of particle physics in a number of significant ways. One is that many of the long-cherished principles, such as naturalness, that guided model development for decades are falling to the wayside. Physicists are increasingly turning to model-independent methods and to models that do not exemplify epistemic theoretical virtues considered by some philosophers as being important or even necessary. Simple, unifying models with large empirical scope, like supersymmetry, are being increasingly passed over in favour of effective models with narrow scope that are relatively easy to assess with existing data. What is being pursued are models that take radically novel approaches. In this paper, I diagnose the poor fit of epistemic virtues with the models that are being pursued in particle physics as reflecting an abandonment of epistemic virtues as guides.

General philosophy of science: formal and linguistic considerations (Milan Grol Hall)

To Be Done With All This Measuring of Truth

Alessandro Cecconi, University of Geneva

Intuitively, given two propositions P and Q, P has more verisimilitude than Q(or is closer to the truth than Q) if P tells more true things about reality than Q (cf. Cevolani and Festa 2020). Throughout the debate on verisimilitude, there have been different ways to render formally this intuition, resulting in competing accounts of the notion. There is no consensus as to which of these is the best. Even worse, it is not completely clear that any of these is satisfactory. Fine (2021) significantly advanced the debate, offering an account of verisimilitude within truthmaker semantics. However, as I shall show, his proposal suffers from a major limitation as well. Hence, I shall put forward my proposal bringing together tools from measure theory and the framework of truthmaker semantics.

Instrumental Devices

Georg Schiemer, University of Vienna

A central theme in formal philosophy of the twentieth century was the study of purely instrumental uses of language in different fields. Roughly put, this can be understood as the focus on linguistic expressions that are viewed as formal but nevertheless as theoretically indispensable or at least instrumentally useful for certain purposes. In this talk, I will present a general study of such instrumental devices and their logical properties as exemplified in three different philosophical debates, namely (i) a formalist philosophy of mathematics inspired by Hilbert's program, (ii) the logic of science with a focus on theoretical languages in the "syntactic view" of theories and (iii) axiomatic truth theories. In the talk, I will introduce three metatheoretic concepts suggested for the explication of the reliability of instrumental devices, namely conservativity, relative interpretability, and proof-theoretic reducibility. Given a presentation of these concepts and several metatheoretic results concerning them, I will discuss how they are used in the three philosophical contexts.

Philosophy of medicine: Understanding Diseases (Library)

The Pre-Pandemic Empirical Grounding of Infectious Disease Models

Raphael Scholl, University of Geneva

During the Covid-19 pandemic, infectious disease models were used to develop scenarios of the future growth or decline in case numbers, and especially of the potential effects of interventions such as mask mandates or vaccination efforts. Here I will consider the question of the empirical grounding of these forecasts: In virtue of what are such counterfactual scenarios reliable guides to action? The focus will be on the development of infectious disease models before the recent pandemic, since this will allow us to study the epistemic virtues and limitations of these tools before their use became entangled with an urgent emergency. I will show that during the decades preceding the pandemic, modellers made many efforts to improve their models' "representational fidelity" – their ability to correctly represent the processes or mechanisms of disease transmission. This was done precisely in order to improve the models' ability to warrant counterfactual claims.

The Pathogenic Niche: An Empowering Concept of Environment For Health Studies

Gaëlle Pontarotti, IHPST
Francesca Merlin, IHPST - CNRS

In this talk, we argue for the need of a new concept of environment for human health studies. After showing the theoretical shortcomings of the fashionable concept of exposome, we borrow from studies in philosophy of biology the idea that the biological environment is a constructed niche. In this view, the environment is always determined (at least partly) by the properties and activities of its reference entity (ontological dependence). Besides, it includes elements that depend on the problem addressed by scientists (epistemological dependence). We claim that, to be more relevant and operational, the environment in health studies should be conceived as a pathogenic niche, epistemologically shaped by the physicians' questions, and ontologically determined by the population that inhabits it. Finally, we ask how our proposal could be translated into tools for scientific practice, and we show its empowering nature for physicians, scientists, but also for politicians and lay people.

<u>Making X-Ray Images Intelligible For Understanding Pulmonary
Tuberculosis: A Community Achievement</u>

Linda Holland, Vrije Universiteit Amsterdam

This paper discusses how scientists made X-ray images intelligible for understanding pulmonary tuberculosis after X-ray imaging was introduced in the late 1890s as a new technique to assist in diagnosing the disease. I will use this case to study scientific understanding in the biomedical sciences. Drawing upon Michael Polanyi's work, I will argue that both tacit knowing and explicit knowledge are necessary conditions for scientific understanding. Insights from the case study will be compared with Sabina Leonelli's account of scientific understanding of biological phenomena.

A crucial difference between the account presented and Leonelli's account is that scientific understanding is considered to be a community achievement rather than the achievement of an individual scientist. This allows me to define a standard of maximum understanding at the community level, against which the degree of understanding of scientists within the community can be evaluated.

Explanation, prediction and inference in cognitive and behavioural sciences (Classroom 2)

<u>Inferring To The Best Explanation In Cognitive Neuroscience</u>

Davide Coraci, IMT School Lucca
Gustavo Cevolani, IMT School Lucca
Igor Douven, IHPST/CNRS/Pantheon-Sorbonne University

Reverse inference (RI) is a reasoning strategy neuroscientists rely on to establish associations between brain activations as observed in functional Magnetic Resonance Imaging experiments and the engagement of cognitive processes. Recent works discuss RI both as a pattern of probabilistic reasoning and as a form of abductive reasoning or inference to the best explanation (IBE). However, the status of RI is contested and the reliability of neuroscientific explanations still controversial. In this paper, we discuss RI in light of recent work on IBE. We survey the key differences between the main methods used to perform RI and discuss recent theoretical and empirical results about IBE, highlighting a number of criteria for assessing the quality of competing explanations construed as conclusions of abductive inferences. Finally, we show how the philosophical discussion of IBE can shed light on the methodological debate about RI.

<u>Integrated Explanatory Models In Cognitive Neuroscience</u>

Violetta Manola, National and Kapodistrian University of Athens

The aim of this contribution is to extract some preliminary conclusions on explanatory integration in cognitive neuroscience through the explication of the explanatory framework underlying Computational Cognitive Neuroscience (CCN). CCN is an approach in the intersection of cognitive science, neuroscience and computational modelling. The key idea is that CCN models aim to offer explanations of the neuro-cognitive link by means of computational modelling. This key idea is best served, if we take it that CCN models play a genuine explanatory and representational role, in contrast to other computational models that are merely predictive. Computational modeling is the best tool to study complex large-scale phenomena such as cognitive ones, since it can process and integrate data from different levels and of different kinds – from neurobiological to behavioural data. Thus, CCN is also promising from a methodological perspective. It combines explanations and methodologies that focus on different levels in an integrated explanatory model and offers a perfect example of how integration of levels, data and kinds of explanations is done in practice. I will focus on three main conclusions drawn from CCN practice methodology; through an

investigation of some successful CCN models, such as the CCN model on the effects of environmental conditions in striatum-mediated learning developed by Ashby & Crossley (see Ashby & Crossley, 2011). Firstly, I argue, that to serve their explanatory purposes, computational models of cognitive phenomena may and indeed should be abstract and idealized. Abstractions and idealisations are part of the procedure of identifying and selecting the causally relevant factors that are most functionally relevant to the behaviour being modeled. Instead of fitting them in the theoretical definitions of Jones (2005), I see them as an inherent part of the model-building process and I outline various examples from the examined case studies. I moreover argue, that this incorporation of idealisations and abstractions by CCN modelling suggests an explanation-based notion of levels (Woodward 2020, 428-429). According to this notion, the explanatory relevant factors are not always the "lower-level" detailed features of the system under investigation, but sometimes the behaviour of a system can be best explained by some idealised or abstracted "higher-level" features of it. Reference to features as being at a higher or lower-level is merely a description of their level of idealization or abstraction. Explanatory relevance to the phenomenon under investigation justifies the use of idealisation in CCN modelling. The second point is linked with the fact that CCN explains and represents through the vehicle of computational modeling, which entails a philosophically rather unexplored set of practices. One of the main processes inherent in model-building is the process of selection (see MacLeod & Nersessian 2015, 3). The modeller has to select the relevant factors, which are then to be inserted into the mathematical model and thus endow it with explanatory power. The key here to understand idealisation and abstraction, is this practice of causal selection inherent in model-building. This selection-process is an active process. It captures a certain level of description of the relevant processes. Thus, the second point of the paper is that CCN models offer causal explanations of the behaviours under study by identifying causally relevant factors and unveiling salient causal dependencies. In this framework – given the previous point – interlevel causation does not seem to pose a problem as in the standard interpretation of the new mechanistic philosophy. These two previous points are linked to the last point drawn from CCN practice methodology. Computational models deal with parameters, not entities. Selecting the relevant factors for explaining, means translating them into the modelling language of parameters, such as variables and constants (parameter-fixing and data-fitting processes) and interpreting their functional roles in a system (information-decoding). These are all interconnected parts of the model-building process and they constitute the explanatory framework of CCN (and other computational models as well). Computational models, thus, produce information, which is not accessible in purely linguistic or pictorial explanations, such as typical mechanistic explanations. The model-building

process in CCN acts as a perfect example of two kinds of integration; the integration of the causal factors at various levels of organisation, as well as the integration of the different methodologies and explanations in cognitive neuroscience.

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From Explanation To Prediction and Back To Integrative Modeling

Lilia Gurova, New Bulgarian University

The remarkable predictive accuracy of recent machine learning models has inspired a "predictive turn" in cognitive and behavioral sciences that is represented by two competing strategies. The first strategy rests on the assumption that explanatory and predictive research pursue different, sometimes conflicting epistemic goals that should be addressed separately. The proponents of the second strategy argue that explanatory and predictive research enhance each other and should be integrated. In this talk I will discuss the roots and the underlying assumptions of both strategies, and will point to examples that illustrate their advantages and disadvantages. The proposed conclusion is that pursuing explanatory and predictive goals in separation is risky to the achievement of both, and thus it seems worthwhile to invest in the development of integrative research paradigms.

Scientific metaphysics (Classroom 1)

<u>Realism About Effective Theories: The Case For Gravitational Forces</u>

Matthias Egg, University of Bern

I argue that gravitational forces are real, although fundamental physics seems to tell us they are not. This argument is part of a larger case for a position called 'effective realism', which is supposed to apply to all non-fundamental sciences insofar as they enjoy a certain kind of empirical success. Juha Saatsi (EJPS, 2022) has recently attacked this position, arguing that effective realism about Newtonian gravity is incompatible with the fact that general relativity treats gravity as a mere inertial force. I will show that this incompatibility can be dissolved by accurately analyzing the ontological status of inertial forces in different contexts: while inertial forces in classical mechanics (e.g., the Coriolis force) are dispensable without significant loss in explanatory and predictive power, the same is no longer true in general relativity for the inertial force of gravity.

<u>Natural Kinds: The Essential Tension</u>

Sören Häggqvist, Stockholm University, Department of philosophy

In recent decades, a large number of different accounts have been proposed for natural kinds. While ingenious, well-argued, and often motivated by realist impulses, these accounts don't align well and collectively suggest that natural kind theorizing may not be making progress. Using a recent diagnosis of this situation by Chakravartty (2023) as starting point, I propose a complementary explanation, appealing to what I argue is a fundamental tension at the root of philosophical theorizing about natural kinds.

Assessment and Application of Scientific Research (Main hall)

<u>Towards An Account of Responsible Modelling In Economics</u>

Caterina Marchionni, University of Helsinki
Säde Hormio, University of Helsinki

Economics has immense power and epistemic authority among both policy makers and the public. Its models affect our beliefs, behaviors, and institutional arrangements. They can do so directly when their models are used by policy makers to justify their policies or more subtly when their dissemination affects our self-understanding, incentives, and behaviors. In this paper we examine issues of responsibility of economists and economics for unintended harmful effects of their models and proposes an account of it that focuses on its collective and institutional dimensions.

<u>An Interactional Approach To Interdisciplinary Excellence</u>

Mattia Gallotti, The London Interdisciplinary School

Despite increased recognition in quality assessment, interdisciplinarity still lacks a system of research evaluation of its own. This paper seeks to address this issue by considering relevance and audience as criteria for assessing research outputs. Relevance and audience speak to the original intents and promises of interdisciplinary research, yet their significance is best appreciated in the context of the broader debate on integration as the mode of interdisciplinary scholarship. Pace emergentists, I argue that integration is interactional in nature, and it does not mirror the emergent nature of the complex, real-world problems that interdisciplinarity is set out to tackle.

Symposium: Rethinking biological lineages (Josif Pancic Hall)

John Dupré, University of Exeter
Elisabeth Lloyd, Indiana University
Celso Neto, University of Exeter
Javier Suárez, University of Oviedo
Sophie Veigl, University of Vienna

Biological lineages constitute the center of attention of much of our contemporary biological research, especially given their relevance for understanding the process of evolution by natural selection and the dominant practices of systematic phylogenetics. Philosophers recognize the apparent relevance of lineages in biology and study them both ontologically (what they are), and epistemically (which epistemic roles they play in biological thinking) (Hull 1978, 1980; Dupré 1984; Ereshefsky 1992; Calcott 2008; Neto 2018, 2020; Haber 2019; Veigl et al. 2022). Recently discovered phenomena such as genealogical discordance, the evolution of adaptations in multispecies consortia, have however questioned some of the traditional roles usually attributed to lineages. In this symposium, five philosophers of biology re-examine traditional positions in the ontology and epistemology of lineages in light of this ground-breaking research in biology.

Symposium: Agent-centred approaches to quantum theory (Music Gallery)

Emily Adlam, University of Western Ontario
Eric Cavalcanti, Griffith University
Peter Evans, University of Queensland
Simon Friederich, University of Groningen
Richard Healey, University of Arizona

Agent-centred approaches to quantum theory promise an elegant dissolution of the measurement problem, and they can be motivated in terms of recent no-go theorems based on Wigner's friend-type scenarios. The goal of this symposium is to consolidate and develop our understanding of such approaches. Our speakers introduce additional reasons for pursuing them but also develop and address key objections.

Richard Healey presents central tenets of his pragmatist approach to quantum theory, Emily Adlam develops an argument that highlights a joint difficulty facing agent-centred approaches – accounting for intersubjective agreement – Pete Evans suggests an agent-centred response to the preferred basis problem for relational quantum mechanics, Eric Cavalcanti argues that a perspectival view of events and quantum states is motivated by an adherence to a form of Copernicanism, and Simon Friederich proposes the simulation hypothesis as a model of how reality might be "gappy" in an agent-centred way.

Science & Policy (Milan Grol Hall)

Making and Breaking Decision Boundaries: Scope and Social Policy
Reasoning Under Radical Uncertainty.

Helena Slanickova, University of Groningen

The reasoning process underlying social policy decisions is subject to multi-dimensional epistemic standards. Understanding the demands of these different dimensions and identifying practices conducive to meeting them is important for improving how we reason about social policy decisions. Work on evidence-based policy has broadened our understanding of what we might call the evidence dimension, but other important dimensions are often overlooked. The purpose of this paper is to shed light on an under-discussed dimension of policy reasoning standards – the scope dimension – and emphasise its crucial importance for radically uncertain policy contexts. I introduce a framework for thinking about policy reasoning and two COVID-19 case studies in order to distinguish the scope dimension from the evidence dimension. I then use work from sociology and management studies to explore why meeting this standard can be more challenging, and yet more pressing, in situations of radical uncertainty

Social Science, Policy and Democracy

Johanna Thoma, Universität Bayreuth

It is widely acknowledged that policy-relevant social science is value-laden in a number of ways. To reconcile this with democracy, it has been proposed that the values in question need to be democratically aligned to guard against problematic technocracy. But where the value judgements that need to be made are especially contentious, and persistent disagreement can be expected, this response may not address the danger of a kind of epistemic inequality that I will argue is also problematic on democratic grounds: the epistemic inequality that arises when social scientific results of public interest are more relevant, usable and trustworthy for the subset of the population that shares the value judgements made in the research than for the subset that doesn't. A value pluralist approach, in contrast, can help ensure epistemic equality. The measurement of value-laden social scientific indicators, in particular measures of the cost of living, will serve as an example of a domain where greater pluralism is both especially desirable and feasible.

There Is No Alternative: Scientific Pluralism In Action For Policy Decisions

Thomas Bonnin, Institut d'Histoire et Philosophie des Sciences et Techniques, UMR8590, CNRS & Université Paris 1 Panthéon-Sorbonne, Elodie Giroux, Université Lyon 3

We argue that an operational model for the relationship between scientific knowledge and policy decisions must combine (a) a radical implementation of scientific pluralism as concerns the knowledge that irrigates policy deliberations and (b) policy alternatives built from a mutual consideration of values and scientific knowledge. After presenting this model in further detail (Part 1), we explain how identified challenges to the practical applications of pluralism are either (a) unproblematic or (b) constitutive to democracy in general (Part 2). We then discuss how attempts to ditch policy deliberations by having scientific knowledge dictating policy decisions, a model called the "linear model", is inefficient and costly for trust for both scientific and policy institutions (Part 3). From this, we believe that "scientific pluralism in action" is the only alternative for sound policy decision-making informed by scientific knowledge.

What Place Does Iks Have In African Science Policy.

Jack Ritchie, UCT

This paper explores the role of Indigenous Knowledge Systems in a well-functioning science policy for South Africa. I identify some uncontroversial ways this research can be justified before discussing two more speculative roles such research might fulfil: helping science policymakers better understand the goals and hopes of local communities and as a way of spreading epistemic risk.

Symposium: Transparency in pharmaceutical research (Library)

Transparency In Pharmaceutical Research: How Much Should and Can The Public Demand?

Isabelle Drouet, Sorbonne-Université
Stephen John, Cambridge University
David Teira, UNED
Marion Vorms, Université Paris 1
Inmaculada de Melo Martin, Cornell University

The pharmaceutical industry is commonly presented as notably opaque but it is unclear how much transparency the public can and should demand. Indeed there may be cases where more information leads to objectively worse decisions. Moreover, full disclosure of all the information that may be useful for individual decision-making is impossible. But at the same time it is very difficult to decide which information it is important to give in view of public and individual decision-making, and the effects of value judgments may be opaque even to researchers themselves. Last but not least, pharmaceutical activities are largely regulated already, raising the question what the transparency demand amounts to. We discuss a sample of cases that put into question this demand and thereby investigate the opacity criticism raised against the pharmaceutical industry. The three presentations, each addressing concerns about the possibility and desirability of transparency in biomedical research settings, will be followed by a discussion.

Philosophy of expertise (Classroom 2)

Expert Judgment As A Scientific Output: The Distinction Between Expert
Judgment Produced On Vs In Science

Mason Majszak, University of Bern

With a growing recognition of experts in multiple scientific domains comes an increased need for evaluating expert judgment within science. Here, I argue for the recognition of a distinction between expert judgment produced on science, those judgments that are produced by an expert as an assessment of the current state of the scientific domain, and expert judgment produced in science, those judgements produced as a means to add to the body of scientific knowledge. To argue for this, I discuss expert judgment in a general scientific context, showing that expert judgment should be seen as an output of science. The role expert judgment plays as an output is then discussed, where I highlight three ways expertise relates to uncertainty in science. Given these uses, I argue the distinction is necessary as expertise is not a monolithic concept, contrary to how it is currently evaluated in the social epistemology literature. Then, in line with an adequacy for purpose like thinking, I argue that through this on vs in distinction, expert judgment as an output can be evaluated based on the different goals of its production rather than evaluating expert judgment as a monolithic concept.

Trust-Conducive Social-Epistemic Practices: Argumentation and Testimony
In Expert-Novice Communication About Covid-19 Vaccines

Piero Avitabile, Scuola IMT Alti Studi Lucca
Alessandro Demichelis, Scuola IMT Alti Studi Lucca

This paper explores how social-epistemic practices can enhance trust between scientific experts and the lay public. In particular, we analyze Argumentation and Testimony, and offer relevant examples from the Italian public debate during the covid-19 pandemic. We aim at enriching Goldman's veritistic account of these practices with trust-linked requirements. To do so, we first show how information-based models of science communication need trust-based approaches, and defend a functionalist, trust-oriented definition of a scientific expert. Then, we focus on Argumentation, discussing trustworthy and untrustworthy uses of the ab auctoritate argument, and on Testimony, discussing some normative requirements for trustworthy public scientific testimony.

Daubert Standard, Expert Witnesses, and The Methodology of Science

Edoardo Peruzzi, University of Siena
Gustavo Cevolani, IMT School for Advanced Studies Lucca

Under the Daubert standard, US judges must decide whether to admit or exclude an expert's testimony to a trial by looking at her methodology, that is, whether her testimony was derived from the correct application of the scientific method. However, a paradox of expertise arises: how can someone who doesn't know the subject matter know whether an expert has employed a scientific methodology? A typical response holds that the Daubert scrutiny should be confined to second-order analysis, that is, judges should only check whether the expert's methodology satisfies certain desiderata (reliability, relevance, academic consensus, etc.). In this way, the argument goes, judges would avoid getting into the merits and technicalities of the expert's methodology (the so-called first-order analysis). Drawing on recent Daubert hearings in antitrust cases, the distinction between first- and second-order analysis will be examined and dismissed on two grounds.

Ontology and Scientific Explanation (Classroom 1)

<u>Unification and Explanation From A Causal Perspective</u>

Christian J. Feldbacher-Escamilla, University of Cologne
Alexander Gebharter, Marche Polytechnic University (UNIVPM)

We discuss two influential views of unification: mutual information unification (MIU) and common origin unification (COU). We propose a simple probabilistic measure for COU and compare it with Myrvold's (2003, 2007) probabilistic measure for MIU. We then explore how well these two measures perform in simple causal settings. After highlighting several deficiencies, we propose causal constraints for both measures. A comparison with explanatory power shows that the causal version of COU is one step ahead in simple causal settings. However, slightly increasing the complexity of the underlying causal structure shows that both measures can easily disagree with explanatory power. The upshot of this is that even sophisticated causally constrained measures for unification ultimately fail to track explanatory relevance. This shows that unification and explanation are not as closely related as many philosophers thought.

<u>Reification and Its Descriptive-Normative Entanglement</u>

James Grayot, University of Porto
Lukas Beck, Mercator Research Institute on Global Commons and Climate Change (MCC)

In philosophy of science, reification is often associated with functional approaches to explanation, in which an object or system is investigated and described in terms of the function or role it performs rather than in terms of the operations of its component mechanisms. However, philosophers have begun to dispute the virtues of reification on two fronts: One set of disputes concern the descriptive implications of reification—e.g., what does it mean for an object or property to be reified? The other set of disputes concern the normative implications of reification—e.g., when, and why, is reification valuable? In this paper we want to examine how these descriptive and normative disputes are entangled. Specifically, we will argue that descriptive and normative disputes can't be resolved independently of one another precisely because the motivations for pursuing reification will impact what it means to commit oneself to it descriptively. To address this issue, we draw a distinction between ontological reification and epistemic reification and we explore how these distinct roles are tied up in and motivated by diverging inter- and intra-disciplinary interests and values. We conclude that much of

the debate over the strategy of reification can be recast as a debate between camps with different disciplinary interests and values.

Coherentism, Explanationism and Explanatory Power

Borut Trpin, Munich Center for Mathematical Philosophy, LMU Munich

Stephan Hartmann, Munich Center for Mathematical Philosophy, LMU Munich

Unification seems to play a role in at least some scientific explanations. If so, the question is how to measure the strength of such explanations. Answering this question is important in many ways, not least for a satisfactory analysis of inference to the best explanation. To this end, we first discuss general measures of explanatory power and show that their focus on reducing surprise is inadequate. From this we derive desiderata for an adequate explication of explanatory power, and we show that coherence considerations play an important role in this. This leads to a new probabilistic measure of explanatory power that has a number of plausible properties and sheds new light on the relationship between Bayesianism and explanationism.

The Extrinsic Dispositions Thesis and Fundamental Physics

Gil Santos, Centro de Filosofia das Ciências da Universidade de Lisboa

João Cordovil, Centro de Filosofia das Ciências da Universidade de Lisboa

The   Extrinsic   Dispositions   Thesis   and   Fundamental   Physics

There is a fairly broad consensus that the Intrinsic Dispositions Thesis applies to the overwhelming majority of powers or dispositions. We shall challenge this view both in philosophical and physical terms. First, we shall argue that the Extrinsic Dispositions Thesis applies to all powers whose manifestation necessarily depends on the obtaining of some causal relation between their bearers and some external entities. Solubility, fragility, and flammability are clear examples of such powers. We shall call them relational causal powers (RCPs). According to the proposed argument, every RCP is a complex relational property, its instantiation thus implying the instantiation of its constitutive co-relata, as well as the existence of its constitutive relation as a possible relation. In the second part of our talk, we shall analyse and discuss the extrinsic-relational of some properties instantiated by the fundamental physical entities, such as electric charge, colour charge and spin.

Modelling and Simulation (Classroom 4)

What Is So Special About Analogue Simulations?

Francesco Nappo, Politecnico di Milano
Nicolò Cangiotti, Politecnico di Milano

Contra Dardashti, Thébault, and Winsberg (2017), this paper defends an analysis of arguments from analogue simulations as instances of a familiar kind of inductive inference in science: arguments from material analogy (Hesse 1963). When understood in this way, the capacity of analogue simulations to confirm hypotheses about black holes can be deduced from a general account – fully consistent with a Bayesian standpoint – of how ordinary arguments from material analogy confirm. The proposed analysis makes recommendations about what analogue experiments are worth pursuing that are more credible than Dardashti, Hartmann, Thébault, and Winsberg's (2019). It also offers a more solid basis for addressing the concerns by Crowther, Linneman, and Wütrich (2019), according to which analogue simulations are incapable of sustaining hypotheses concerning black hole radiation. [2. Philosophy of the Physical Sciences.]

A New Interpretation of Surrogative Reasoning

Dun Xiang, college of philosophy, Nankai University
Aki Lehtinen

Philosophers of modelling commonly accept that any account of modelling must make sense of its indirect nature: modellers are studying a surrogate instead of directly studying the target system itself. The direct account (by Toon and Levy) is commonly taken to deny this indirect nature of modelling on the grounds that it does not satisfy 'the surrogative reasoning condition' (e.g., Frigg & Nguyen, 2020). In this paper, we argue that a direct account of modelling can satisfy a properly formulated surrogative reasoning condition. The key to our solution is the distinction between indirect representation and indirect inference-making: Representation may be direct in the sense that model descriptions directly represent the target, but modelling is still relevantly indirect in the sense that the modeller studies model descriptions rather than the target system directly. Furthermore, we require that surrogative reasonings must require that the modeller makes inferences with the model. 1. General Philosophy of Science

Path-Dependence and Epistemic Risks In Large-Scale Experiments

Marianne van Panhuys, Karlsruhe Institute of Technology
Rafaela Hillerbrand, Karlsruhe Institute of Technology

In scientific practices, which are inherently uncertain, experimental decisions shape the path of inquiry. Building on the concept of "path-dependence", i.e., the persistence of a particular path of outcomes due to past decisions (Garrouste et al., 2001), I rely on a case study from particle physics to map out sources of dependencies and investigate their impact on the aim of discovery. While scholars in Technology Studies have raised concerns about the implications of path-dependence on technological change, only few authors in the Philosophy of Science have addressed the issue whether path-dependence could be problematic for scientific change (e.g., Cooper, 2015; Peacock, 2009). I bring together the concepts of path-dependence and epistemic risk, to argue that particularly in the context of large-scale experiments that rely on intensive modelling and simulation practices, understanding of the development of scientific knowledge and its associated risks requires an understanding of path-dependencies.

Better Than Best: Epistemic Landscapes and Diversity of Practice In Science

Jingyi Wu, University of California, Irvine

When solving a complex problem in a group, should we always choose the best available solution? In this paper, I build simulation models to show that, surprisingly, a group of agents who randomly follow a better available solution than their own can end up outperforming a group of agents who follow the best available solution. The reason for this relates to the concept of transient diversity in science (Zollman 2010). In my models, the "better" strategy preserves a diversity of practice for some time, so agents can sufficiently try out a range of solutions before settling down. The "best" strategy, in contrast, may lock the group in a suboptimal position that prevents further exploration. In a slogan, "better" beats "best."

Symposium: Towards a dualist model for the metaphysics of laws and nature (Main hall)

Stathis Psillos, National and Kapodistrian University of Athens

Vassilis Livanios, University of Cyprus

Maria Panagiotatou, National and Kapodistrian University of Athens

Konstantina Antiochou, National and Kapodistrian University of Athens

Stavros Ioannidis, National and Kapodistrian University of Athens

The symposium 'Towards a Dualist Model for the Metaphysics of Laws of Nature' will examine a novel theoretical model of the status and necessity of laws of nature, according to which both laws and causal powers ground natural necessity by playing discrete and indispensable roles in specifying the nomological structure of the world. This dualist model stands in contrast to the dominant monistic or reductivist approaches to laws. The symposium will include five talks (four of which will be presented in-person, and one online) that will explore and develop the central features of the dualist model, and investigate it from a methodological, historical, conceptual and scientific perspective, forging connections among approaches in philosophy of science, metaphysics, history of science, and philosophy of physics.

Symposium: Biodiversity conservation (Josif Pancic Hall)

Biodiversity Conservation: The Challenges of Producing Reliable
Knowledge For Reliable Policy

Federica Bocchi, Boston University
Hari Sridhar, Konrad Lorenz Institute for Evolution and Cognition
Research
Joeri Witteveen, University of Copenhagen

We know a lot about biodiversity loss. Despite this, the question of how to avert the decline and recover threatened populations and ecosystems is hotly discussed. Actionable knowledge – knowledge especially suited to guide policy-making – is much harder to obtain because it requires, besides scientific knowledge, a good sense of priority-setting, communal values, and evidence for the success of past conservation strategies. In this symposium, we bring together three perspectives on producing actionable knowledge in biodiversity conservation. The three talks address, respectively, the evidential standards to turn biodiversity data into evidence, the involvement of domestic communities in setting research questions and methods, and the role of non-epistemic values in determining taxonomical classification. Our symposium contributes to the nascent field of socially-involved philosophy of science zooming in on biodiversity conservation. Section: 3. Philosophy of the Life Sciences

Physical time (Music Gallery)

<u>The Direction of Time As An Intrinsic Property of Spacetime</u>

Martin Voggenauer, University of Cologne

Short abstract: The problem of the direction of time consists of an apparent contradiction between the time-reversal invariance of fundamental physical laws and many temporal asymmetries that we experience in our world. While the standard answer to this problem refers to a distinguished low-entropy state of the early universe, Maudlin has recently argued for an alternative that takes the direction of time to be a primitive intrinsic property of spacetime. In this talk, I aim to compare the two approaches with respect to their underlying metaphysical assumptions and investigate whether Maudlin's alternative can be strengthened by taking into account contemporary cosmological assumptions that provide physical reasons for the direction of time as an intrinsic property of spacetime. Specifically, I examine whether appropriate constraints on Einstein's field equations that in some sense restrict the possible solutions to physical ones can explain that our universe is intrinsically time-directed.

<u>A Timeless Solution To Temporal Asymmetry</u>

Patrick Dawson, University College Dublin

Temporal asymmetries in physics seem to suggest a direction for time. Given that our theories do not feature an intrinsic direction, other solutions such as the `past hypothesis' are proposed instead. In this paper I argue that some forms of timelessness allow for a novel, and superior, solution to the problem of temporal asymmetry. Rejecting the reality of a temporal dimension alters how we interpret the time-reversal transformation, and so changes our expectations about whether the universe should be globally symmetric under that transformation. This allows for the temporal asymmetries seen in nature to be accepted at face-value, without proposing a direction for time, nor any early-universe boundary conditions. I argue that this solution has several advantages over the past hypothesis, and so provides a reason to support timeless approaches to physics, including those that draw on metaphysical presentism.

Is Time's Emergence Physically Coherent?

Eugene Y. S. Chua, University of California San Diego

It is said that time disappears in quantum gravity. Yet time seems to exist in our world. This raises a question of how, if at all, time exists. One response is to 'walk the middle way' between fundamentally timeless physics and manifestly temporal reality by deriving time from timeless physics. If successful, the middle way explains why time emerges non-fundamentally, despite timeless physics. However, Baron, Miller & Tallant (2022) recently argued that this approach faces metaphysical incoherence: the metaphysics of emergence requires spatiotemporality, and can't be coherently applied to a fundamentally non-spatiotemporal world. I augment this worry and argue that the middle way also risks physical incoherence. Explanatory projects in physics seeking to derive time from timeless reality might employ temporally laden concepts, running into circularity. I illustrate this worry with two proposals for time's emergence: the semiclassical and thermal time programs.

Time Is Order

Álvaro Mozota Frauca, Autonomous University of Barcelona

In this paper I argue that the fundamental aspect of our notion of time is that it defines an order relation, be it a total order relation between configurations of the world or just a partial order relation between events. This position is in contrast with a relationalist view popular in the quantum gravity literature, according to which it is just correlations between physical quantities what we observe and which capture every aspect of temporality in the world, at least according to general relativity. I will argue that the view of time as defining an order relation is perfectly compatible with general relativity, while the relationalist view has to face some challenges. This debate is important not only from the perspective of the metaphysics of space and time and of how to interpret our physical theories, but also for the development and understanding of theories of quantum gravity.

AI, machine learning and big data (Milan Grol Hall)

The Meta-Problem of Artificial Consciousness

Giacomo Zanotti, Politecnico di Milano

A great deal of attention has recently been devoted to what can be referred to as the problem of artificial consciousness — that is, whether and under what conditions AI systems can be conscious. A different approach is adopted here, and the meta-problem of artificial consciousness is addressed: why are we taking seriously the possibility of conscious AI? Possible answers to the meta-problem are considered by taking into account the main sources of public concern about conscious AI. I show that they are not sufficient for grounding discussions on artificial consciousness, and I argue that a more convincing reason for being serious about the possibility of conscious AI is that the functioning of some AI systems depends on recurrent processing, which is typically deemed necessary - and sometimes sufficient - for consciousness in biological organisms. That being said, I contend that the meta-problem is still largely open, and I conclude by focusing on some ethical implications.

Model-Choice Accountability and Deep Machine Learning Models

Koray Karaca, University of Twente

In recent years, the need for algorithmic accountability (AA) has become a pressing issue in contexts where automated decision (AD) systems are used to make high-stake decisions about human subjects. In this talk, I will address the epistemological dimension of AA that concerns the choice of DML models (to be) used in the design of AD systems. I shall refer to the kind of AA that applies to the choice of DML models as model-choice accountability (MCA). I shall characterize MCA as the obligation to provide necessary adequacy-for-purpose (AfP) justifications as to why the chosen model is adequate for the design of the relevant AD system. As I shall suggest, demonstrating MCA boils down to finding relevant AfP justifications for the choice of a model that is essential to the design of an AD system. This is basically a manifestation of the problem of justifying model choice, for the solution of which an appropriate account of model evaluation is needed. To this end, I will draw on Wendy Parker's recent account (2020) of model evaluation, as it considers AfP as the sole criterion of model choice.

Mechanistic Interpretability As A "Missing Link"? Cognitive Models For Explainable Artificial Intelligence

Céline Budding, Eindhoven University of Technology
Carlos Zednik, Eindhoven University of Technology

Because Explainable AI faces challenges similar to the ones facing cognitive science, the explanatory strategies of the latter may be useful guides for the former. Top-down and bottom-up strategies are used in cognitive science to create cognitive models, which describe cognitive processes as computational algorithms. However, such models remain elusive in XAI. Mechanistic interpretability is an approach that identifies interpretable structure within a network to explain its global behavior. By studying a network's internal parameters, this method determines the algorithm it has learned. This approach has made first steps toward explaining machine vision and natural language processing. Although preliminary, this work resembles cognitive modeling efforts in cognitive science by combining top-down behavioral observations with bottom-up investigations of the underlying mechanisms. Therefore, mechanistic interpretability deserves closer philosophical scrutiny.

Measuring Scientific Understanding In Humans and Machines

Kristian Gonzalez Barman, Radboud Universiteit
Henk de Regt, Radboud Universiteit
Sascha Caron, Radboud Universiteit
Tom Claassen, Radboud Universiteit

This paper presents a framework for measuring agents' scientific understanding of phenomena (where agents include humans and machine learning models). We focus on artificial understanding, i.e. whether machines (such as Large Language Models) can have scientific understanding. Our starting point is De Regt's account of scientific understanding, which we extend into a framework for scientific understanding of agents in general. The framework considers three key aspects of understanding: knowing, explaining, and establishing counterfactual inferences. We show how these aspects can be measured using what-, why- and w-questions, respectively. We provide recommendations for generating concrete tests and suggestions as to how the community should employ this framework to articulate a network of tests. These tests can serve a multitude of functions, e.g. contrasting the teaching abilities of different teachers, benchmarking models, adversarial training, and measuring student understanding.

Ethics and Epistemology (Library)

Validity Arguments On The Legitimacy of The Forced Swim Test

Yingying Han, Institute for Science in Society (iSiS), Radboud University

Animal models have been an indispensable part of pre-clinical research and they are widely used in drug development. However, the legitimacy of using animal models for these purposes has long been debated. Epistemic, pragmatic, social, and ethical considerations are often intertwined in these debates. One of the prerequisites for the legitimacy of an animal model is its validity, specifically to what extent the model is a plausible (partial) proxy of the human disorder and thus useful for developing potential treatments. The forced swim test (FST) is an interesting case of contested animal model legitimacy. Scientists have challenged the FST'S validity based on Willner's theoretical framework, which was picked up by animal rights groups to advocate banning the test. By presenting how different actors use validity arguments in the FST's legitimacy controversy and the distinct outcomes, I aim to demonstrate that the epistemic issues of the FST's validity, intertwining with non-epistemic values including pragmatic and ethical concerns, play an essential role in determining the FST's legitimacy in both academic and public discussions.

Epistemic Asymmetry and The Ethics of Informed Consent: The Case of Brain Organoids

Alice Andrea Chinaia, Scuola IMT Alti Studi Lucca
Piero Avitabile, Scuola IMT Alti Studi Lucca

This contribution discusses the problem of epistemic asymmetry in the context of informed consent. The authors explore three questions related to this issue: who should highlight ethically controversial aspects of research, what should be included in informed consent documents, and how to balance sufficient information with the practical need to carry out research. Using human-derived brain organoids as a case-study, the authors argue that a shift towards designing the informed consent process, rather than just the document, is necessary to address the issues of epistemic asymmetry and epistemic injustice, urging for greater representation of soft-experts at the interface between science, society, and ethics.

The Cultural Etiology of Morality Supports The Mind-Dependence of Moral Normativity

João Pinheiro, University of Bristol and Centre for Philosophy of Science of the University of Lisbon

We begin by surveying existing conceptual and empirical challenges that stand in the way of establishing that humans have moral-domain-specific cognitive and conative adaptations [e.g., Machery & Mallon 2010, Stich 2018, Machery 2018, Levy & Levy 2020, Plakias 2022, and Heyes 2018, 2019, & forthcoming]. We then argue that holocultural moral psychology best supports the hypothesis that our moral domain is a function of our sociocultural development [e.g., Wright et al. 2013, Buchtel et al. 2015, and Levine et al. 2022]. On this basis, we then develop an abductive argument in support of the metanormative thesis that the properties that may characterize specifically moral normativity [e.g., "queer" properties, sensu Mackie 1977] are mind-dependent rather than entities that exist robustly, in the relevant metaphysical sense of "mind-independence" [Shafer-Landau 2003]. This agrees with Tiffany's [2007] "deflationism" and Eklund's [2017] "presentationalism" [vide Copp & Morton 2022].

Integrity, Responsibility and Reproducibility (Classroom 2)

<u>Cohen's Convention and The Body of Knowledge In Behavioral Science</u>

Aran Arslan, Boğaziçi University, Istanbul
Frank Zenker, Nankai University, Tianjin

In the context of discovery-oriented hypothesis testing research, many behavioral scientists today accept a convention according to which the general relative seriousness of the antecedently accepted false positive error rate $\alpha = 0.05$ is matched by a false negative error rate of $\beta = 0.20$. Proposed by Jacob Cohen, this convention implies that the probability that a statistically significant true observed effect (aka a genuine discovery) cannot be independently replicated is four times larger than the probability that a statistically significant observed effect is a mistaken discovery. Moreover, Cohen's convention ignores contexts of hypothesis testing where the more serious of both errors is the β-error. Cohen's convention, we argue, has proved harmful to the development of a progressive science of human behavior, making its wide acceptance crucial to explaining the replication crisis in behavioral science. While the "right" error rates for some context should be informed by epistemic and practical considerations, epistemic considerations alone suggest that a genuine contribution to the body of scientific knowledge presupposes $\alpha = \beta << 0.05$.

<u>A Deflationary Account of Replication</u>

Sophia Crüwell, University of Cambridge

When does a replication count as successful and when as failed? What does a replication failure tell us about the phenomenon of interest? When is replication useful? These and other questions are key to understanding and ultimately solving the replication crisis that the social and biomedical sciences are currently facing. As a consequence, various philosophers of science have recently engaged with these questions. In this talk, I propose an alternative to existing accounts of replication, in particular those by Machery (2020), Nosek and Errington (2020), and Fletcher (2021). I argue that these accounts either go too far, such that nearly every study is a replication, or not far enough, such that studies we would want to count as replications do not. I propose a deflationary account of replication, replacing the label 'replication' with specific elaboration of the function and epistemic outcomes of experiments. This removes confusion surrounding the multifarious concept of replication while leaving space for experiments to be specifically

concerned with, for example, validity, generalisability, reliability, or error correction.

When "Replicability" Is More Than Just "Reliability": The Hubble Constant Controversy

C. D. McCoy, Yonsei University
Vera Matarese, University of Perugia

We argue that the epistemic functions of replication in science are best understood by their role in assessing kinds of experimental error. Direct replications serve to assess the reliability of an experiment through its precision; conceptual replications serve to assess the validity of an experiment through its accuracy. To illustrate the aptness of this view, we examine the Hubble constant controversy in astronomy, showing how astronomers have responded to the concordances and discordances in their results by carrying out the different kinds of replication that we identify, with the aim of establishing a precise, accurate value for the Hubble constant.

Towards Epistemically Responsible 'Fact-Checking' of Scientific Claims

Dunja Šešelja, Ruhr University Bochum (RUB)
Will Fleisher, Georgetown University
Daniel C. Friedman, Stanford University

To combat the spread of disinformation, online media has introduced the practice of 'fact-checking'. While its application to political claims has been the subject of scholarly research, fact-checking of scientific claims has received comparatively less attention. Yet, applied to the frontier scientific research, fact-checking can be especially challenging. For one thing, claims at the frontier of science are rarely fully established as facts. Moreover, whether a scientific claim is factual cannot always be easily 'checked'. This is because ongoing inquiry, often pervaded by scientific disagreements and controversies, is typically characterized by a high degree of uncertainty. This raises the question: how can we evaluate scientific claims concerning ongoing inquiry in an epistemically responsible way? In this talk we argue that assessing whether a scientific claim is adequately justified requires not only sensitivity to the evidence in favor of that claim, but also sensitivity to the field of research that has produced the claim. We suggest that this requires sensitivity to two kinds of reasons often overlooked in fact-checking discussions: higher-order evidence and inquisitive reasons.

Scientific Explanation and Understanding (Classroom 1)

<u>Descriptive Shortcomings of Models of Scientific Explanation: A Case Study of Explanations of Seismic Phenomena</u>

Hernán Bobadilla, Politecnico di Milano, Department of Mathematics

Models of scientific explanation (MSEs) are commonly used as tools for describing scientific explanatory practices. As explanatory pluralists submit, a plurality of MSEs is needed to describe explanatory practices across disciplines. However, it is contentious whether MSEs should be adopted as readymade tools to accurately describe explanatory practices in general. The aim of this paper is to display the shortcomings of MSEs as tools for describing single explanatory practices and to introduce an alternative tool that overcomes them. I conduct a case study based on Olami et al. (1992)'s research on seismic phenomena. This case shows two shortcomings of MSEs as descriptive tools, viz. the issues of "overlaps" and "integration". To overcome these shortcomings, I introduce the notion of "explanatory commitments", which are accepted guidelines that shape decisions in explanatory enterprises. Explanatory commitments are deployed in bundles, some of which correspond to traditional MSEs. However, some explanatory practices deploy bundles that fall at the intersection or union of traditional MSEs, preventing accurate description based on a single one of them.

<u>Exploring The Complexity of Past Events: A Journey Through Catastrophes and Gradual Changes</u>

Drago Đurić, Faculty of Philosophy University of Belgrade
Petar Nurkić, Institute for Philosophy, Faculty of Philosophy University of Belgrade

Explaining the history of a geological (or any other) entity involves identifying the past events that influenced its current state. The present state contains empirical evidence of past events. The Cuvier-Lyell debate is an example of a recurring geological explanatory pattern throughout history. While Cuvier considered both catastrophic events and gradual changes in the earth's history, Lyell focused only on gradualism, suggesting that gradual changes have played the primary role in shaping the present state of the earth. Theophrastus does not address the causes of the mixing of land and water, but his hypothesis explains the appearance of fossils deep in the land by considering the role of both gradual erosion and catastrophic events in the creation of elevations. Xenophanes' theory that fossils of sea creatures deep in the land indicate catastrophic events is also concerned with past events.

These examples will help us to focus on an adequate understanding of the past events that have shaped the present state of the entity under consideration, whether catastrophic or gradual. Our paper aims to demonstrate that contemporary life sciences are more familiar than it seems. History is abundant with curious and ingenious theories about the origins of life, which can be useful even today. We just need to dig deeper (no pun intended).

Plausible Storylines of Extreme Weather Events

Tero Ijäs, University of Helsinki

This paper explores the extreme weather attribution debate in climate science and analyzes the notion of plausibility use in the newly proposed "Storylines" approach. Storylines is a qualitative case study-based approach that has been presented as an alternative or complementary to the conventional probabilistic risk-based approach of extreme event attribution. Storylines proponents argue that their approach can overcome many limitations of risk-based approach and provide a better basis for communication climate change to public and decision-makers. This paper explores the concept of physical plausibility, and how it used in the assessment different climate scenarios and choosing the appropriate response. It will distinguish between different criteria that can be used to determine the plausibility of a given scenario and their respective trade-offs. Finally, this question on scenario plausibility is connected to a wider discussion on the challenges in modelling of possibilities.

Examining The Role of Scientific Understanding In Application-Driven Research

Basel Myhub, University Bielefeld

In this paper, I argue that scientific understanding, or for short understanding, should not be regarded as the prime aim of scientific research in all research areas. Hence, the scientific merit of research should not be always judged against the degree of understanding of the subject matter the research generates. This is particularly the case in application-driven research (AdR), where the role of understanding is instrumental to the goal of solving the practical problem in question. Understanding in AdR serves specific roles such as helping (re-)define the problem, as a tool for discovery or development, or as a reliability-check tool.

Science dynamics (Classroom 4)

The Dynamics of Ignorance In Science

Paul Hoyningen-Huene, Leibniz Universität Hannover

I shall first present a detailed taxonomy of kinds of ignorance, based on five distinctions about kinds of ignorance. The idea of a dynamics of ignorance is that a scientific field not only moves, in the best case, from ignorance to knowledge, but also between different kinds of ignorance. To prepare a case study of the dynamics of ignorance, I shall then present a rough sketch of the different kinds of infectious diseases and the historical development of our present knowledge about them. The latter can then be reread as a case study in the dynamics of ignorance: how different kinds of ignorance emerged, transformed into other kinds of ignorance, or disappeared. From this case study, a tentative sketch of a general dynamics of ignorance in science can be derived.

A Functional-Externalist and Perspectivalist Account of Scientific Progress

Frank Hernández, Central European University

Scientific progress is a widely acknowledged phenomenon in the history of science. However, the assessment of whether and when it happens remains a subject of controversy. In this thesis, I address the problem of assessing scientific progress and propose an account that elucidates its nature and implications. I examine contemporary approaches to progress, including what are known as the semantic, epistemic, functional-internalist or problem-solving, and noetic approaches. Building upon these discussions, I introduce a novel functional-externalist and perspectival account of progress. According to this account, scientific progress is characterized by the minimization of "success miracles," which are unlikely, unreliably supported claims and ad hoc postulates that are necessary to justify the formulation of a theory in observance of the empirical evidence available to a scientific community at a given time. By addressing the problem of progress, this thesis aims to contribute to a deeper understanding of scientific advancement and its evaluation.

Non-Cumulativity Without Incommensurability? On A Purported Kuhnian Revolution In Chemistry

William Goodwin, University of South Florida

In a series of recent papers, Wray and Scerri have engaged in a dispute about whether the transition from atomic weight to atomic number as the basis for organizing the periodic table should be regarded as a Kuhnian revolution. Because of their agreement about the basic history of this transition in chemistry, focus on Scerri and Wray's disagreement can bring to the fore issues not only about how to interpret and evaluate Kuhn, but also about the philosophical point of trying to 'see' episodes from the history of science through a Kuhnian lens. Instead of the accuracy or plausibility of a particular Kuhnian account of a historical episode, what is at stake in Wray and Scerri's dispute is something more like the overall adequacy or philosophical usefulness of Kuhn's analytic machinery as applied to this particular episode from the history of chemistry. By focussing on common ground between Wray and Scerri, this paper tries maximize the philosophical usefulness applying a Kuhnian lens to this historical episode.

On Whats and Thats In What-That and That-What Discoveries?

Radin Dardashti, University of Wuppertal

When do scientific discoveries occur? To answer this question, Thomas S. Kuhn (1962, 1977) introduced a distinction between that-what and what-that discoveries. He distinguishes between discovering that something exists and discovering what that something is. It may be that scientists already know what they are looking for and only need to discover that it exists (the what-that discovery). On the other hand, one may discover that something exists without having any specific knowledge of what that something is, and only later find out what it is (the that-what-discovery). First, I will argue that any what-part of a scientific discovery needs to be explained gradually rather than categorically. Second, it will be argued that any that-discovery must already presuppose some degree of what-discovery. This systematic argument will be complemented by an example from modern particle physics, namely the discovery of the Higgs particle. Finally, we will draw on the role of the element of surprise and the problem-generating power of a scientific discovery to understand the pragmatic role of scientific discoveries.

Experimentation and Measurement (Main hall)

The Epistemic Power of Proxies – Perspectives From Experimental Life Science

Stephan Guttinger, University of Exeter
Alan Love, University of Minnesota

Scientific research often relies on measuring proxies: traces that reflect secondary effects or remnants of the actual phenomenon of interest. Such indirect measures are used because the objects or processes under scrutiny lie in the past or cannot be captured with existing measurement techniques (in practice or in principle). Proxies are often seen as a necessary evil: if researchers could directly measure their target, they would. We disagree and develop a more positive picture of proxies, claiming they are not just a fix to cover a lack of access, but a generative feature of scientific research. Analysing contemporary functional genomics, we show that researchers use a dynamic toolkit of proxies in creative ways, even when more direct measures are available. We argue that proxies are used to generate novel insights and new research questions, and that this alternative perspective on proxies augments philosophical discussions of measurement in the sciences.

Exploratory Experimentation: A New Epistemological Approach

Pierre-Hugues Beauchemin, Tufts University
Kent Staley, Saint Louis University

We employ a pragmatic model of inquiry to distinguish the epistemological character of exploratory experimentation. We show how considerations of epistemic risk inform the conception of an inquiry's objectives and strategies to meet those objectives. Exploratory experimentation is not a distinct kind of experiment involving special procedures, but a context calling for a distinct evaluation of epistemic risks and an adjustment of tasks, resources, and aims reflecting that evaluation, implemented in a manner sustainable under critical examination. To demonstrate the usefulness of our approach, we apply it to searches for new physics at the Large Hadron Collider that are not focused on testing specific Beyond Standard Model predictions. These searches explore by emphasizing the goal of not-missing-anything-that-might-be-new over not-being-wrong-about-a-specific-new-thing. Our approach provides a model for establishing the epistemological significance of details of experimental practice. 1. General Philosophy of Science

Philosophy of biology: Evolution (Josif Pancic Hall)

What You Can do For Evolutionary Developmental Linguistics

William Bausman, University of Zurich
Marcel Weber, University of Geneva

This paper is an exhortation to explicitly reckon with an Evolutionary Developmental (Evo-Devo) perspective in linguistic evolution. While the Evo-Devo perspective has become an integral part of evolutionary biology , all evolutionary discussions of the change of languages over space and time are held purely in Neo-Darwinian terms. In this paper we show through case studies how evo-devo concepts could be extended to linguistic evolution and how the evo-devo perspective could advance linguistic research. The Neo-Darwinian perspective considers natural selection and drift as the operative causes of population change, whereas the Evo-Devo perspective considers in addition the role that developmental constraints play in the production of variants in a population. We urge the powerful but limited Neo-Darwinian perspective to be supplemented by the Evo-Devo perspective, as it is in biology and cultural evolution. Doing so will open new paths for research and new ways of organizing knowledge.

The Restructuration of Sociomaterial Assemblies: An Evo-Devo Approach To Musical Change

Luis Alejandro Villanueva, Konrad Lorenz Institute for Evolution and Cognition Research
Cristina Villegas, Universidade de Lisboa

Cultural evolution studies have recently advocated for overcoming the informationist framework that prevailed for decades by introducing aspects of material culture and embodied cognition. This has enhanced analogies with new fields of evolutionary biology that go beyond classical population genetics, especially evolutionary developmental biology (evo-devo). However, evo-devo models of cultural evolution are still underdeveloped. In this talk, we present an evo-devo model of music change as the result of a restructuration of the reproductive mechanisms of musical traditions. Our model overcomes some of the shortcomings of understanding music as an abstract capacity based on the mental processing of acoustic information.

Physical time (Music Gallery)

A Dynamical Perspective On The Arrow of Time

Kian Salimkhani, University of Cologne

It is standardly believed that the generally time-reversal symmetric fundamental laws of physics themselves cannot explain the apparent directionality of time. In particular, it is believed that CP violation is of no help. This paper intends to push back against a quick dismissal of CP violation as a potential source for the arrow of time and argues that it should be taken more seriously for conceptualising time in physics. This is based on the fact that CP violation is a fundamental feature of the Standard Model of Particle Physics that has large-scale explanatory import regarding the matter–antimatter asymmetry of the universe. I investigate how CP violation may help to explain the directionality of time. In particular, I argue that accounts à la Maudlin that posit an intrinsic fundamental direction of time are not convincing and instead propose to utilise recent results from work on the dynamical approach to relativity theory.

Temporal Nonlocality From Indefinite Causal Orders

Laurie Letertre, Warsaw University of Technology

Previous works explored the possibility of a genuinely temporal counterpart to Bell nonlocality, one that would refer to the presence of non-classical correlations between timelike-separated events. This paper argues that famous existing proposals do not properly target an adequate notion of nonlocality along the temporal dimension. It is proposed to focus instead on a more recent definition of temporal nonlocality provided by [Adlam, E. (2018). "Spooky action at a temporal distance." Entropy 20(1), p.41]. This paper explores to what extent causal nonseparability is a necessary ingredient to Adlam's temporal nonlocality, and can therefore be used to test that principle. It is then explained how indefinite causal orders allow testing Adlam's temporal nonlocality, but also standard Bell nonlocality and noncausality of processes. This allows clarifying the relation between these notions. Finally, it is argued that, while the test of temporal nonlocality remains, in general, model-dependent due to necessary relativistic effects involved in the corresponding experimental setup, an objective test of temporal nonlocality can still be obtained in principle.

AI, machine learning and big data in the life sciences: AlphaFold (Milan Grol Hall)

Has Alphafold Solved The Protein Folding Problem?

Gregor Greslehner, University of Vienna

A widely celebrated breakthrough in protein structure prediction was achieved with the performance of AlphaFold, a machine-learning artificial intelligence approach that yields impressive prediction results from amino acid sequences. From a theoretical perspective, does this mean getting closer to – or even achieving – the solution of the protein folding problem? By asking this question and analyzing what it would mean and entail to actually solve the protein folding problem, I argue that AlphaFold has not solved this fundamental problem. Doing so would require more than just predictive success, which still comes with some drawbacks and caveats. Solving the protein folding problem should also provide insight into the mechanism of the folding process, the chemical and physical principles at work, and other theoretical components of understanding that AlphaFold cannot provide. Despite being a powerful tool for prediction, modeling, analysis and developing applications, the theoretical challenges of the protein folding remain.

The Incomplete Janus Role of Deep Learning In Structural Biology

Luis Lopez, Leibniz Universität Hannover

In this paper, I examine the role of deep learning in structural biology using the case of AlphaFold2 and its (potential) applications in protein folding research as an example. I argue that deep learning has both a theoretical capacity and an instrumental role in structural biology, which I refer to as the "Janus role of deep learning." However, I also argue that both of these roles are incomplete, with AlphaFold2's theoretical capacity limited by the opacity and complexity of its neural networks and its instrumental role lacking the epistemic superiority of actual measurement instruments.

Sustainability and Resilience (Library)

Resilience and The Shift of Paradigm In Ecology: A New Name For An Old Concept Or A Different Explanatory Tool?

Lara Barbara

In the shift from the balance of nature to the flux of nature paradigm, the concept of resilience has gained great traction in ecology. While it has been suggested that the concept of resilience does not imply a genuine departure from the balance of nature paradigm, I shall argue against this stance. To do so, I first show that the balance of nature paradigm and the related conception of a single-state equilibrium relies on what Eliot Sober has named the "Natural State Model (NSM)", suggesting that it has instead been dismissed in the flux of nature paradigm. I then focus on resilience as the main explanatory concept of the flux paradigm. After distinguishing between engineering and ecological resilience, I argue that the former is close to the concept of balance or stability, but the latter is not. Finally, I claim that ecological resilience is inconsistent with the NSM and hence it is not part of the balance of nature paradigm but rather a genuinely new explanatory tool. Relevant sector: 3. Philosophy of the Life Sciences

The Crisis In Sustainability Research: Implications For Research Practice, Organization of Science, and Suggestions How To Improve The Field

Milutin Stojanovic, University of Helsinki, Practical philosophy dpt.

Recent abundant evidence for a crisis in the quality of modern science and published research – mostly known as the replicability crisis –, is severely undermining the credibility of many disciplines, the used scientific methods and the institutional arrangements. This puts sustainability research, which builds on other disciplines through interdisciplinary modes of knowledge production, in a precarious position. I will highlight the most worrying evidence of the crisis in quality of published research, focusing on the fields similar to sustainability research in the relevant features, notably in urgency, high stakes, and the systemic character of the investigated problems. My point is that SS research should take seriously and draw lessons from these failures to uphold the standards of quality of research, and that we need a more explicit and systematic discussion of the standards of quality in SS.

Instigating this discussion, I will identify some basic quality standards for SS and focus on certain, arguably widespread, pitfalls in sustainability research, thereby suggesting how we can improve the field. In particular, I will discuss

two types of dubious means and of dubious ends in sustainability research. Namely, how non-systemic methodology, as well as the institutional design, can undermine the factual correctness (including accuracy, validity and reliability) of the results. And secondly, how lack of systematic and explicit value deliberation can hamper both the generalizability (and transferability) of the evidence and, importantly, the social usefulness of the research results. By engaging with the issue regarding the standards of quality in SS, I hope to demonstrate the need to jointly reflect on the most fundamental normative questions about science, such as "Why trust science?" and "What is the purpose of the institution?", in the context of sustainability research.

Pluralism and Interdisciplinarity (Classroom 2)

<u>Anthropocene, Planetary Boundaries and Tipping Points: Interdisciplinarity and Values In Earth System Science</u>

Vincent Lam, University of Bern
Yannick Rousselot

Earth system science and modelling have the ambition "to build a unified understanding of the Earth", which includes all the relevant human and social processes interacting with the physical components of the Earth system (atmosphere, cryosphere, land, ocean, lithosphere). This unified understanding involves many different disciplines both from the natural and social sciences, and fundamentally requires some level of interdisciplinarity. We argue that the interdisciplinary relations between the natural and social science domains in Earth system science can be characterized as a form of scientific imperialism. We show that this imperialistic nature of the interdisciplinary relations in Earth system science may pose new challenges for managing non-epistemic values in this context. We argue for more balanced interdisciplinary relationships, in particular leading to a more nuanced articulation of the Earth system science concepts of Anthropocene, planetary boundaries and tipping points.

<u>Costs of Pluralism</u>

Teemu Lari, University of Helsinki
Uskali Mäki, University of Helsinki

Philosophers have argued that various forms of cognitive plurality and diversity in science, such as plurality of theories and approaches, can lead to epistemic benefits: scientific knowledge may be improved and extended. However, in practice cognitive plurality and diversity come with non-epistemic costs that may have epistemic consequences. These costs have attracted all too little attention. We aim to fill this gap in the literature. Drawing on theoretical and empirical research in the fields of transaction cost economics and organizational sociology of science, we map the various costs that relate to 1) production and maintenance of plurality and diversity, 2) activities needed to process plurality and diversity into epistemic benefits, and 3) activities countering potential unwanted side-effects of plurality and diversity. Finally, we examine whether the institutional features of various disciplines may explain the actual degree of plurality and diversity in each discipline.

Modal explanation (Classroom 1)

<u>Elucidating and Embedding: Two Functions of How-Possibly Explanations</u>

Franziska Reinhard, University of Vienna

Philosophers of science have variously tried to characterise how-possibly explanations (HPEs) and distinguish them from how-actually explanations (HAEs). However, there is disagreement over whether HPEs are independent from, or continuous with, HAEs. I argue that existing contribution to this debate have failed to pay attention to the different, but complementary, functions possibilities play in scientific explanations. To bring these functions to the fore, I introduce a distinction between what I will call elucidating and embedding HPEs. While elucidating HPEs specify and demonstrate possible processes for a given research target, embedding HPEs demonstrate how the research targets fits into a space of suitably constrained possibilities. I specify both functions of HPE with reference to two case studies from origins-of-life research. The distinction between elucidating and embedding HPEs, I argue, provides a new perspective on how to resolve the debate over the nature of HPEs.

<u>Ontological and Dynamical Nonseparability: Responding To Bell's Theorem and The Measurement Problem</u>

Nick Ormrod, University of Oxford

It has been argued by Henson that nonseparability cannot play an important role in responding to Bell's theorem, since it is possible to derive Bell inequalities from a set of assumptions that does not imply separability. Similarly, recent formalizations of the measurement problem as a no-go theorem for the absoluteness of observed events show that a contradiction can be derived from a set of assumptions that don't obviously have anything to do with nonseparability, so one could make a similar argument that nonseparability will not help us respond to the measurement problem. I'll argue that both of these arguments are flawed by introducing a new version of Bell's theorem and a no-go theorem for the measurement problem. In both cases, a contradiction is derived from various separability assumptions together with another set of assumptions that might reasonably be upheld even in the face of existing no-go results. By modus tollens, we face the problem of rejecting at least one assumption in each case: one way to solve it is to embrace nonseparability. The results make tenable the view that we might develop a theory more satisfactory than the current quantum theory precisely by leaning further into the idea of nonseparability.

Shape dynamics in physics (Classroom 4)

<u>The Two Approaches of Shape Dynamics</u>

Paula Reichert, LMU München

Based on the relationalist ideas of Leibniz and Mach, shape dynamics provides an alternative to standard gravitational theory, be it Newtonian or Einsteinian gravity. What is little known: the terminus "shape dynamics" refers not to one, but rather to two different theories. While one has been developed bottom-up from the metaphysical principle of relationalism, the other has been constructed top-down from a well-confirmed physical theory following the principle of ontological sparseness. While one is merely about angles, i.e. shapes, the other includes relative scale as a remnant of absolute space. Where one's validity remains to be shown, the other is in accord with observation by construction. Still, both employ a principle of ontological sparseness. This leads to a minimalist versus minimal ontology of spatiotemporal relations in the two cases.

<u>Pure Shape Dynamics, Self-Subsisting Structures, and The Nature of Time</u>

Antonio Vassallo, Warsaw University of Technology
Pedro Naranjo, Warsaw University of Technology and University of Warsaw

Pure Shape Dynamics (PSD) is a new framework for constructing relational theories of motion. It differs from standard Shape Dynamics in that it supplies a description of the evolution of a physical system solely in terms of the geometric properties of an unparametrized curve defined in the relational configuration space of the theory (called shape space). The aim of the talk is twofold. First, a self-contained presentation of the technical machinery of PSD and its physical significance will be provided. Second, the possible metaphysical implications of this framework for the metaphysics of time will be considered. The starting point of the metaphysical analysis will be an interpretation of shapes in moderate ontic structuralist terms, which gives rise to the notion of self-subsisting structure. A Newtonian-particle toy model will be introduced and discussed as a concrete example.

Symposium: Explainable AI in Scientific Research (Main hall)

Emanuele Ratti, University of Bristol
Alessandro Facchini, IDSIA USI-SUPSI
Alberto Termine, University of Milan
Philippe Verreault-Julien, Eindhoven University of Technology
Carlos Zednik, Eindhoven University of Technology
Lena Kästner, University of Bayreuth
Barnaby Crook, University of Bayreuth
Hajo Greif, Warsaw University of Technology

Explainable AI in Scientific Research Explainable Artificial Intelligence (XAI) aims to develop methods and techniques that generate humanly-comprehensible explanations for the notoriously opaque behaviours and outcomes of machine learning (ML) models. Recently, XAI has attracted philosophical attention. While much has been said about opacity and explainability more generally, relatively little has been said about the specific role XAI plays in scientific research practice. Which roles can XAI play in scientific inquiry both in terms of methodology and theory formation? What is the relation between scientific explanations (or models) and explanations (or models) delivered by XAI tools? These questions are of fundamental relevance for contemporary philosophy of science given (i) the impact of ML technologies on scientific practice and (ii) the central yet underspecified role of explanations in XAI. This symposium aims to address them and shed light on the multi-faceted relations between XAI and scientific practice. 6. Philosophy of Technology and Philosophy of Interdisciplinary Research 7. Philosophy of Science in Practice

Philosophy of biology: Evolution (Josif Pancic Hall)

On Two Kinds of Genetic Drift

Ciprian Jeler, Alexandru Ioan Cuza University of Iaşi

Philosophers have been debating about whether genetic drift is a distinct process from that of natural selection. Against both camps engaged in this dispute, I argue that, by taking as a criterion the sources of drift, we may distinguish between two theoretically possible kinds of drift, only one of which consists in a separate process from that of natural selection. I thus distinguish between circumstantial-drift (which requires that differences in a circumstantial trait cause differences in the reproductive output of biological entities) and probabilistic-drift (which requires no other process than an intrinsically probabilistic causal relation between a non-circumstantial trait and reproductive output, i.e. requires only the causal relation on which the work of natural selection could also depend). I also show that the factors that determine the magnitude of the ability to drift of a population are not exactly the same for the two types of drift.

Biological Functions As Selected Dispositions

Fabian Hundertmark, Bielefeld University

I will argue that theories that construe proper functions as certain actual dispositions of a trait, as well as theories that construe proper functions as selected effects, fail to satisfy central adequacy conditions. (1) A theory of proper functions must provide a plausible account of dysfunction. While actual disposition theories, by definition, cannot do this, selected effect theories are not fully satisfactory either. They cannot distinguish between dysfunctional traits and functional traits with a low disposition to perform their function. (2) A theory of proper functions must account for productive functions. These are functions for engaging in novel activities in response to novel stimuli. I will show that selected effects theories have trouble accounting for novelty. In the positive part of my paper, I will show that the best way to mitigate the disadvantages of both types of theories is to combine them. According to this approach, proper functions are selected dispositions.

Can The California School Avoid Evolutionary Psychology?

Haggeo Cadenas, UC-San Diego

I propose a distinctive reading of the California school (i.e., the cultural evolutionary views of Boyd, Richerson, Henrich and their collaborators) and

a novel mechanism of cultural transmission. One upshot is that the California school can avoid commitment to evolutionary psychology, and thus be seen as a more versatile and fruitful framework. In §1, I argue that at the center of Boyd and Richerson's framework is the idea that information acquisition costs matter for understanding culture, and I argue that this idea does not commit them to evolutionary psychology. Next, while Henrich writes that the logic of evolution commits one to evolutionary psychology, I show this is mistaken. This is because the logic only commits us to the claim that adaptations for cultural learning evolved, but said adaptations could be either genetically inherited or culturally inherited. In §2, I develop a mechanism (i.e., reinforcement) as an account of norm transmission. I show that this mechanism can meet the low-cost criteria of cultural inheritance; that is, it fits into the framework of the California school, and it avoids evolutionary psychology.

Trait Fitness As Fundamental: Against Long-Term Fitness For Token Organisms

Marshall Abrams, University of Alabama at Birmingham

In sexually reproducing species, probabilities of various future descendants of an organism depend on probabilities that other organisms have descendants at future times. I argue that this fact undermines attempts to define trait fitness as an average of long-term fitnesses of token organisms. Similar arguments can be applied to species without sexual reproduction. This problem with token organism fitness results from treating token organisms as trials of chance setups (analogous to coin tosses). A better way to think about the situation is to treat an entire population along with its environment as a chance setup, with trait fitnesses defined in terms of probabilities of various possible trait realizations (by organisms) in a single, complex trial. Trait fitness would thus be understood as fundamentally relative to the probabilistic dynamics of an entire population and its environment. I argue that this view is supported by the character of empirical research in evolutionary biology.

Symposium: Overcoming the Fundational-Pracmatic Divide. Philosophical Lessons from Early Quantum Field Theory (Music Gallery)

<u>Overcoming The Foundational-Pragmatic Divide: Philosophical Lessons From Early Quantum Field Theory</u>

James Fraser, University of Wuppertal
Michael Stöltzner, University of South Carolina
Alexander S. Blum
Kasia Rejzner
Michael Miller

Philosophers of physics have often sharply distinguished the mathematically rigorous, foundationally orientated, axiomatic formulations of quantum field theory from the messy yet predictive formulations employed in mainstream particle physics. This symposium challenges this simple picture by highlighting the historical interplay between mathematical and phenomenological approaches to the theory. Emphasis is put on the existence of rigorous perturbative (and therefore predictive) approaches as well as non-rigorous foundational projects, which lie outside the scope of a naive foundational-pragmatic dichotomy. The symposium reflects on the implications of moving to a more complex and pluralistic view of quantum field theory, both for local debates in the philosophy of physics, and more general questions about mathematical rigor, theoretical progress, and axiomatic reconstruction projects.

Symposium: Climate storylines (Milan Grol Hall)

Climate Storylines: Perspectives At The Intersection of Philosophy of
Science and Climate Science

> Vincent Lam, University of Bern
> Marina Baldissera Pacchetti, University of Leeds and Barcelona
> Supercomputing Center
> Mathias Frisch, Leibniz University Hannover
> Laura Garcia Portela, Karlsruhe Institute of Technology
> Julie Jebeile, CNRS
> Joe Roussos, Institute for Futures Studies
> Theodore G. Shepherd, University of Reading

The notion of physical climate storyline has recently emerged as an important
conceptual tool in various domains of climate science, such as extreme event
attribution, assessing low likelihood high impact outcomes, and constructing
and communicating regional climate change information. This symposium
aims to show that these physical storylines in climate science fruitfully
connect with a number of central epistemological issues in philosophy of
science related to causal reasoning, narrative explanations, the
dynamics/thermodynamics distinction, the 'modelling paradigm', and the
role of expert judgement and non-epistemic values, among others. Seriously
addressing these issues is crucial to the production of climate science
knowledge that can support fair and just decision-making in the face of deep
uncertainties. To this aim, this interdisciplinary symposium brings together
six philosophers of science with different backgrounds as well as one climate
scientist. Topic Areas: General philosophy of science, Philosophy of the
physical sciences

General philosophy of science: scientific inference (formal aspects) (Library)

<u>Evaluating Boolean Relationships In Configurational Comparative Methods</u>

Luna De Souter, University of Bergen

Configurational Comparative Methods (CCMs) aim to learn causal structures from datasets by exploiting Boolean sufficiency and necessity relationships. One important challenge for these methods is that such Boolean relationships are often not satisfied in real-life datasets, as these datasets usually contain noise. Hence, CCMs infer models that only approximately fit the data, introducing a risk of inferring incorrect or incomplete models, especially when data is also fragmented. To minimize this risk as much as possible, evaluation measures for sufficiency and necessity should capture all relevant evidence. Based on the rule of contraposition, this paper points out that the standard evaluation measures in CCMs, consistency and coverage, neglect certain evidence for these Boolean relationships. Correspondingly, two new evaluation measures, contrapositive consistency and contrapositive coverage, are introduced to the CCM context as additions to consistency and coverage.

<u>How Much do Novel Predictions Confirm? A Bayesian Analysis</u>

Rafael Fuchs, LMU Munich
Stephan Hartmann, LMU Munich

This paper develops a Bayesian model to answer the question whether predictions of novel phenomena can be expected to generate high degrees of confirmation. Since the postulation of novel phenomena in the context of new theories involves language change (i.e. the introduction of new concepts, like gravitational waves), the question of how much novel predictions can confirm used to be difficult to answer for standard Bayesianism. However, the principle of maximum entropy provides us with a rational procedure for extending a given probability distribution over a language that includes new propositions. Our results show that maximising the entropy of a new probability distribution (after novel phenomena were postulated) generally has a moderating effect on confirmation. Hence, the only way to obtain high degrees of confirmation by novel predictions is via very specific sets of conditions. It turns out that these requirements are generally hard to satisfy, and hence, excess confirmation via novel predictions might be less common than previously expected.

Discordant Evidence, Evidential Reasoning, and Scientific Inference

Sofia Blanco Sequeiros, University of Helsinki

In this paper, I analyze the concept of discordant scientific evidence and its epistemic and methodological significance for scientific inference and reasoning. While the need for and advantages of concordant scientific evidence – evidence that stands clearly in favor or against of a hypothesis or claim – are fairly intuitive, the question of discordant evidence remains understudied. The main thesis of the paper is that discordance in scientific evidence is a result of scientists interpreting the evidential relations, conceptualized here as counterfactual dependencies between data and phenomena (cf. Woodward 2000), in conflicting ways. I illuminate my arguments with case examples from the social sciences, but the main argument is meant to apply to scientific inference and reasoning more generally.

Extremizing: Social Learning Meets Meta-Analysis

Jan-Willem Romeijn, University of Groningen
Simon Huttegger, UC Irvine

Our paper is concerned with methods of aggregating statistical results. The direct motivation is a phenomenon known as "extremizing": in some cases it seems rational to bring the aggregated opinion beyond all the individual expert opinions, i.e., $q^* > q_i$ for all experts i. This phenomenon can be connected to the "risky shift" observed in social psychology, where agents irrationally amplify each others' opinions. But it also naturally relates to successful forecasting methods, as discussed in Tetlock's popular science book "Superforecasters", and to corrections on the biases described in Kahneman's prospect theory. We present three Bayesian models of increasing complexity in which extremizing can be explained and motivated. They offer insights by which we can connect themes from inductive logic, social learning, and statistical meta-analysis.

Philosophy of the Cognitive Sciences (Classroom 2)

Neural Representations Unobserved

Marco Facchin, IUSS PAVIA

Contemporary cognitive neuroscience is said to reveal to us the neural vehicles of our cognitive representations. Here, I will argue that this is not the case. My argument will be fairly linear. First, I will introduce two paradigmatic "neural vehicles" that have allegedly been discovered by cognitive neuroscience; namely neural maps and activation spaces. Then, I'll sketch a standard philosophical account of representational vehicles which is standardly accepted in philosophy of cognitive neuroscience. Having done so, I will show that, for different reasons, neither neural maps nor activation spaces satisfy that account. Hence, they should not be considered as vehicles of our cognitive representations. I'll conclude by spelling out the implications of my claim for mechanistic explanations in cognitive neuroscience.

How To Understand The Distinction Between Personal and Subpersonal?

Marko Jurjako, University of Rijeka

This paper examines the distinction between personal and subpersonal, which was introduced by Daniel Dennett. Despite its wide use in philosophy and cognitive science, there is still disagreement as to how to understand this distinction. The original distinction was formulated in terms of different levels of explanation. However, some think that the distinction primarily pertains to delineating different kinds of psychological states or processes. Given the latter, the main challenge is to provide a criterion according to which different kind of states, abilities, and processes can count as personal, as opposed to subpersonal. To advance the debate, I propose three desiderata that a satisfactory account of the distinction should satisfy, including extensional adequacy, explanatory adequacy, and neutrality requirement. Based on these desiderata, I propose a levels of organization account that can satisfy them better than alternative accounts. 4. Philosophy of the Cognitive Sciences

Neural Representations Are Not Natural Representations: The Case From Content Multiplicity

Ori Hacohen, Hebrew University of Jerusalem
Gal Vishne, Hebrew University of Jerusalem

Current neuroscientific explanations regularly refer to internal "neural representations" in explaining cognitive phenomena. Many philosophers maintain that these are natural and objective representational entities. We argue against this naturalistic view and aim to show that neural representations are dependent on subjective explanatory considerations. To that end, we first show that neuroscientists often regard the same neural state as a representation of multiple distinct contents. We claim that such content multiplicity is a characteristic feature of representations in neuroscience, which is becoming increasingly common. We then claim that the only way to account for content multiplicity is to accept that explanatory considerations have a role in defining the contents of neural representations. The main reason for this is that representational content must be determinate, and naturalistic theories cannot pick out one determinate content from a multitude of options.

Are Groups Capable of Cognition? Symmetry, Emergentism and Multiple Realizability

Alejandro Gordillo Garcia, KU Leuven

Group cognition is a phenomenon in need of rigorous philosophical scrutiny, especially in a time when multiple formal approaches are being applied to study it scientifically. The goal of this research paper is twofold: firstly, to defend the coherency and tenability of a philosophical account of group cognition (based on the multiple realizability thesis) against philosophers who call it into question; and secondly, to provide some key analytical considerations suggesting that the inference made by biologists that groups display cognitive capacities is grounded on an unsound use of deductive reasoning. Put differently, I argue that the arguments advanced so far for the existence of group-level cognition by scientists need to be reconsidered.

Laws and Principles (Classroom 1)

<u>Balance In The Best Systems Account of Laws of Nature</u>

Alfonso García-Lapeña, Universidad Autónoma de Barcelona (UAB), TECNOCOG Research Group

Dorst (2019) distinguishes between two main components in any Best Systems Account (BSA) of laws of nature: the Humean Base (HB) and the Nomic Formula (NF). The former represents the idea of the HM, a characterization of the fundamental ontological structure of the world that contains no modal facts. The latter is an operation, a formula, which gets applied to the HB in order to generate the laws. Recent work on the BSA (Hicks, 2018; Dorst, 2019; Loewer, 2020) has produced different proposals regarding the variables of the NF. However, besides the variables, the NF presents a second component, the balancing function bal(…) itself, which has received little to no attention. Appealing to multi-objective optimization problems (which deal with the same kind of problem faced by the BSA), I will argue that the BSA cannot expect to provide an objective, a priori answer to how the bal(…) function must be defined. This would imply that the BSA can't maintain a realist approach to laws of nature.

<u>Physics of Principles Vs. Physics of Models. On Cassirer's Interpretation of Relativity Theory</u>

Marco Giovanelli, Università degli Studi di Torino

In his Zur Einstein'schen Relativitätstheorie Cassirer presents relativity theory as the last manifestation of the tradition of the 'physics of principles' that, starting from the nineteenth century, has progressively prevailed over that of the 'physics of models.' In particular, according to Cassirer, the relativity principle plays a similar role as the energy principle in previous physics. The paper argues that this comparison represents the core of Cassirer's neo-Kantian interpretation of relativity. Unlike the individual physical laws, these principles do not pretend to provide models of any specific physical system, but they do impose constraints on the law-like statements that describe them. The latter do not qualify as proper laws unless they satisfy such constraints. Cassirer pointed out that before and after Kant, the history of physics presents significant instances in which the search for formal conditions that the laws of nature must satisfy preceded and made possible the direct search for such laws. In his earlier years, Cassirer seems to have regarded principles like the energy principle, the relativity principle, the principle of least action, etc., as a constitutive but provisional form of a priori, imposing specific limitations on the form of the allowable laws of

nature. Only in his later years, by attributing an autonomous status to these statements of principle, did Cassirer attribute a definitive but merely regulative meaning to the a priori. This does not impose specific requirements on natural laws but only a motivation to search for them.

Mechanisms and Principles: Different Approaches To Scientific Generalizations

Yoshinari Yoshida, University of Minnesota
Alan Love, University of Minnesota

Many philosophers have explored the extensive use of non-universal generalizations in different sciences for inductive and explanatory purposes, analyzing properties such as how widely a generalization holds in space and time. A complementary analytical strategy is to examine how different forms of generalizations are associated with different strategies of inquiry, which goes beyond categorizing and taxonomizing generalizations. We concentrate on developmental biology in order to distinguish and characterize two forms of scientific generalizations—mechanisms and principles—that correspond to different investigative aims. Our analysis shows why each kind of generalization is sought in a research context, thereby accounting for how the practices of inquiry are structured. It also diagnoses problematic assumptions in prior discussions about generalizations, such as the presumption that generalizations with wide scope must involve abstraction.

Symposium: Time, causation and metaphysics (Classroom 4)

Time, Causation, and Metaphysics. Discussing Baron and Le Bihan's ``causal Theories of Spacetime''

Niels Linnemann, University of Geneva
Kian Salimkhani, University of Cologne
Annica Vieser, University of Amsterdam
Baptiste Le Bihan, University of Geneva

Recently, Baron and Le Bihan (2023) have proposed a new understanding of causal theories of spacetime --- roughly, the position that the spatiotemporal should be analysed in terms of causation. Unlike traditional causal theories of spacetime, which identify spatiotemporal relations with causal relations (e.g., Reichenbach (1956), Grünbaum (1973)), Baron and Le Bihan argue for an understanding according to which causal relations ground spatiotemporal relations. They dub their account the non-identity theory. Baron and Le Bihan demonstrate one way of spelling out the general idea of the non-identity theory in detail, given a mereological understanding of the grounding relation and an interventionist account of causation.

But is it all that easy? From a general philosophical point of view, two concerns arise in particular: (1) is grounding by absence sensible (and is the non-identity theory tenable, if not)?; and (2) how relevant is such a proposal ontologically, given that it relies on a single research program towards a theory of quantum gravity?

AI, machine learning and big data (Main hall)

Deep Learning: A Hot Interface With Philosophy of Science. Can Ai Master Theory-Based Thinking?

Louis Vervoort, Higher School of Economics
Henry Shevlin, University of Cambridge
Alexey Melnikov, Terra Quantum AG
Alexander Alodjants, ITMO University

We scrutinize publications in automated scientific discovery using deep learning, with the aim of highlighting problems with strong connections to philosophy of science, of physics in particular. We show that core issues of philosophy of science, related, notably, to the nature of scientific theories; the nature of unification; and of causation loom large in scientific deep learning. Therefore advances in deep learning could, and ideally should, have impact on philosophy of science, and vice versa. The scrutinized publications show that surely the most high-end achievement would be to develop AI that can discover and master theories based on data alone. We analyze what are the status, main hurdles and prospects based on state-of-the-art publications. In the last part of this work we present test results we are presently gathering using some of the most advanced 'general purpose' AI, in order to reach a more definite answer to the question of whether AI can master theory-based thinking. These results are expected to be compiled and analyzed by the time of the conference. ++++ Most relevant section: 6. Philosophy of Technology and Philosophy of Interdisciplinary Research.

In Search For An Epistemology For Machine Learning

Juan Duran, TU Delft

This talk analyses transparency and computational reliabilism (CR) as two competitive epistemologies for machine learning (ML). Now, instead of addressing how each approach fosters justification, it discusses in which ways they fail as suitable epistemologies. To this end, this presentation follows a two-fold strategy. First, it shows that transparency is limited in critical, irremediable ways. The core objection is that justification depends on the depth of our insight into the data and the algorithm, thus demanding unrealistic forms of cognitive security. Two arguments are laid out: i) transparency entails cases of algorithmic regress; ii) transparency enables circular justification. Second, two objections against CR are addressed: i) under CR, statistically insignificant but serious errors can undermine the reliability of ML; ii) CR is a reliabilist epistemology, and thus it requires a high frequency of success, which ultimately can be cast as an issue of high

predictive accuracy. Arguments are presented that answer these objections, ultimately favoring CR as a more promising epistemology for ML.

Representational Similarity Analysis Underdetermines Similarity of Object Recognition Mechanisms In Deep Neural Networks and The Brain

Bojana Grujicic, Max Planck School of Cognition; Humboldt-Universität zu Berlin; University College London

Given the impetus of using deep convolutional neural networks to model the mechanism of object recognition, it becomes important to analyse the evidence of their similarity and the kinds of claims about explanatoriness of these models that are justified. I focus on one method of their comparison – representational similarity analysis, and I argue that it underdetermines mechanistic similarity between the models and the brain. The key issue arises due to the fact that models are not made with an explicit hypothesis about population coding in the task, and different similarity measures are used as a part of this framework, whose relevance for the explanandum capacity of object recognition is not assessed. I show that this conclusion of underdetermination holds for two accounts of representational mechanisms one may want to map via representational similarity analysis – one on the level of individual neurons comprising neural populations, and another on the level of neural manifolds.

Philosophy of biology: Plants and Animals (Josif Pancic Hall)

What Is Innovativeness?

Andra Meneganzin, KU Leuven, Institute of Philosophy
Grant Ramsey, KU Leuven, Institute of Philosophy

Behavioral innovativeness—the propensity of an individual, group, or species to innovate—is often invoked as a measurable trait in comparative analyses. Crows and cockatoos are more innovative, it seems, than condors and chickadees. Such assessments seem to imply that we can rank order species in their degree of innovativeness and that innovativeness can be collapsed to a single dimension. This paper challenges the unidimensional approach and defends a multidimensional framing of behavioral innovativeness, such that innovativeness can vary along several independent degrees of freedom. We then analyze innovativeness at various levels of organization and show how innovativeness at higher levels is not a simple function of lower-level innovativeness. Finally, we discuss possible applications of the multidimensional innovativeness space to hominin evolution, highlighting constraints on innovativeness and bridging animal and hominin innovativeness.

Tool Use Beyond Humans

Gianmaria Dani, KU Leuven
Grant Ramsey, KU Leuven

Tool use is widely regarded as a type of object-mediated instrumental action. It has long been considered an indicator of technical intelligence and the investigations of its nature, implications, and distribution across all animal taxa still represent key challenges for biology, ethology, and comparative psychology. However, while there is general agreement on what counts as human tool use, the investigation of tool use behavior in non-human animals is characterized by ambiguities and a lack of coherency. The aim of this paper is to show that neither traditional ethological attempts, nor a recent alternative theory, can provide an unproblematic understanding of tool use. To achieve this aim, we will (1) criticize ethological approaches to tool use behavior, (2) address and challenge tooling (a recent alternative approach to tool use), and (3) highlight alternative avenues for the development of future research.

Plant-Environment "Boundary": A Cognitive Approach

Özlem Yilmaz
Ric Sims

When we think of organisms and their microbiota, the task of distinguishing an organism from its environment is often a challenging one. In these cases, instead of only trying to understand them separately, we also think of their activities collectively. An example of this research method can be seen in efforts to understand whether plants or their microbiota produced a hormone. In this paper, we will examine several examples of plant-plant microbiota research in order to understand how researchers distinguish plants and their environments. We will present the possibility that what is traditionally seen as the plant-environment boundary is not the same as the system responsible for various kinds of goal-directed behaviour – defined by what we call the cognitive boundary. This understanding does not aim to clearly distinguish the individual plant from its environment; rather, it aims to understand the active and dynamic interaction between them.

What Information Processing Is Needed For Plant Cognition?

Nir Fresco, Ben-Gurion University of the Negev
Matteo Colombo, Tilburg University

Contrary to prior assumptions, growing empirical evidence indicates that plants behaviour can exhibit remarkable flexibility and display various cognitive capacities. One key reason for the idea that plants are cognitive is that complex information processing capacities in plants—implemented by "neuro"-physiological structures—enable them to communicate, anticipate, learn, and remember. Adams, a recent critique of plant cognition, claims that plants do not share the necessary common core with other forms of cognition. He argues that whilst plants sense their environment, they do not possess representations of the right format (i.e., Dretskean digital representations), and, thus, they do not cognise. However, because Dretskean digital information processing is constituted by analogue information processing, the latter is the very common core that Adams denies of plants. In this paper, we will argue that his conclusion does not follow from his argument.

Philosophy of physics: Quantum mechanics (Music Gallery)

Quantum Mechanics As An Extension of Newtonian Mechanics

Davide Romano, Centre of Philosophy of the University of Lisbon

There is a long-standing debate concerning the ontology of quantum mechanics. The major interpretations adopted nowadays to formulate a clear ontology of quantum mechanics are Bohmian mechanics, the Everett theory and the GRW theory. However, all these theories are extensions of classical Hamiltonian mechanics, which is generally regarded as an instrumental theory, and so they should not be regarded as a good guide for quantum ontology. Indeed, as Newton's theory provides a clear ontology for the classical world, an ontology for the quantum world should be provided by a natural extension of Newtonian mechanics in the quantum domain. As a matter of fact, this theory already exists in the literature and corresponds to the original Bohm's 1952 theory. Differently from Bohmian mechanics, Bohm's 1952 theory is a second-order theory of particles in motion—as Newton's theory. In particular, I show that Bohm's theory can be regarded as a natural extension of Newtonian mechanics when it is interpreted within the multi-field framework. For this reason, this specific account (Bohm's theory plus multi-field) provides a plausible ontology for the quantum world.

Aristotelian Grounding For Grw's Flash Ontology

Ryan Miller, University of Geneva

The flash ontology for the GRW formulation of quantum mechanics has become popular for maintaining both a primitive ontology and serious Lorentz invariance. Valia Allori's straightforward reading of this ontology suggests that the flashes are fundamental, grounding both the wavefunction and macro-scale ontology, but Tim Maudlin has put pressure on the former and Elizabeth Miller on the latter.

I suggest resolving these difficulties by grounding the flashes in entangled macro-objects (without positing downward causation). This Aristotelian approach is reminiscent of Jonathan Schaffer's priority monism, but the multi-time GRW approach insists that wavefunctions and entanglement are largely (though not exclusively) local affairs. While entanglement can persist non-locally, collapses promote disentanglement and the macro-processes which cause entanglement operate locally, recovering realism about the

special sciences and explaining why we observe a high degree of separability and locality.

Quantum Contextuality, Powers, and The Ontology of Weak Values

Marek Woszczek, Adam Mickiewicz University, Faculty of Philosophy

Contextuality is a fundamental property of quantum systems and a primary problem for ontological theories of causation based on the notion of time-asymmetric quantum dispositions ascribed to individual systems interacting in space. First, we shall clarify how it reflects the fundamental topological nontriviality of quantum histories in time and why it principally manifests in single quantum systems when nonlocal behaviour is absent. Then we shall argue that nontrivial temporal structure cannot be easily reconciled with the concept of intrinsic dispositions or causal properties ascribed to systems at any moment and show how it is deeply connected to the so-called 'anomalous' quantum weak values which are empirically accessible. It will be argued that the latter may be consistently construed as the contextual amplitudes reflecting the non-spatiotemporal, time-symmetric causal powers appropriate for quantum ontology.

Von Neumann, Gleason, Kochen-Specker: Revisiting Three Theorems and Hidden Variables

Pablo Acuña, Pontifical Catholic University of Chile

It is a common view that von Neumann's 'impossibility proof' is an irrelevant result that does not achieve its alleged goal of absolutely ruling out quantum hidden variables. It is also a common view that the Kochen-Specker theorem imposes a contextuality constraint on the ontology of beables in hidden variables theories. I challenge both these views. I show that if the true goal, scope and logical structure of von Neumann's theorem are considered, we see that it never meant to be an absolute impossibility proof, and that it shows that hidden variables theories cannot be Hilbert space theories. This analysis shows that von Neumann's theorem is quite analogous in goal, meaning and scope to Gleason's celebrated result. Furthermore, the official understanding of the Kochen-Specker restriction holds for Hilbert space hidden variables theories, which are ruled out by von Neumann and Gleason, so the constraint that it really imposes on such theories is much weaker than usually thought.

Symposium: Complexity, prediction and understanding in climate Science (Milan Grol Hall)

Gabriel Tarziu, Munich Center for Mathematical Philosophy, Ludwig Maximilian University of Munich
Wendy Parker, Virginia Tech
Charlotte Werndl, University of Salzburg
Margherita Harris, London School of Economics
Matthias Ackermann, Universität Hannover

This symposium focuses on the interplay between complexity, prediction, and understanding in climate science. More precisely, it aims to determine to what extent the characteristics of the climate system (e.g., its complexity and chaotic dynamics), the models used to represent it (the complex computational models), and what we are most interested in when studying it (i.e. accurate predictions) are negatively impacting the goal of understanding it. Our symposium consists of five talks. Two of the talks (the ones by Margherita Harris and Charlotte Werndl) will draw attention to new problems that impact negatively the quest to understand the climate system. The other three talks (the ones by Wendy Parker, Matthias Ackermann, and Gabriel Târziu) concentrate on providing arguments that particular aspects of the climate system or of its scientific study are not incompatible with the goal of understanding.

Reproducibility and Objectivity (Library)

<u>Bias and Reactivity In Qualitative Research</u>

Julie Zahle, University of Bergen

Recently, philosophers of science have begun to pay more attention to the philosophical issues surrounding data collection in science, including the question of what characterizes high-quality data (see, e.g., Canali 2020, Feest 2022, Illari 2014, Leonelli 2017, Zahle 2023). In this paper, I contribute to this emerging trend through an examination of the commonplace view that qualitative data sets tend to be of poor quality because two main threats to their quality, bias and reactivity, are difficult to avert (see, e.g., Johnson et al. 2008). Against this conception, I argue that, because of various characteristics of the practice of qualitative data collection: 1. the threat of bias may, properly conceived, often be warded off 2. reactivity as such is not a threat. Rather, not being clear on reactivity is a threat to data-quality and this threat may often be satisfactorily dealt with too.

<u>The Problem of Trustworthiness In Retrospective Data Validation</u>

Michaela Egli, University of Geneva

Good Clinical Practice guidelines (GCP) are a central reference point for the clinical research community, yet their importance is largely neglected by philosophers of science. To date, philosophical work has mostly focused on the role of methodological properties like randomisation or blinding to explain the reliability of clinical evidence. The growing use of repurposed health data, however, also sheds new light on the epistemic significance of data collection and data verification processes on an operational level. In my paper, I explore to what extent retrospective procedures for data validation can assure the reliability and trustworthiness of repurposed data and contrast them with the epistemic merits of well-entrenched GCP standards. I argue that retrospective measures fail to assure transparency for third parties and that their contextual nature prohibits the adoption of internationally recognized standards that are essential to the trustworthiness of clinical studies. Most relevant section: Philosophy of the life sciences.

<u>Reproducibility In Animal-Based Research In Biomedicine</u>

Simon Lohse, Radboud University

In this talk, I will address reproducibility/replication issues in animal-based research in biomedicine and scrutinise the view that "the causes of

irreproducible results are largely the same across disciplines". I will argue that there are several aspects specific to animal-based research that are relevant to discussions about reproducibility issues but have as of yet not been thoroughly analysed in philosophy of science. After mapping out the received view on the irreproducibility of scientific results in animal-based research, I will discuss two challenges to reproducibility that are specific to animal-based research but have not received much attention in philosophical debates: methodological challenges to standardisation and ethico-epistemic trade-offs in pre-clinical research. This will contribute to a more pluralistic and nuanced picture of local challenges to scientific replication and point to normative implications for animal-based research and its self-governance.

Unifying The Notion of Objectivity

Inkeri Koskinen, University of Helsinki

I compare five recent accounts of objectivity: Koskinen 2020; Zahle 2021; Wilholt 2022; Cartwright, Hardie, Montuschi, Soleiman, and Thresher 2022; and Hoyningen-Huene 2023. I first describe the accounts, in the order of the amount of conceptual heterogeneity they allow. Then I focus on the aims of the accounts: what is it that they are supposed to achieve? I argue that they all have different aims. Finally I describe and defend my view of what a satisfactory general account of objectivity should offer: a description of the use of the concept, not the criteria of objectivity.

General philosophy of science: representation content and convention (Classroom 2)

Beyond Batterman's Minimal Models: Uniting Global and Local Understanding.

Uzma Malik, Durham University

According to what Robert Batterman (2009) calls the 'traditional view', the goal of mathematical modelling is a convergence between a model and reality: models are meant to present the most accurate and detailed mathematical representation possible of the phenomenon of interest. Idealisations are introduced only to be later de-idealised. Contra the above, Batterman argues that a good model does not let details get in the way. The full details can "take something away" from a full understanding of the phenomenon of interest. A minimal model most "economically caricatures the essential physics." But how can models that distort or misrepresent reality provide us with understanding? Up until now there has been no explicit account of what minimal model understanding consists of. I will provide a new account of scientific understanding that accommodates what Batterman says and beyond, an account I call LOCAL-UNIFICATION. My account has two aims: Aim 1: To provide an explicit account of what Batterman's minimal-model understanding consists in using his 2009 as base. Aim 2: To generalise from this--to provide an account of a scientific understanding that has not been well articulated before. In pursuing aim 1, I will explain how Batterman's water-droplet-shape model generates understanding in my own way to highlight what Batterman does that constitutes providing understanding, generalising to a broader account– my Local Unification. The five components that constitute Local-Unification are: First, we have not properly understood the world if we do not identify the regularities obtaining in it. So, the component 1 of Local-Unification requires recognising regularities where they exist. Component 2 calls for the original or base representative model. Component 3 calls for a single unifying account of such regularities, where possible. Component 4 is motivated by noting that just producing the model is not enough--- We want to understand why things that differ have the same behaviours (teardrop shapes). So, component 4 of Local-Unification is an account of why the single unifying model is appropriate for sets of circumstances that differ in their causal details. Component 5, following the difference making (causal) intuition lays out the set of different circumstances and identifies what features they have that make the model relevant for them when it is not relevant for others. Component 6 looks to each separate case of the regularity to show that each possesses the features that makes the difference to whether they fall under the unifying model or

not. The precursors of Local-Unification are Sorin Bangu (2017) and Michael Strevens (2004/8). It is a hybrid theory whose components are inseparable, entwined, and proportional to each other. This is made clear by the example of breaking drops. In conclusion my theory of Local-Unification is a hybrid theory entwining local and global understanding. It is inspired by Batterman's minimal models but goes beyond his own account of them. It makes more explicit just what kind of understanding his minimal models provide and it does so in a way that allows for wider application to models across the sciences.

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Guiding Principles In Physics

Enno Fischer, Ruhr-University Bochum

In this talk I present a systematic account of guiding principles in physics. I will first suggest a distinction between two modes of employing scientific principles. First, principles can be employed as principles of nature. Roughly speaking, principles of nature are understood as making general descriptive claims about epistemic objects. Second, principles can be employed as principles of epistemic action. These are general directives as to what must be done in order to reach one's epistemic goals. Guiding principles integrate both these aspects. They imply claims about the epistemic object, and at the same time they provide directives for further research. By going through a few examples, I will explore the consequences for evaluating current guiding principles in physics.

Against Modelism

John Dougherty, Munich Center for Mathematical Philosophy

Philosophers of science often presuppose "modelism": the idea that the mathematical structures used in science are paradigmatically structures of model theory. I argue that certain dissatisfactions among modelists are grounds for admitting some anti-modelist ideas. The first concerns recent dissent from the rough consensus that identity of representational purport coincides with isomorphism. This dissent arises from an inflexibility in the model theorist's notion of isomorphism. The second dissatisfaction arises in attempts to spell out modelism formally. A recent research program has proposed to do this with tools from category theory. Proponents and opponents of this category-theoretic brand of modelism agree that it has yet to fully make good on its claim of precisifying modelism. These dissatisfactions are related, and both can be eased by relaxing our commitment to modelism in favor of a "coherentist" account of isomorphism that I outline.

From Empirical Symmetries To Unobservable Changes

Valeriya Chasova, Archives Henri-Poincare

Direct empirical status (DES) makes theoretical symmetries of physics non-redundant by matching them with empirical symmetries in the world. But which theoretical symmetries have DES is unclear, because the notion of empirical symmetry is not yet satisfactorily defined. I criticise the previous accounts of empirical symmetries (Healey's, Greaves and Wallace's, Ladyman's) and propose a better account. It generalises over macroscopic recognised examples of empirical symmetries, admits essential observable intrinsic changes within the subsystem and yields a more reasonable ontology at the unobservable level.

Reduction and emergence (Classroom 1)

Setting Limits To Emergence: The Case of Phonons

Sebastian Fortin, CONICET - Universidad de Buenos Aires
Matias Pasqualini, CONICET - Universidad Nacional de Rosario

According to the standard conceptualization used in materials science, crystalline solids are described as a periodic array of atoms. However, for practical reasons the system is transformed into another one made up of phonons. In the field of the philosophy of physics, Franklin and Knox argue in favor of phonons as a case of emergence compatible with reduction using the Butterfield's notion of emergence. In this work we analyze the atomic and phononic descriptions from the formalisms of the Tensor Product Structures (TPS) and we conclude that these ontologies are built on the same level of reality. According to our analysis, the description of crystals in terms of phonons brings novelty but, since there are no different levels in an ontological hierarchy, it is not possible to use the notion of emergence.

On The Emergence of Virtual Particles In Classical Mechanics

Amaia Corral-Villate, University of the Basque Country

My objective in this talk is to build a very simple and illustrative model for emergence in classical mechanics, by analysing the singular limit consisting in taking the number of particles involved to be infinite.

Specifically, my model shows that under a general condition of locality, infinite classical mechanical systems may entail the emergence of entities that, given the similarities with virtual particles in quantum field theory, may be thought of as classical virtual particles. Such similarities consist basically in (i) not satisfying the relation for energy and momentum, and (ii) belonging essentially to interactions.

Even if the basis for a model is not itself physical, what can be learnt from it may help understand other processes that are physical. In particular, this simple and illustrative model of emergence in classical mechanics allows for a very clear and intuitive grasp of the process of emergence of virtual particles.

Asymptotic and Limiting Reduction Why The Difference Matters, and Why They Are So Easily Confused

Johannes Mierau, Witten/Herdecke University

Asymptotic and limit relations play a preeminent role in the debate on reduction and intertheoretic relationships in physics. This elevated philosophical interest is mainly due to the fact that most prominent candidates for emergent phenomena in physics are closely related to limit relations. Despite the extensive debate on that matter, conceptual clarity of what it means that theory X is the limit of theory Y is lacking. In this talk, I want to defend three claims: (1) The semantic view on theories allows to precisely define limit relations in terms of convergence of the sets of the theories' models in a topology that adequately reflects the underlying idealizations. (2) Asymptotic relations between theories are to be distinguished from limit relations. (3) However, every asymptotic relation between physical theories also involves a limit relation. I will discuss the implications of this result and explain why the distinction between both kinds of reduction is nonetheless helpful.

Less If Divided: Strong Emergence Naturalised

Nanxin Wei, University of Birmingham

Contemporary philosophical interest in emergence largely falls into two camps, one with motivations from metaphysics and philosophy of mind which often takes strong emergence seriously, and the other typically focusing on weak emergence while paying much closer attention to scientific practices. For the second camp, the talk of strong emergence is naturalistic if not paradoxical. In this paper, inspired by recent progress in complexity sciences, I propose a fresh characterisation of emergence relations, reconciling Weak and Strong Emergence and naturalising the latter in the process. Weak Emergence and Strong Emergence should be taken as different perspectives of emergence relations between the two levels of description rather than mutually exclusive types of relations. Weak Emergence is the bottom-up, part-whole perspective. How weak is an emergence relation, is about how little (organization, interaction, etc.) is needed in additional for the parts to generate the whole, vindicating the well-known slogan "More is Different." Strong Emergence is the top-down, whole-part perspective. How strong is an emergence relation, is about how much would be lost (synergistic information, topological order, etc.) if the whole is divided into its parts, best summarized in a new slogan "Less if Divided."Various case studies are

provided from theoretical neuroscience to condensed matter physics to demonstrate the upshots of this account of emergence.

General philosophy of science: Causation (Classroom 4)

A Regularity Theory of Causation

Mario Günther, LMU Munich
Andreas Holger, University of British Columbia

In this paper, we propose a regularity theory of causation. The theory aims to be reductive and to align with our pre-theoretic understanding of the causal relation. We show that our theory can account for a wide range of causal scenarios, including isomorphic scenarios, omissions, and scenarios which suggest that causation is not transitive.

Mechanisms and Reductive Physicalism

Tudor Baetu, Université du Québec à Trois-Rivières

Causal mediation mechanisms are well supported by available experimental evidence and pro-vide a practicable way to reductive physicalism. According to the causal mediation account of mechanistic explanation, descriptions as diverse as 'black-box' phenomena, mechanistic sketches and schemas mixing physically interpreted and operationalized biological, psychologi-cal and social variables, and detailed descriptions of mechanisms refer to the same causal struc-ture circumscribed within the spatiotemporal boundaries of a replicable experimental setup. The coreference of coarser- and finer-grained descriptions of causal structures opens new possibili-ties for testing the reductive physicalism conjecture. I discuss experimental designs supporting the causal mediation account and show how recent studies demonstrating the biological media-tion of mind-mind causal processes can provide evidence for reductive physicalism.

Symposium: Qualitative research methods in and for philosophy of science (Main hall)

Qualitative Research Methods In and For Philosophy of Science: Where We Stand, Where We Are Going

Vincenzo Politi, Institute for the History of Science, Universitat Autonoma de Barcelona

Nora Hangel, Leibniz Center for Science and Society (LCSS), Leibniz University Hannover

Miles MacLeod, Department of Philosophy, University of Twente

Qualitative studies of scientific communities, which analyse and interpret the 'shared culture' of research labs, are not a novelty. Traditionally, however, so-called 'laboratory studies' have mainly focused on sociological factors, missing out the interplay between social and cognitive aspects of reliable knowledge production. In the past two decades, some philosophers have championed the use of qualitative methods for philosophical purposes. These methods can be adapted to inform philosophical research questions empirically. The symposium discusses the challenges, fruitfulness, and potential developments of the use of qualitative methods in and for philosophy of science. It explains how qualitative research methods inform philosophical theories about scientific rationality, collective belief formation, and socially responsible research. It also clarifies how this approach bridges the gap between philosophical idealizations and the complex reality of day-to-day research practice.

Symposium: Philosophies of the environment in organ technologies (Josif Pancic Hall)

Silvia Caianiello, Institute for the history of philosophy and science in modern age (ISPF), National Research Council
Guglielmo Militello, IHPST & Hospital Gustave Roussy, CNRS
Xavier Guchet, University of Technology of Compiègne

New advanced 3D organotypic technologies allow one to study organ pathology and physiology with human- and patient derived cells and raise high hopes for personalized and regenerative medicine. One of the major characteristics of these new in vitro systems is that they recapitulate the dynamic interactions between cells and their three-dimensional microenvironment in space and time. However, the characterization of what counts operationally as microenvironment is different, and this difference leads to different research strategies and practical implications for personalized and regenerative medicine. The aim of the panel is to shed light on the different notions of environment that are emerging in this field and on how they are conceptualized and operationalised. We will explore the historical roots of organotypic systems in the earlier organ culture and highlight its role in establishing notions of dynamic reciprocity between cells and their microenvironment. Furthermore, through an analysis of organoids and organs-on-a-chip, we examine the different aspects of the microenvironment they choose to represent and control in in vitro settings. Finally, we question more generally the notion of organ at work in the new organ technologies, and argue that the integration of the macroenvironment in the design of bioartificial tissue and organs might help reorienting the scope of personalized medicine to encompass its wider social and political implications.

Philosophy of social science and economics (Music Gallery)

When Are We Unequal? On Power and Strategic Voting.

Bele Wollesen, London School of Economics

Research around voting rules treats the absence of possibilities for strategic voting as normatively highly desirable. Yet, there is little substantial discussion concerning what constitutes the harm of strategic voting. I show that this lacuna has far-reaching consequences for the very tools that evaluate voting rules developed in economics (e.g., voting power indexes) and computer science (e.g., relaxations of strategyproofness). In particular, I argue that our assessment of these tools crucially depends on how exactly we conceptualize the harm of strategic voting.

Endogenous Preferences, Environmental Economics, and Welfare

Lukas Beck, Mercator research institute on global commons and climate change

Endogenous preferences have been identified as a pressing problem for environmental economics by prominent economists such as Nicholas Stern and Joseph Stiglitz. There is now a growing literature on how to do welfare analysis with endogenous preferences in environmental economics. Against this background, I argue that (i) the endogenous preference literature in environmental economics faces severe obstacles when it comes to distinguishing welfare-relevant from welfare-irrelevant preferences and (ii) that methods for dealing with similar problems in behavioral welfare economics do not readily translate to environmental economics. Nevertheless, I outline (iii) that we can still rationalize current practices in the relevant literature if we assume (a) an evidential account of the relationship between preferences and welfare, (b) that preferences in the relevant contexts are fundamentally fuzzy, and (c) appeal to preference-independent evidence for welfare.

Another Entanglement Paradox

Julian Reiss, JKU Linz

Abstract: I introduce and discuss three stances concerning fact/value entanglement and value judgements in economics: Value Neutrality is the 'traditional' position, which is still held by many economists: that (ethical) value judgements have no place in positive economics. This view concerning

the separability of facts and values is usually motivated by and combined with non-cognitivism about ethics. Propitious Entanglement is the combined thesis that (a) facts and values are metaphysically entangled, and that economists cannot and ought not to investigate economic phenomena without ethical reflexion.; and (b) rational exchange makes disagreements concerning value judgements dissipate over time. Amartya Sen, Hilary Putnam and Vivian Walsh are prominent proponents of this view. Pernicious Entanglement combines fact/value entanglement with the view that moral conflict is ubiquitous and permanent. Value Neutrality is made implausible by much recent work in philosophy of science. Propitious Entanglement is made implausible by a number of considerations concerning value pluralism. Pernicious Entanglement is the most defensible stance of the three, but it threatens the authority of science in society: because consensus concerning important scientific issues (say, on the impacts of a Unconditional Basic Income or on the effectiveness of Nudges) is unlikely to arise. I conclude with some reflexions on how to escape the resulting paradox.

Science and Values (Milan Grol Hall)

How Talking About Background Assumptions Rather Than Values Could Improve Science Communication

Jaana Eigi-Watkin, University of Tartu

The aim of the paper is to argue that Helen Longino's account of scientific reasoning with the focus on background assumptions may be helpful for envisaging better ways to communicate science. In particular, I contrast the approach to communication in terms of assumptions with the approach in terms of values that has recently been proposed by philosophers such as Kevin Elliott. I suggest that the former may be less controversial and more acceptable in the situation where the value-free ideal for science is influential. The work done on the values in science communication may nevertheless serve as a useful model for developing the alternative approach. In addition, developing the approach that focuses on communicating assumptions requires building on the philosophical work that helps explication of assumptions on the individual and the communal level. 1. General Philosophy of Science

Sisyphean Science: Why Value Freedom Is Worth Pursuing

Menon Tarun, Azim Premji University
Jacob Stegenga, University of Cambridge

The value-free ideal in science has been criticised as both unattainable and undesirable. We argue that it can be defended as a practical principle guiding scientific research even if the unattainability and undesirability of a value-free end-state are granted. If a goal is unattainable, then one can separate the desirability of accomplishing the goal from the desirability of pursuing it. We articulate a novel value-free ideal, which holds that scientists should act as if science should be value-free, and we argue that even if a purely value-free science is undesirable, this value-free ideal is desirable to pursue.

Understanding The Role of Social Values In 'Obesity' Science

Azita Chellappoo, The Open University

Feminist philosophers of science have elucidated the role of gender biases in many fields of science, including archaeology, neuroscience, and biomedicine. I argue that feminist philosophy of science provides the resources through which we can understand the role of values in 'obesity' science.

We live in a society where weight discrimination or fatphobia is pervasive: understanding the ways in which anti-fatness may shape knowledge production in scientific research into 'obesity' is critical to evaluating this research, and charting a way forward for scientific research which is aligned with, or at least does not hinder, the goals of social justice regardless of body size.

I draw on two cases to demonstrate how fatphobia could be operating in knowledge production in 'obesity' science. Firstly, the way in which the connection between metabolic dysfunction and body size is characterised and explained. Secondly, in the neglect of weight stigma as a contributor to poor health outcomes.

Cognitive Biases In Medicine and The New Demarcation Problem

M. Cristina Amoretti, University of Genoa
Elisabetta Lalumera, University of Bologna

The New Demarcation Problem is the task of distinguishing between illegitimately and legitimately value-laden science. In medicine, values are present in research question choice, inductive risk appraisal, and definition of specific concepts. Cognitive biases, such as priming, framing, and stereotyping, are also present in medical research and practice. We argue that to address the New Demarcation Problem in medicine, it's important to differentiate between values and cognitive biases. While values can be openly discussed and evaluated, biases cannot be approached in the same way, but they can be categorized and assessed for their epistemic and ethical costs and benefits. 3. Philosophy of the Life Sciences

General philosophy of science: Understanding (Library)

Metaphysically Understanding Why

Stefan Roski, University of Münster

In recent years many philosophers have become interested in the use of explanatory notions in metaphysics. Various kinds of robust metaphysical dependence (grounding, parthood, etc.) seem to give rise to a distinctive form of metaphysical explanation. At the same time, however, many classical assumptions about explanation that have dominated the philosophy of science have been challenged by epistemologists and philosophers of science that have investigated the connection between explanation and understanding. Metaphysicians have thus far rarely taken notice of this lively debate. And similarly, philosophers working on understanding usually focus on scientific or simple causal cases. The present talk is part of a project that aims to bring both debates into contact. I will propose a novel account of understanding that is suitable to accommodate the kind of understanding that is provided by metaphysical explanations. To motivate my account, I will argue that popular extant accounts of understanding-why are in- applicable, or at least highly non-informative, with regard to metaphysical understanding. The alternative account I will suggest is inspired by Michael Strevens's account of understanding in terms of difference-making. In the final part of the talk, I will compare my approach to an account of metaphysical understanding in terms of unification suggested by Kovacs.

A Challenge For Ontic Explanation

Melinda Fagan, University of Utah

Ontic views of explanation – i.e., that explanations are or aim to represent real things in the world – are prevalent in philosophy of science today. I pose a challenge for such views, from scientific practice. If defenders of ontic explanation want to engage scientific practice, they should treat the ontic view as a fruitful heuristic for studying explanation, not as a universal requirement for all explanations across the sciences. The other option is to not engage scientific practice at all. The challenge spurs refinement of the ontic view and its implications for philosophical method. I show that the ontic view as heuristic is a fruitful way to philosophically study science in practice, while imposing the ontic view as a philosophical requirement on scientific practice is problematic. There are at least three problems: poor empirical support, commitment to an outdated ideal, and epistemic hubris. So defenders of ontic explanation have a choice to make: engage science in practice, with

ontic ideas as productive heuristics; or defend ontic explanation as a substantive philosophical thesis that does not engage scientific practice.

General philosophy of science: Causality (Classroom 2)

<u>Two Differences Among Nonspecific Biological Causes</u>

Ulrich Stegmann, University of Aberdeen

Causally specific biological phenomena have attracted much attention. An important but under-investigated account is one cause-one effect specificity (Woodward 2010). This paper argues that not all nonspecific causes are equal. First, biologists distinguish causes with diverse effects from causes with similar effects. I will argue that the distinction can be understood in terms of the biological phenomena (or domains) to which effects contribute. Causes with many effects can differ in the number of domains to which their effects belong. A second issue is the extent to which causes determine a given domain. For instance, a single transcription factor controls the transcription of all enzymes in bacterial arginine biosynthesis. Thus, nonspecific causes (in the one-to-one sense) exhibit structural differences along at least two dimensions of biological importance. I illustrate the latter point with the problematic concept of master regulators. 3. Philosophy of the Life Sciences

<u>Are They Causal, After All? A Constraint Conception of Causality To Shed Light On The Causal Role of The Microbiome.</u>

Javier Suárez, University of Oviedo
Roger Deulofeu, Autonomous University of Barcelona

Microbiome research has become a very important area of scientific inquiry during the last decade. Originally, some people expected that microbiome research would revolutionise biology and medicine (Blaser 2014), but over the years some of the most grandiloquent expectations have been cast into doubt and even described as "hypes" (Falony et al. 2019). One of the main criticisms raised against the microbiome is that its causal role in many biomedical conditions has been exaggerated, and thus microbiomes cannot be considered to be causal, at last how causality has been traditionally conceived (Hanage 2014; Lynch et al. 2019). In this talk, we will argue that the problem is not the causal role of the microbiome in health and disease states, but rather the way in which critics conceive causality, which is unsuited to think about the type of causality at play in the microbiome. To this end, we defend what we call a constraint conception of causality, derived from systems biology and based on the idea of downward causation. According to this conception, the microbiome is causal insofar as it harnesses possible states of a system and, in doing so, it can be said to be responsible for certain states of health and/or disease of its host.

Causal Persistence and Long-Run Effects

Ina Jantgen, University of Cambridge

How should scientists select causes with long-run effects particularly useful for manipulative purposes? Though much ink has been spilt recently on the role of causal properties in causal selection, these properties do not guide causal selection of long-run effects. Instead, to make sense of causal selection in the long run, we need to understand how causal relationships can be persistent. I introduce three ways in which causal relationships can be persistent: causing a persistent effect, causing the persistence of an effect and persistently causing an effect. These properties track different ways in which agents can control causes to bring about desired effects in the long run. Persistence matters for selecting causes with long-run effects useful for manipulation. Yet, common methods used to study long-run effects fail to provide evidence for causal persistence. Hence, researchers studying such effects should pay more attention to providing evidence for their persistence.

Symposium: Framing Digital Philosophy of Science (Main hall)

Maximilian Noichl, University of Bamberg
Charles Pence, Université catholique de Louvain
Catherine Herfeld, University of Hannover
Bárbara Jiménez-Pazos, University of the Basque Country, San Sebastián
Gareth Pearce, University of Vienna

Digital methods have gained considerable traction among empirically oriented philosophers of science in recent years. By using digital, data-driven methods, philosophers can extend their investigations to large-scale phenomena, strengthen their theories through hypothesis testing, and build background knowledge for other philosophical approaches. In this symposium, we will discuss the potential of digital methods for philosophy of science, including the advantages and disadvantages of language and network modeling techniques, hypothesis testing, and visualization methods. We will also discuss the integration of digital methods with practice-based approaches and how digital methods can be used to support case studies. The panel of participants will present novel research that makes use of digital methods, and discuss how the introduction of digital methods into philosophy can be framed most productively.

Symposium: Deliberating about Organismic Agency (Josif Pancic Hall)

Thomas Reydon, Institute of Philosophy, Leibniz University Hannover
Bendik Aaby, Higher Institute of Philosophy, KU Leuven
Hugh Desmond, Institute of Philosophy, Leibniz University Hannover

Currently there is a persistent lack of clarity with respect to both the metaphysical content and the epistemic role or roles of the concept of agency in the biological sciences. Different authors, even within the philosophy of biology, are using the term "agent" in different ways, often without rigorous definition. Because "agency" is a key concept in ethics with a specific meaning (linked to concepts such as empowerment or oppression), the worry arises that in the biological sciences the term "agent" plays a metaphorical role at best and an obfuscating one at worst.

The specific approach of the symposium will be to enquire into two sets of problems regarding the concept of agency as it occurs in the biological sciences: (1) the ontology of agency, and (2) the scientific function of the concept of agency. These two sets of problems will provide the axes of the conceptual landscape on which the varying approaches to agency will be situated.

Symposium: Open and Closed Systems in Quantum Physics and Cosmology (Music Gallery)

Michael Cuffaro, MCMP, LMU Munich
Stephan Hartmann, MCMP, LMU Munich
James Ladyman, University of Bristol
Sebastien Rivat, MCMP, LMU Munich
David Sloan, University of Lancaster
Karim Thebault, University of Bristol

In current physics an `open system', which is coupled to the environment and exchanges energy, matter or information with it, is contrasted with a `closed system', which is isolated from the environment in that there is no exchange of energy, matter or information, with it. However, no real systems are ever completely isolated and on the other hand all physical theories are empirically confirmed by being applied to subsystems of the universe rather than the entirety of physical reality. This symposium analyses the open/closed system distinction and its foundational significance.

Symposium: Discrimination, Measurement and Normative Theory (Milan Grol Hall)

Marion Kathe Godman, Aarhus university
Naftali Weinberger, University of Munich
Lennart Ackermans, University of Rotterdam
Jens Tyssedal, Aarhus University
Morgan Weinberger, University of Bielefeld

Wrongful discrimination is a topic of not only law and politics but of social science. An adequate understanding of discrimination must combine tools from fields such as economics, sociology and psychology. How these tools are to be fruitfully combined raises philosophical issues concerning the relationship between ontology and methodology, the role of values in empirical research and the weighing of evidence from distinct sources.

The four symposium papers will address questions about how to measure and conceptualize discrimination. A first theme will be the extent to which discrimination is better conceptualized as an individual or a group phenomenon. Another theme is the meaning and status of the distinction between differential treatment and disparate impact both in selecting measurement techniques and for normative theorizing about discrimination. A third theme is the ontological and epistemic justifications of selecting certain groups as variables in studies and as protected groups or discriminatees.

Navigating, Assessing and Embracing Scientific Literature (Library)

<u>Loving Science</u>

David Ludwig, Wageningen University

This article explores "love" as an analytic category that expands current debates about "trust" in science. "Loving science" highlights elements of commitment and care for science that remain underexplored in philosophy of science and in debates about the epistemic status of scientific knowledge production. A focus on love also helps to understand that epistemically trustworthy science often remains deeply unlovable because it contributes to inequality and social-environmental crises. Finally, the notion of "loving science" is used to formulate criteria for a healthy relationship between science and society which is based on reciprocal care and commitment. In order to be deserving of our love, science needs to extend love to us through care about its impact on people and planet.

<u>Literature Navigation Systems: An Epistemological Analysis</u>

Chiara Lisciandra, University of Munich

The volume of scientific output is rising exponentially. How can scientists navigate this literature without drowning in it? This paper investigates a set of technologies—namely "(AI) academic search engines", such as The Web of Science, Scopus, Google Scholar, PubMed, and Semantic Scholar—from the perspective of the philosophy of science. These technologies promise to assist scientists in searching, selecting, and processing the literature in a way that facilitates the discovery of relevant information and might lead to scientific development and innovation. This paper considers two challenges that academic search engines face. The first concerns the accuracy of their results that are ordered according to citation ranking algorithms; the second concerns their reliability in light of the opacity of the algorithms that they use to display results. Finally, the paper shows they are changing the scientific principles behind the organization of the literature, this way enlarging the pool of search strategies available to scientists and the information they can retrieve from existing work.

<u>What Makes Research Relevant?</u>

Anita Välikangas, University of Helsinki

Several organisations and actors identify relevance as one of their central targets. This notion is used in several levels of knowledge production, ranging from practices to ideal research outcomes. This article offers a review on the uses of relevance in recent academic discussion, identifying eight main ways of discussing relevance. It shows how relevance is being used in several ways, ranging from societal meaningfulness and transdisciplinarity to the relevance of data and evidence at the context of scientific explanation. This paper argues that we need to understand better the relationship between these various forms and levels of relevance. This lack of clarity leads to vagueness surrounding the characteristics of policy relevant research. As a case study, the paper reflects how these different portrayals of relevance are visible in discussion about the goals of the Intergovernmental Panel on Climate Change (IPCC). This case shows that the organisation utilised several formulations of relevance while maintaining its target of policy relevance.

Symposium. Causation and causal models - how to overcome the standstill (Classroom 2)

Tomasz Wysocki, University of Pittsburgh
Jennifer McDonald, Columbia University
Mario Günther, Ludwig Maximilian University of Munich
Sander Beckers, University of Amsterdam

Since the early noughts, causal models have been instrumental in developing theories of causation, with increasingly complex theories handling increasingly complex cases. This progress has recently slowed down, and we aim to explore ways in which the standstill could be overcome. We agree on the problem but disagree on the solution, with each speaker challenging, suspending, or modifying a different element of the causal-models framework. Günther adapts causal models to regularity theories and work out a reductive theory of causation. Wysocki replaces structural equations with polymorphic functions and defines causation recursively: the cause causes the effect in virtue of causing the effect's direct causes. McDonald dismantles the assumption that the role of causal models is to encode counterfactuals. Beckers abandons saving intuitions for a functional approach: producing a theory that satisfies the epistemic and pragmatic norms that guide causal reasoning in science and in life.

Posters

Non-Cognitive Modulators of Perception and Their Implications For Realism Across The Board

Themistoklis Pantazakos, University College London

In this paper, I argue, contrary to a dominant yet implicit assumption within the literature, that non-cognitive modulators of perception serve to undermine vision realism. To this end, I adopt Raftopoulos' account of vision and focus on two specific non-cognitive such modulators: attention and perceptual learning. I demonstrate that differences in the stripes of attention and learning that do not carry conceptual content can give rise to mutually exclusive, yet epistemologically competent, percepts – thus prompting minimally early vision perspectivism, and maximally early vision relativism. In addition, I show that this poses a challenge for scientific realism as well. I investigate a series of episodes from the history of science whereby, I argue, scientific realism was compromised by vision effects originating in perception. Last, I consider whether my argument can be generalized to the modern scientific context, and provide a sketch of the reasons why it does.

Contingency Helping Stochasticity. From Molecular Biology To Philosophy of Paleontology and Back

Marco Casali, LabEx Who Am I? (Université de Paris) & IHPST (Paris 1 Panthéon-Sorbonne, CNRS)

In the 1970s Gould challenged the classical paradigm that evolution occurs gradually under the main guidance of natural selection. In his famous 1989 book titled Wonderful Life, he emphasizes that the evolution of life is fundamentally contingent. His thought experiment is well-known: if we could replay a tape of life, the outcomes (i.e. the historical present) would be always different. His work as a paleontologist has intrigued some philosophers such as Beatty (2006) that was the first (followed by Turner 2012) to bring the attention that Gould's idea of contingency actually referred to two distinct notions. During the presentation, I will highlight the fact that these two notions, that Beatty calls "unpredictability" and "causal dependence", are extremely similar to two other concepts of stochasticity that are used in molecular biology to explain a very different kind of process that takes place in cell, that is to say mutually exclusive alternative splicing. With the conceptual tools provided by Beatty (2006) and Turner (2012), my proposal is to characterize stochasticity in alternative splicing such as an "insufficiency of causal dependence" (ICD). ICD refers to the fact that knowing certain starting point parameters could be not sufficient to understand how the

process behaves and which outcomes can give arise. ICD could be extensible beyond splicing because a definition of stochasticity free from metaphysics and which cannot be deflated to our cognitive limitation could be a good way to rethink original relationships between chance and living been.

A Novel Approach To Handle Epistemic Opacity In Fully Connected Neural Networks

Mariana Seabra, CFUL - Centro de Filosofia da Universidade de Lisboa

The epistemic opacity of Neural Networks (NN) concerns both philosophers and scientists. Epistemic opacity arises because information required to produce outputs is contained in NN in a form that does not explain those outputs. It is thus hard to determine when results obtained through NN are justified. This work proposes a novel approach that combines philosophical understanding and technical details. Fully Connected NN (FCNN) are discussed in the context of Bayesianism and analyzed as both stand-alone computational templates and as parts of computational models, that is, templates supplemented with additional features. This framework is combined with computational methods that handle opacity from the inside, e.g. influence functions, and methods that handle opacity from the outside, model agnostic methods. The template and model perspectives will be combined to address the opacity problem in FCNN and its extension to Convolutional NN.

On Boolean Inferential Methods For The Establishment of Constitutive-Mechanistic Models In The Cognitive and Biological Sciences

Johannes Mierau, Witten/Herdecke University
Jens Harbecke, Witten/Herdecke University
Sebastian Schmidt, Witten/Herdecke University

According to the "mechanistic approach" to the cognitive and biological sciences, scientific explanations succeed by analyzing the mechanisms that underlie a phenomenon, or "constitute" it, on several levels. In this presentation, we are concerned with the formal strategies to establish multi-level causal-mechanistic models that form the core of mechanistic explanations. Our goal is twofold: On the one hand, we offer a novel algorithm that transforms Boolean data tables obtained from tests on multi-level systems into causal-mechanistic models compatible with these tables. On the other hand, we offer several philosophical insights suggested by, and associated with, the solutions produced by this script. Among these is the claim that the number of model solutions consistent even with small data

tables is often extremely large. Further reductions may have to involve a pragmatic dimension, which has sharp consequences for the realistic ambitions of mechanistic explanatory projects.

Climate Science's Scenario Framework

Rawad El Skaf, Politecnico Di Milano

The adequacy of purely quantitative approaches is forcibly questioned in scientific fields that are complex, interdisciplinary, deal with "deep" uncertainties, are politically and socially relevant and where non-epistemic values are arguably ineliminable. This is most notable in climate change research where scientists have progressively developed hybrid forms of inquiries that includes both quantitative and qualitative elements. There are two important examples of hybrid approaches in climate science. The most notable one is the "scenario framework", the other is the storyline approach to the science of detection and attribution of extreme weather events (which for lack of space I shall not consider here). This paper is programmatic and aims at drawing philosopher's attention to climate science's scenario framework in particular and to this hybrid form of doing climate science more generally.

On The Reported Demise of Local Realism

Daniel Shanahan, Retired

After considering the reasons for the demise of the local realism of classical physics, I argue that currently favored reinterpretations of quantum mechanics have resolved neither the measurement problem nor the mystery of self-interference. I show how a strict accounting of movements in conserved properties would resolve the measurement problem and also explain the Born probabilities. I argue that it is the equal but opposite reaction of the scattering medium, propagating through the experiment in like manner as the particle itself that explains self-interference. I discuss two loopholes, namely basis-biassing and the reaction of the scattering medium, that persist in Bell tests. I argue that the problems of quantum mechanics would be better avoided by a return to the local realism of the earlier physics.

Constituting Phenomena: Cognitive Vs. Mechanistic Constitution?

Flavia Padovani, Drexel University
Michele Luchetti, Max Planck Institute for the History of Science (MPIWG)

In this paper, we aim at bridging discussions on cognitive constitution with recent developments in the mechanistic literature on phenomena reconstitution. In general, the notion of "constitution" in the mechanistic literature is understood naturalistically, with reference to the parthood relation holding among and within mechanistic phenomena and, thus, prima facie completely unrelated to—and possibly incompatible with—the understanding of constitution in a cognitive sense. We will argue that the two approaches are not incompatible. By analyzing examples from molecular biology, we will show how assumptions underlying the use of instrumentation, measurement standards, and experimental techniques influence the identification and characterization of phenomena, and in this sense, use the same epistemic strategy that is often deployed to identify and characterize phenomena within cognitive constitution. As a result, the mechanistic phenomena can be regarded, to some extent, as cognitively constituted, which makes mechanistic constitution compatible, rather than incompatible, with cognitive constitution.

Understanding As Perspective Taking In The Context of Artificial Intelligence

Elena Popa, Jagiellonian University
Richard David-Rus, Institute of Anthropology Francisc I Rainer

We argue for an application of humanistic understanding in the context of AI. The partial commensurability of different types of understanding makes the ecosystem vulnerable to failures of different kinds, notably ethical ones. We argue that humanistic understanding is required to alleviate such vulnerabilities. We show how perspective taking (a kind of humanistic understanding), is suitable, by situating oneself in the web of relationships of the target subject or seeing the world in terms of how it affords actions and satisfies the interests of target persons. We employ Von Wright's account and its goal-oriented explanations for this purpose. As this view is too restrictive for cases requiring an enlargement of the frame of a stakeholder beyond her specific goals and interests, we further use Wilkenfeld's model to address this. For illustration, we discuss understanding why AI algorithms used in precision medicine perpetuate gender bias and to include information about gender.

Physicalism, Matter and Relations Under Scrutiny: An Interpretation of Their Impossibility With The Assistance of Quantum Field Theory

Marco Gomboso, Centre of Philosophy of Science of the University of Lisbon, Portugal

If we understand physicalism as the claim that "everything that exists is something physical" (Esfeld, 1999) and, moreover, that current physics is devoted to explain the nature of what exists, then we are faced with a problem: physics tends to conceive things in relational terms, stressing their functions rather than their essence. This is an issue that leaves room for a natural question: what is the nature of matter and things that we conceive as related? Moreover, what are these relations about? We have not yet found an adequate answer to these questions. This paper will address these problems by questioning the relational character of some interpretations of quantum holism (Ismael and Schaffer, 2016; Esfeld 1999). I argue that relations, even if taken as the most fundamental thing of one whole (such as in quantum field theories), bear certain impossibilities under a physicalistic view. Their conception as basic along with the things they relate, and this entanglement as the ultimate character of matter, clashes against the specification of the latter. I'll offer an alternative, based on avoiding relations and discarding physicalism as the privileged method to conceive reality.

On Understanding In Multispecies Ethnography

Richard David-Rus, Institute of Anthropology, Romanian Academy

The contribution aims to qualify the sort of understanding gained in a recent orientation in cultural anthropology i.e. multispecies ethnography. The intend of the orientation is to extend the ethnographic inquiry beyond humans to nonhuman species. Understanding in anthropology was claimed in the tradition of understanding as Verstehen - the sort of understanding specific for humanities and social sciences. I will argue that the new trend puts a heavy pressure on interpreting understanding as Verstehen. This happens mainly due to the reliance on natural science, essential in multispecies ethnography that diminishes the chances of understanding as Verstehen.

How The Structure of Scientific Communities and Communication Channels Impact The Public Understanding of Science

Sacha Ferrari, KU Leuven

In this study, we aim to describe how public understanding of science is moderated by two variables: the structure of the scientific community (the

degree of connection between scientists) and the communication channel that is used to inform citizens about their findings (e.g., a journalist or a propagandist). Based on numerical simulations, we determined how these two variables impact the beliefs and degree of uncertainty concerning a scientific hypothesis (one of two mutually exclusive alternatives) of both the scientists themselves and the citizens. Based on our results, we conclude that a highly connected scientific network decreases the chance that the public reach the correct conclusion (i.e., believe the correct hypothesis). However, moderately connected networks perform better when the scientists are reluctant to listen to the beliefs of others. Furthermore, the choice of the communication channel is found to have a limited impact on the citizens.

Non-Symbolic Intelligence

Nina Poth, Humboldt-Universität Berlin

A central feature of general intelligence is few-shot learning. Cognitive scientists agree that some form of mental-model building is involved, but its basic principles remain insufficiently understood. I trace the lack of progress to a divide between symbolic and subsymbolic approaches to cognition. Probabilistic models of cognition render the phenomenon uniquely human since, at their core, they assume a language of thought. In contrast, subsymbolic deep-learning and active-inference research takes serious situated views but does not scale up to explain human-level few-shot learning. I defend an integrative account building on the Conceptual Spaces framework, arguing that perceptuo-motor similarity principles generalize the phenomenon to different kinds of intelligence. I also show that the notion of similarity perfectly combines with Bayesian computation. This allows reinterpreting probabilistic models in the light of embodied and action-oriented perspectives, providing a shared platform to evaluate previously thought to be opposing interpretations of few-shot learning in the cognitive and biological sciences.

More Or Less Natural Kinds

Marabel Riesmeier, University of Cambridge

Natural kindhood is generally taken to be something discrete: If there are natural kinds at all, a kind is either natural or it is not, there is no in-between. I argue that this view is mistaken: Drawing on examples such as the substance cubane, I show many kinds depend on humans, but not uniquely so. They often simultaneously depend on something that seems well captured by the word natural. However, current views of natural kinds do not allow for such nuance. The issue lies with a criterion that is widely shared across the

literature, whether sympathetic or unsympathetic to the very notion of natural kinds: The term natural is taken to be applicable only in the absence of all human-dependence. Instead, I suggest that the assignment of naturalness reflects our confidence in the counterfactual stability as a causally relevant kind in scenarios of decreasing human interference. My proposal allows us to better account for the multiple dependencies of more or less natural kinds.

An Inferential-Information Transmission Account of Observation

Sarwar Ahmed, University of Wuppertal

The development of science and technology has transformed the concept of observation. Arguably, the major transformation is discarding the perceptual dimension of observation and preserving its epistemic dimension.

In this paper, I argue that the reliability of the information channel and the justifiability of the involved inferences are the two epistemological elements of any observational process.

This is consistent with Dudley Shapere's influential conception of information transmission as the basis of observation but deviates from his construal of direct and inferential observation. Shapere's distinction is sensitive, I argue, to historical, practical and epistemological counterarguments. In this talk, I focus on the epistemological aspect. Besides, I introduce an alternative account of observation based on information transmission combined with inference to the best explanation. I apply this account to the observation of the binary black hole systems as a case study.

In Defense of A Generalist Approach To Scientific Theories

Tomasz Bigaj, University of Warsaw

This paper discusses the positions of generalism (anti-individualism) and anti-haecceitism with respect to the ontology of scientific theories, in particular physical ones. It is argued that the rejection of individualistic facts and mere individualistic differences is supported by scientific practice and general methodological considerations. Two cases of symmetries in physics are brought into considerations: permutation-invariance in quantum mechanics and diffeomorphism-invariance in general relativity. Subsequently some major challenges to anti-haecceitism are analyzed and repelled, including the case of symmetry-breaking indeterminism and chance-based arguments. In conclusion it is claimed that we should abandon

individualistic facts and distinctions while retaining individuals as a category of entities separate from properties and relations.

Agential Biological Perspectives Facing Mechanism

Louis Virenque, IHPST

The mainstream definitions of agency refer to actions according to intentional goals, but recent conceptions are emerging and their partisans try to naturalize agency either in terms of a system's capacity to self-determine or by integrating this capacity into evolutionary biology. The autonomous perspective (AP) aims to provide a new theoretical description of organisms, while the agential evolutionary perspective (AEP) suggests a new ontological approach to evolution. Both strategies use intrinsic purposiveness to understand agents' behavior in their environment, and are both opposed to mechanism. However, AP is criticized of being a mechanistic approach by AEP, and AEP is blamed of being a cybernetic approach by AP. Our objective is to clarify these critics and establish a common theoretical basis for agency.

Calculemus! Robot Scientists and The Mechanization of Scientific Reasoning?

Jaakko Kuorikoski, University of Helsinki
Samuli Reijula, University of Helsinki

We provide a conceptual mapping of recent arguments for the demise of the human scientist in the wake of advances in machine learning, new forms of data, and the automatization of physical experimentation. We do this by considering scientific research as heuristic search in a multidimensional problem space and focus on the role of AI and automated experimentation in justification, in contrast to heuristic discovery. We distinguish between four arguments for the mechanization of scientific reasoning based on different technologies (algorithmic analysis of big-data, deep learning, high-throughput experimentation, and adaptive experimentation guided by open-ended search), and highlight their salient differences in a contrastive manner. We explore which of the interpretations of the discovery-justification still stand and what capabilities are still missing from the full Leibnizian dream of mechanization of scientific reasoning.

Patterns and Polanyi: An Overlooked Account of Scientific Understanding

Damon Kutzin, University of Cambridge, Department of the History and Philosophy of Science

Recently the approach to scientific understanding has focused on the role of the heuristic or informal logic of scientific practice. Considering this reorientation, a natural candidate for the objects of scientific knowledge are real patterns (Haugeland 1998, Rouse 1999), which require a perspectival knower, as well as constitutive skills and commitments to recognize them. This turn can be helped along by Polanyi's work, and his little-known definition of scientific knowledge: "Scientific knowing consists in discerning gestalten that indicate a true coherence in nature" (1969, 138). Polanyi means that scientific knowledge consists of recognizing real patterns in nature, the way in Gestalt theory that visual perception consists of recognizing wholes that are other than the sum of their parts. His theory generalizes this connection, proposing an account of scientific understanding grounded in an epistemology of patterns. I argue that Polanyi's thought has anticipated much of the current concerns in the scientific understanding literature, and that a dialogue between his thought and the current literature leads to promising new avenues of research.

Perspectivism In Practice: Evolutionary-Ecological and Biomedical Approaches In Microbiome Research

Robert Meunier, University of Luebeck

This contribution develops the notion of a research approach as a conceptual framework that is well suited to connect the analysis of the perspectival character of theoretical models as emphasized by perspectivism with the analysis of material practices as put forward in the practice turn in philosophy of science. The notion of an approach, which is used by scientists themselves, is explicated as the alignment of a problem and a method. The bi-directional dependence of perspectives and approaches is discussed. Furthermore, the usefulness of the framework is demonstrated with a case study from research on the human gut microbiome. Researchers with an background in evolutionary-ecological biology and researchers in biomedicine respectively start from different perspectives on host-microbiome relations, develop different approaches to the phenomenon, and deliver models that again constitute different perspectives.

Developing A Physics-Specific Theory of Analogy: A Case Study of Black Holes and Sonic Black Holes In The Post-Newtonian Framework

Veljko Simovic, University of Western Ontario
Ashkan Alibabaei, University of Cambridge

The search for the general theory of analogy (TA) that started with Aristotle and culminated with Hesse (1966) has recently gotten an interesting twist. Norton (2010) and Bartha (2019) have argued that the search is futile since its products are usually too permissive or too intuitive. We agree with Norton´s and Bartha´s critiques, but we argue that their conclusion is too radical. Instead of abandoning the search, we propose to narrow it down to field-specific TA. To support our claim, we outline a physics-specific TA and demonstrate its usefulness on an example from ongoing research in theoretical physics. Our TA is based on Hesse's, but with modifications in both content and scope: We add robustness and common cause to Hesse's criteria for analogy, swap her deterministic causality for probabilistic and limit the theory to physics. An example we use is an analogy between black holes and sonic black holes which we develop in the post-Newtonian framework.

An Eliminativist Account of Psychological Validity

Oliver Holdsworth, University of Cambridge

Psychological validity, roughly understood as good measurement of a psychological construct, has a varied definitional history. Taken by some psychologists and philosophers to be a property of the test, and others a property of interpretations, the question of its scope and proper domain is equally controversial and diverse (Borsboom et al. 2004; Stone 2019; Feest 2020). Frequent moves to polish up its definition have been met with strong resistance however (Newton and Baird, 2016). Those who argue in favour of a broad notion point to the multiple concerns surrounding measurement (including a test's use in practice). Those who advocate instead for a restricted definition (focusing only on whether a test measures for example), argue that we thereby avoid unwieldiness, in favour of practicality. In the face of this confusion, I argue for an eliminativist account of validity. Multiple validity accounts exist in the literature, but it isn't desirable to reduce these into a single unitary or dominating concept. I argue that the term 'validity' should refer only to the general notion, precision appears when we specify individual validity accounts.

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General Relativity Between Theory and Practice: Analogy With The Wallace/fraser Debate On Qft?

Kevin Chalas, CEFISES, Université Catholique de Louvain

I propose to show that the ontological investigations of general relativity face a situation quite similar to those of quantum field theory: either accept to ontologically commit to the forms taken by the theory in the actual experimental practice, or loose the empirical support by obstinately chasing the fundamental structure. For GR, the latter option even threatens it with empirical incoherence: it becomes either pathologically indeterministic or hostile to any form of change. I thus defend that we ought to commit to general relativity as it appears in actual experimental practices by showing how doing so avoid the previous dilemma.

Structure Representation of Deep-Learning Models and Scientific Understanding

Giovanni Galli, University of Urbino

Peer-Review: Historical and Epistemological Perspectives On A Central Mechanism of Scientific Self-Control

Ann-Christin Fischer, Ruhr University Bochum

This poster discusses the theoretical foundations and origin of peer review processes. Peer review is a central method of self-control in science. In fact, over the last decades, the scientific community has increasingly accepted the procedure as "the holy grail" of justifying truth claims. In recent years, however, problems of peer review have been addressed by philosophers of

science. Especially the influence of non-epistemic values and personal attitudes in the process were highlighted. Moreover, scientists pointed towards the influences of commodification of science, as well as the lack of shared standards in peer review and publication processes. By building on these critiques, I argue that peer review (i) is not suited to secure the objectivity or correctness of a publication, and (ii) is a good case study for the more general difficulties of quality control in science. My analysis draws on the history of peer review since 1665 and current theoretical discussions.

Presenters