

# Hi-Phi

23 - 24 June 2022  
Lisbon

# international conference

**Book  
of Abstracts**

The background is a solid orange color. It features several overlapping circles and lines. There are two large circles, one red and one blue, in the upper right quadrant. Another pair of red and blue circles is in the lower left quadrant. A large, thin black line forms a complex, abstract shape that loops around the text and circles, resembling a stylized figure or a path.

## **Hi-Phi International Conference**

**23-24 June 2022**

**Faculty of Sciences of the University of Lisbon**

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# WELCOME ADDRESS

The Hi-Phi International Conference aims at fostering the debate between the History of Science and the Philosophy of Science communities by integrating not only independent studies of both disciplines, but also those that stand at the interface of History and Philosophy of Science.

The idea for this conference stems from the joint forces of the two research units – the Centre for Philosophy of Sciences of the University of Lisbon (CFCUL) and the Interuniversity Centre for the History of Science and Technology (CIUHCT) – in partnership with the Department of History and Philosophy of Science of the Faculty of Sciences of the University of Lisbon (Ciências ULisboa).

The goal of this meeting is to relink different communities and facilitate the dialogue between senior and junior researchers, but also between historians and philosophers that often work apart. Therefore, the dialogue between History and Philosophy of Science will be promoted by gathering in the same session presentations focused on the same topic, but from the perspective of each of the disciplines, in order to establish scientific bridges and foster community building of historians and philosophers of science.

The conference is organised following seven main axes, namely:

- History and Philosophy of Life Sciences;
- History and Philosophy of Environment;
- History and Philosophy of Logic and Mathematics;
- History and Philosophy of Physics;
- History and Philosophy of Technology;
- Science and Art;
- Science and Ethics.

Ana Duarte Rodrigues; João L. Cordovil; Henrique Leitão; Pedro Freitas

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# INVITED SPEAKERS

## **Fabrizio Baldassarri**

Ca' Foscari University, Venice

### **Vegetare: The Life of Plants in Premodern Science. Obscurities and Innovations**

Premodern scholars inherited from Aristotelian tradition the general claim that the life of plants is an obscure subject of investigation and definition. If, on the one hand, the work on plants and vegetation composed a section of medical studies and a field for natural historical collections, on the other hand, the definition of plant life presented several difficulties. This was connected to Aristotle's demise of plant life, which affected all philosophical tradition up to the Renaissance, when a revival of Platonic and Galenic interpretations fueled a new interpretative line. In this context, the life of plants emerged as a subject disquieting the traditional interpretation of life, as Guido Giglioni has recently claimed. Indeed, the vegetal world became the subject of philosophical investigations throughout the Renaissance, drawing serious attention from scholars. In my presentation, I aim to explore this new attention to the life of plants, and the diverse definitions of plant life, from the 150 years that run from Julius Caesar Scaliger's work and Nehemiah Grew's texts. My goal is to reconstruct the importance of vegetation in the philosophical investigations of life and living nature, ultimately showing the obscure corners and the innovative features of this field in premodern science of nature and life.

**Jutta Schickore**

Indiana University

**Causation, Observation, and Experiment: Reflections on Practical Inquiry in the German Lands Around 1800**

This paper examines reflections on the nature of causation in German science in the decades around 1800, specifically in those sciences that concern human health and prosperity. Reflective practitioners, some academic philosophers, and educators discussed how to identify and exploit cause-effect relations in practical contexts such as making medicines, growing plants, extracting metals from ores, and warding off superstition. These inquirers developed heuristics as well as evaluative criteria for finding and assessing hypotheses about cause-effect relations and discussed how experiments and observations could assist in this endeavor. Their writings on “applied logic” [angewandte Denklehre] connect the practical problems of scientific inquiry with the lofty discourse on the metaphysics and epistemology of causation in Kantian philosophy.

**Stathis Psillos & Stavros Ioannidis**

University of Athens, Greece

**Mechanisms in Science: from Metaphysics to Practice**

A main aim of the currently popular mechanistic philosophy has been to find a common and general notion of mechanism in the sciences present in many different scientific fields. Such a concept is commonly thought to have both methodological value, as well as ontological significance. So, the concept of mechanism has a double role: it can be (and has been) used to understand scientific

practice, but also to construct a comprehensive metaphysics of nature.

In contrast to this widespread view, in our new book *Mechanisms in Science: Method or Metaphysics?* (Cambridge U.P. 2022) we argue that a promising candidate for the methodological role of mechanism in science is a Causal account of Mechanism (CM), according to which a mechanism is a causal pathway that produces a phenomenon. We compare the methodologically-based CM with the main competitors in the literature that focus on metaphysical aspects of mechanism or take relations of constitution (and not only causation) to be central in characterising mechanisms. We argue that, in contrast to such metaphysically inflated views of mechanism, CM offers a characterisation of mechanism as a concept-in-use in science that is deflationary and metaphysically neutral (and as such, it does not make any general ontological assertions about the ‘deep’ nature of causal processes), but still methodologically useful and central to scientific practice.

The present keynote will have two parts. In first part, we will focus on presenting the main features of CM, i.e. (1) that mechanisms are to be identified with causal pathways, (2) that causal relations among the components of a pathway are to be viewed in terms of difference-making; and (3) that CM is metaphysically agnostic. CM will be placed in the context of a thesis we call *Methodological Mechanism* (MM). According to MM, commitment to mechanism in science should be viewed as a methodological stance, that is, as a call for a certain type of explanation. MM argues that the very issue of the ontic status of mechanisms is irrelevant to the role mechanisms play in scientific practice.

In the second part, we will argue that non-causal constitutive relations are not required to understand what a mechanism is in scientific practice and present an alternative view of multi-level mechanistic explanation. According to a common view, ‘levels’ in multiple-level explanations are levels of mechanisms and

mechanistic multi-level explanations are instances of constitutive explanations. We argue instead that levels and mechanisms are distinct notions and that levels of nature and of multi-level explanations are levels of composition. According to this alternative account, multi-level mechanistic explanations are causal explanations that identify particular causal pathways, where the components of the pathway can be at different levels of composition.

In sum, the main claim of the talk is that when it comes to practice, CM is enough for having a general understanding of mechanisms and their role in science.

## **Valeria Giardino**

CNRS / Institut Jean Nicod

### **Diagrammatic proofs: old questions and new challenges**

In this talk, I will analyze the notion of diagrammatic proof in the context of the practice of mathematics. First, I will specify how “diagrammatic proof” has to be intended in comparison with other proofs. To this aim, I will present the philosophical arguments that were given at the end of the 19th century and the beginning of the 20th against its validity and the reasons for revising them. Second, I will focus on the practice of mathematics and point out that it implies “trafficking in heterogeneity”, to employ the term used by Emily Grosholz in her criticism of the Russell-Carnapian tradition in logic. Third, I will examine some examples of diagrammatic proofs both in Euclidean geometry and in contemporary mathematics that have been discussed in the literature. To conclude, I will consider the consequences of accepting them as valid for a philosophy of the practice of mathematics.

# SUBMITTED PAPERS

**Adán Sus**

University of Valladolid

## **Spacetime and Dynamical Symmetries in Relativity. An Alternative to the Dynamical Approach**

In GR, locally (in neighbourhoods where curvature terms can be ignored), the laws for all the non-gravitational fields are Poincaré invariant and this invariance coincides with the symmetries of the metric. In this talk I will challenge the position, recently defended in a number of papers (see, for instance:), that claims that these facts must be considered as brute facts, unexplainable or miraculous in GR. The original miracle claim is motivated by noting that, on the one hand, the so-called geometrical approach (GA) to relativity is insufficient in providing an explanation of these features of non-gravitational laws (neither does it provide a credible story of the coincidence nor it is able to account for the contingency of the feature) and, on the other, that for the dynamical approach (DA) the claim is a natural extension of its defining motto of regarding the spatiotemporal character of the metric in special relativity (SR) as a consequence of the fact that matter laws are Poincaré invariant. Under the perspective of the DA, the chronogeometricity of the metric in GR is a consequence of the coincidental fact of local symmetries of non-gravitational laws being the same as the symmetries of the metric that is governed by the Einstein field equation. This so-called second miracle of relativity is also the content of what has been called the strong equivalence principle

(SEP). My contention is that neither the Poincaré invariance of matter laws in SR nor the coincidence, locally, of this invariance with the symmetries of the metric field in GR must be taken as miraculous; or at least not as much as it has been claimed by defenders of the dynamical perspective. Relativity theory has resources for providing an account of the miracles. The central idea of my proposed explanation consists in regarding the facts expressed in the miracles as a consequence of some principles, properly understood, that operate in relativity theory. In this talk I will explore an account of the relation between spacetime symmetries and dynamical symmetries alternative to the DA and the GA.

Linnemann, N., Read, J. "Miracles persist: A reply to Sus". *European Journal for the Philosophy of Science*, 12.

Read, J., Brown, H., Lehmkuhl, D. (2018). "Two miracles of general relativity". *Studies in History and Philosophy of Modern Physics* 64, 14-25.

Sus, A. (2021). "Relativity without miracles". *European Journal for the Philosophy of Science* 11(33), 1-33.

## **Adrià Segarra**

University of Cambridge, Department of History and Philosophy of Science

### **A Hybrid Theory of Induction**

In this talk I present a Hybrid Theory of Induction (HTI), in which I articulate the role of both rules and local facts in understanding inductive support. I take a theory of induction to be an account of inductive support. Approaches to induction can be roughly divided into formal and material. According to formal theories of induction, inductive arguments are warranted by rules, like those of Bayesianism, which allow us to articulate measures of inductive support. No rule of induction, however, provides a correct universal account of inductive support (Norton (2005); Lipton (2004, ch. 1)).

According to material theories of induction, inductive arguments are not warranted by rules but by matters of fact. Norton (2021), in particular, convincingly argues that inductive arguments are warranted by local facts about the matter of the induction. Material theories, however, don't provide accounts of inductive support (e.g. Peden (2019, §3.2)). As a consequence, material theories are not full-fledged theories of induction but (narrower) theories of inductive warrant. In developing the HTI I articulate an account of inductive support that takes on board Norton's lessons on inductive warrant. According to the HTI, warranted rules of induction accurately describe relations of inductive support, and a rule of induction is warranted if the right facts about the matter of the induction obtain. This view acknowledges that we need rules of induction in order to articulate measures of inductive support, and we need local material facts in order to define the domains of application of those rules. I argue that this view is actually widespread in contemporary and classic literature, although not explicitly stated. Consequently, I hope the HTI can be a useful lens to examine historical views on induction by bringing the role of rules and matters of fact into focus.

Lipton, P. (2004). *Inference to the best explanation* (2nd ed.). London, UK: Routledge.

Norton, J. D. (2005). A Little Survey of Induction. In P. Achinstein (Ed.), *Scientific evidence: Philosophical theories and applications* (pp. 9–34). Baltimore: Johns Hopkins University Press.

Norton, J. D. (2021). *The Material Theory of Induction*. BPS Open. Calgary, Alberta: University of Calgary Press.

Peden, W. (2019). Direct Inference in the Material Theory of Induction. *Philosophy of Science*, 86(4), 672–695.



## **Allie Richards**

University of Lisbon / CFCUL

### **Conspiracies and Counter-evidential Reasoning**

Scientific theories have been known throughout history to have a robustness despite disconfirming evidence. Within a Bayesian framework, this can be explained as instances when auxiliary hypotheses, which connect beliefs to observational data, become ad hoc in order to save a central hypothesis. That is, the auxiliary hypotheses form a “protective belt” in which they are called upon to absorb most of the blame in light of incoming disconfirming evidence. In some cases this has been successful and beneficial for discovery, while others have not. The former cases are what (Strevens, 2001) describe as ‘glorious rescues’, and the latter as ‘desperate rescues’. This project aims to analyze the reasoning behind such behavior. More specifically, I propose an alternative framework using Horty’s (2012) theory of reasons, formulated in terms of default logic. While Strevens’ formulation gives a quantified explanation of this sort of behavior, a default logic model provides a qualitative account of how our reasons arrive at certain conclusions. In my models, I use historical examples such as the discovery of Neptune, and the Copernican Revolution as test cases.

Gershman, S. J. (2019). How to never be wrong. *Psychonomic bulletin & review*, 26(1), 13-28. Horty, J. F. (2012). *Reasons as defaults*. Oxford University Press..

Lakatos, I., Worrall, J., & Currie, G. (1979). The methodology of scientific research programmes: philosophical papers. *British Journal for the Philosophy of Science*, 30(4).

Strevens, M. (2001). The Bayesian Treatment of Auxiliary Hypotheses. *British Journal for the Philosophy of Science*, 52(3).

## **Almira Omarova**

Jawaharlal Nehru University, New Delhi

### **Evolution of Morality: A Biological Approach to Ethics**

The relationship between science and ethics is one of the challenging philosophical questions. For decades, many philosophers tried to reconcile science and ethics. Logical positivists and expressivists argued that moral statements are nothing but our mere expressions of emotions of approval or disapproval of a specific state of affairs; thus, moral facts do not exist.(1)

In their book *Evolutionary Moral Realism*, John Collier and Michael Stiglitz develop a biological approach towards morality. They suggest that evolution and a biological drive in humans have impacted people's moral and collective skills, thus prompting self-individuals to form close alliances and construct complex societies. The authors say that "...morality is not a negligible aspect of the biological world, arising late in the evolutionary day with the appearance of humans. It is a deeply significant aspect of the evolution of species that are social and intelligent, from near their very beginnings."(2) Collier and Stiglitz also state that "human morality becomes a special case of a broader biological phenomenon."(3)

One of the principal problems in the history of moral philosophy concerns moral realism. Moral realism is more than a doctrine about moral facts and properties. Many controversial theories argue that moral facts cannot be considered a part of the scientific picture of the world because they are unverifiable. Later developments in psychology and neuroscience have brought many exciting outcomes, mainly that moral facts might result from evolutionary processes. Evolution is part of the scientific worldview. Hence, it is crucial not to exclude ethical considerations from the scientific domain.

This paper will examine how the history of evolution has impacted our most valuable ethical deliberations in practice. It will also discuss how our biological approach towards morality has motivated humans to develop moral norms, thus laying the foundations of moral normativity.

(1) Alfred Jules Ayer, *Language, Truth and Logic*, Dover Publications, Inc., New York, 1952.

(2) Allan Gibbard, *Wise Choices, Apt Feelings: A Theory of Normative Judgment*, Clarendon Press, Oxford, 1992.

(3) Simon Blackburn, *Essays in Quasi-Realism*, Oxford University Press, 1993.

(4) John Collier and Michael Stingl, *Evolutionary Moral Realism*, Routledge, New York, 2020.

## **Ana Duarte Rodrigues**

CIUHCT

### **The Idea of Nature in Herrera's Book of Agriculture (1513)**

The Spanish gardener Gabriel Alonso de Herrera wrote the first treatise on agriculture in a European vernacular language in 1513. It was written in Granada just after the conquest of the Catholic Kings to the Moors in 1492. Therefore, I argue that its importance stems, not only because it is the first book of this genre written in Castilian, but because it is the only one to incorporate both classic and Islamic influences. I will demonstrate that two ideas of nature are at stake. The Aristotelian conceptual framework of the four humours, influential to all European intellectuals, and the Islamic conceptualization of natural phenomena. On this regard, I will take into consideration above all the botanical theories formulated by al-Tignari, who wrote a twelfth-century Arabic agricultural manual, *Kitab Zuhrat al-Bustan wa-Nuzhat al-Adhan* (The Book of the Brilliance of the Garden and the Recreation of Minds). This book is especially important as it was presented to the Almoravid emir of

Granada circa 1110 and was frequently quoted by the most famous of Andalusian writers on agronomy, such as Ibn al-Awwam (Seville) and Ibn Luyun (Almería). Essentialist assumptions, meaning the human predisposition to believe that a hidden causal essence is responsible for the properties of certain categories, labelled in English usually as 'soul', 'nature', and 'life force', can be found there. The natural categories in al-Tignari's texts are those that represented in living organisms, such as figs, and natural substances, such as water. In this talk, I will reveal the evident influence of Aristotle's ideas of the elemental qualities of the sublunary world, as in other European agronomic books. However, I will also demonstrate that parallel to this, Herrera was not only influenced by Ibn Wafid, but by a larger universe of Arabic sources and contacts, which could have included al-Tignari.

### **Andrea Olmo Viola**

University La Sapienza, Rome

### **Darwin's Prediction: History and Epistemology Entangled**

In the 19th century the debate on predictivism developed, from that moment on became a classic in the philosophy of science. Nowadays, there are differences concerning the correct conceptualization of the value of predictions and the reconstruction of historical cases of growth of scientific knowledge. The debate has been extended to evolutionary biology and has represented an opportunity to refine the conceptualization of the value of predictions. One exemplar has occupied a privileged place in this domain: Darwin's prediction of the pollinating moth of the orchid *Angraecum sesquipedale*. I analyze how the standard interpretation of this prediction, both the historical account and the epistemological analysis, is vitiated by a falsificationist perspective, which focuses on the valorization of risky predictions, and I enrich

the analysis with the consideration of further anomalies that have not been highlighted to date. I argue in favor of the application of different epistemic interpretative tools, based on a pluralistic, non-reductionist, pragmatic perspective, having as aim the correct valorization of Darwin's prediction. For what concerns the historical reconstruction, I argue that without the appropriate epistemological glasses, forged by a pluralist perspective, tuned on the historical context, the real history of science appears irrational in its dynamics. It is difficult to identify a privileged level of analysis, or a perfect epistemic tool capable of exhaustive explanations, history and epistemology are complexly entangled and contextual balancing is needed to understand the dynamics of the growth of scientific knowledge.

### **Antonino Drago**

University "Federico II", Naples

### **The Emergence of Biology's Foundations from the Two Major Narratives of its History**

Gould stresses that since some centuries there exists inside this science a deep divergence between two approaches, i.e. functionalism and structuralism (1). I trace back this divergence to Leibniz's two labyrinths of human reason (actual infinity or potential infinity, freedom or law) which I interpret as two dichotomies, one on the kind of infinity and one on the kind of the organization of a theory (which is translated by latter Leibniz's labyrinth in terms of subjective feelings) (2). The divergences among the four couples of choices on these dichotomies give reason of: 1) the paradigmatic role played by Darwinism in the history of theoretical Biology; 2) the clash which occurred between Darwinism and Mendelism in past times; 3) the present contraposition, underlined by Gould, between the two

interpretations of Biology; 4) the radical variations in meaning of the common notions of the two interpretations; these variations constitute a peculiar phenomenon of two theories which are mutually incommensurable (I define incommensurable two theories differing in their basic choices on the two above dichotomies); 5) the structure of Mendel's theory, obtained through a particular logical analysis of the original text.

(1) Mayr E. (1972), *The Growth of Biological Thought: Diversity, Evolution, and Inheritance*, Lakonia NH: Belknap Press. (Italian translation Torino: Bollati Boringhieri, 1982, pp. 10 and 58). Gould S.J. (2002), *The Structure of Evolutionary Theory*, Harvard: Harvard U.P., pp. 251-232, 261, 505-506.

(2) Drago A. (1994), "The modern fulfilment of Leibniz' program for a *Scientia generalis*", in Breger H. (ed.), *VI Int. Kongress: Leibniz und Europa*, Hannover, pp. 185-195.

## **Barton Moffatt**

Mississippi State University

### **Is there a Role for the History of Science in Research Ethics Education?**

The ever-growing expansion of research ethics mandates has greatly increased researchers' exposure to basic concepts in the responsible conduct of research (RCR). There is an active debate on the sufficiency of current models of research ethics education (Resnik 2014). Some argue that while RCR training is good at imparting knowledge of research ethics principles, there is little evidence that research ethics education changes researcher behavior (Plemmons, Brody and Kalichman 2006). Mentorship is the key to effective research ethics education. Junior researchers are moral apprentices needing the guidance of a knowledgeable practitioner. A key part of this mentoring education is communicating the moral norms that structure good research

behavior and instilling a commitment to uphold these values moving forward. When done poorly, mentoring of the wrong sort leads to a willingness to bend the rules and commit questionable research practices (Anderson, Horn, Risbey et al. 2007). When done right, research ethics mentoring produces future generations of ethical researchers.

History of science is an essential part of this educational process. The research ethics community needs to draw on historical examples of ethical behavior to serve as role models for apprentice researchers. Science has made extraordinary progress in understanding the modern world. Our perspectives on research ethics should discuss and reflect on the sacrifices and achievements of the communities that created that knowledge. Specifically, I argue that ethics education should take a historical approach and highlight the types of good ethical behavior that create and maintain flourishing epistemic communities. This is not a call for Whiggish history in which scientific geniuses are lauded for their correct views, but rather a call to unearth a series of diverse research practitioners who made scientific results possible by their contributions and to use these examples as moral exemplars in RCR.

Anderson, MS, Horn, AS, Risbey, KR, Ronning, EA, De Vries, R, & Martinson, BC. (2007). What do mentoring and training in the responsible conduct of research have to do with scientists' misbehavior? Findings from a National Survey of NIH-funded scientists. *Academic medicine: Journal of the Association of American Medical Colleges*, 82(9), 853–860.

Plemmons, DK, Brody SA, Kalichman MW. (2006). Student perceptions of the effectiveness of education in the responsible conduct of research. *Sci Eng Ethics* 12(3):571-82.

Resnik, DB. (2014). Does RCR education make students more ethical, and is this the right question to ask? *Account Res* 21(4):211–217.

**Bican Polat<sup>1</sup> & Frank Zenker<sup>2</sup>**

<sup>1</sup>Johns Hopkins University, <sup>2</sup>University of Hamburg

**At the Interface of History and Philosophy of Science:  
Attachment Theory as a Case Study in Theory Construction in  
Psychology**

This talk combines historical and philosophical methodologies to critically evaluate some of the key debates surrounding attachment theory, a psychological paradigm about parent-child relationships. We focus on the empirical research program developed by Mary Ainsworth at Johns Hopkins University in the 1970s and examine how an observational procedure she designed helped establish an “empirically progressive” research paradigm in developmental and social psychology (Lakatos 1970). Ainsworth’s Strange Situation Procedure allowed for the classification of individual differences in children’s attachment relationships on a scale ranging from “secure” to “insecure” types and formalized the psychometrically validated construct of “attachment security” (Ainsworth et al 1978). Building on this exemplar (Kuhn 1970), Ainsworth’s followers have placed attachment theory within a statistical network, which enabled the correlation of its constructs with other quantifiable indicators of psychological distress and well-being.

Here, we describe some of the key measures and concepts that attachment researchers have developed since the 1980s as they have critically built on the classification system of the Strange Situation Procedure. Based on an empirically grounded history of science approach, we review some of the conceptual and methodological controversies that have occupied the attachment community over the past four decades. We suggest that a philosophy of science and philosophy of statistics perspective can shed critical light on these controversies. Our discussion centers on a philosophical analysis of the replication problems in attachment research and a critique of the metanalytic approaches often



employed by psychologists to address these problems. Using attachment research as a case study and working at the interface of history and philosophy of science, this talk thus illustrates how an interdisciplinary dialogue can be fostered across historians and philosophers who are specialized in science studies.

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Polat, B. (2021). *Mental Hygiene, Psychoanalysis, and Interwar Psychology: The Making of the Maternal Deprivation Hypothesis*," *ISIS, Journal of the History of Science Society*, 112 (2): 266-290.

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## **Blanca Luque**

University of Lisbon / CFCUL

### **The Role of Auguste Comte's Biology in the Positive Philosophy**

The purpose of this work is to address the role of Auguste Comte's biology in the development of the positive method of knowledge, exposed in the *Cours de Philosophie Positive* (1830-1842) through

the classification of the sciences that organize the encyclopaedia. The influence of this work on nineteenth-century thought is as undeniable as the rejection of its doctrine is today, especially from the use of the term “positivism” by the “empiricists or logical positivists” of the well-known Vienna Circle. However, paradoxically, the return of the naturalism at the end of twentieth century (Kitcher, 1992) and its great diffusion until our days, has promoted a re-reading of Comte since the study of Comte helps to clarify the implicit positivist assumptions in some of the so-called naturalist positions.

Our aim is, therefore, to contribute to the understanding of Comtean positivism aiming to show that this analysis has relevance for current philosophy of science. In this sense, biology becomes especially pertinent.

Within the encyclopaedia, biology occupies the penultimate place, a scientific disadvantaged place according to Comte, but an epistemologically ‘strategic’ position for most of his current commentators. This science is the link between the studies related to the inert world and those that refer to the living world. Within it, we will pay special attention to the last section, i.e., cerebral physiology, because in it the subordination of analytical methods by synthetic methods for the study of knowledge takes place. This subordination supposes, according to Comte, the end of the “fatal antagonism” between the conceptions referring to man and those referring to the “external world”. Therefore, the relevance of this science is linked within the encyclopaedia, to the possibility of establishing the general system of knowledge for which the *Cours* was created; and within current philosophy, to the possibility of shedding light on the conceptual foundation of current naturalistic positions.

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**Carlos Oliveira, Raphael Cassou,  
Walder Gervásio Virgulino de Souza**

Federal University of Rio de Janeiro State (UNIRIO)

**The Medical Theatre: from Charcot to Grand-Guignol**

This paper deals on the interrelationships between the neurology classes held at La Salpêtrière Hospital and the plays staged at the Grand-Guignol Theatre. On the surface, they have a common time and space – the end of the XIXth century and the periphery of Paris, the city of light. Clearly, from the first dissections practiced in the Italian Renaissance anatomical theatres on, vision became the dominant sense to Medicine. Vesalius' *Humani Corporis Fabrica* with its dramatic plates of skeletons in postures worthy of Hamlet has contributed to reinforce it, reaching a climax with Rembrandt's masterfully taught Anatomy Lesson of Dr. Nicolas Tulp.

Jean-Martin Charcot's extensive iconographic archive is inscribed in this tradition. Here, however, medical visualization through photographic capture generates a mutual seduction at the level of the image between doctor and patient, transforming in Didi-Huberman's words the hysterical into objects of art.

In parallel, the Grand-Guignol, in its search for the épouvantable,

made crimes and mental illnesses a rich source of dramaturgy. The collaboration of several of Dr. Charcot's students to Guignol's plays enhanced the affinities between the performances of the hysterics at La Salpêtrière and theatrical presentations. In particular, Dr. Alfred Binet, considered one of the fathers of French psychology, together with the playwright André de Lorde produced a set of plays sometimes described as "le théâtre médical".

Binet and de Lorde frequently staged mental illness as a pathological performative issue that not only infected society, but also affected medicine itself. In a *mise en abyme* phenomenon, it is possible to observe the continuous exchanges between the medical discourse of La Salpêtrière and the plays of the Grand-Guignol as an immense hall of mirrors, in which science and art distortedly reflect their images.

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Lorde A. de; Binet, A. et al. *La folie au théâtre*. Paris: Fontemoing, 1913.

Marshall, J. W. *Performing Neurology: The Dramaturgy of Dr Jean-Martin Charcot*, Londres: Palgrave Macmillan, 2016.

## **Carlos Sierra**

University of Antioquia

Centre for Science, Technology and Society (SOCITEC)

## **Life as Process. Philosophical Foundations for a Metaphysics of Biology**

The main purpose of this paper is to present certain lines of general reflection on the processual nature of life that are being developed in the field of the philosophy of biology. This conception of life as a continuous stream -SLC- (Daniel J. Nicholson), of which historical precedents can be found in the approaches of Whilliam Whewell, Thomas Henry Huxley or John Scott Haldane, respond to an

attempt to overcome the schemes of understanding of life established by both traditional physicalist mechanicism (through the antivitalist reformulation promoted by the Berlin physiological school in the mid-19th century) and by certain currents ascribed to the new mechanistic philosophy (NMP) that emerged in the early 1990s. From this point of view, the emergence of a metaphysics or speculative philosophy centred on "process" as a way of understanding the constitutive dynamics of life means, to a large extent, establishing new epistemological bases for biology. It can thus be understood that biology must come of age and claim an autonomy in terms of its epistemological idiosyncrasy that distances it from the reductive and essentialist models of physical science. Moreover, this implies questioning substantialism, causal integrity, as well as onto-epistemological frontierisation and the hierarchisation of life processes.

This alternative approach which addresses an intrinsically dynamic and stochastic reality of the vital phenomenon (promoted, among others, by Adam Ferner, Johanna Seibt, Stephan Guttinger or John Dupré) implies, in short, a necessary convergence with certain philosophical theses that are outlined or developed, without the need to go back to the ancient theses of Heraclitus, in the works of Friedrich Schelling -and his philosophy of nature-, Alfred North Whitehead -and his philosophy of the organism-, Henri Bergson -and his thesis on creative evolution- or John Locke -and his account of mental operations-.

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- Zammito, J. H. (2018). *Philosophy and Physiology from Stahl to Schelling*. Chicago & London: The University of Chicago Press.

## **Carolina Resende**

University of Lisbon

### **Forecasting the Future in Seventeenth-Century Portugal: The Almanacs of Francisco Guilherme Casmach**

The main goal of this paper is to study two astrological almanacs written by Francisco Guilherme Casmach (1569-?) in 1644 and 1646. Casmach was a Portuguese surgeon who served as court astrologer to King D. João IV (r.1640-1656). After the Restoration in 1640, he produced two prognostics for the years of 1645 and 1646 that supported the new political regime and stood out for their rich prose and content. Here, I seek to go beyond Casmach's motivations for publishing these prognostics and to focus, instead, on the accuracy of his astrological techniques and knowledge. These almanacs have been known to historians for some time, and previous studies, namely by Luís Miguel Carolino and Carlos Ziller Camenietzi, have addressed them in relation to a quarrel between Casmach and Manuel Galhano Lourosa (fl. 1643-1674), arguably the

most famous Portuguese astrologer of this period. At stake was the authorship of a work about a plague of locusts in 1639. Over the years, the two astrologers publicly questioned each other's practices and knowledge. A detailed scrutiny of the controversy reveals that Casmach's criticism of Lourosa's work were not unfounded. On the contrary, Casmach's calculations of the astrological figures were more accurate and his judgements were more detailed, revealing a greater knowledge of the rules and techniques and the ability to apply them. So, the validity of Lourosa's predictions was briefly put into question. By shedding light on these episodes, this paper will contribute to the growing scholarship on astrological knowledge and practices in seventeenth-century Portugal and to support the argument that Lourosa's main reasons for publishing annual predictions were indeed political, sometimes neglecting astrological thoroughness, as Casmach had argued.

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## **Carsten Reinhardt**

Bielefeld University

### **Chemical Residues as Result of and as Challenge for Regulatory Knowledge**

In the wake of industrialization, the availability of synthetic and natural chemical materials became a necessity for any societal and economic development. Today, we estimate that tens of thousands of different substances are produced worldwide. As a result, also the hazards of chemical production increasingly received public and political attention, if only gradually (e.g., Homburg and Vaupel 2019). During the twentieth century, governments tried to mitigate the resulting environmental and health problems by setting up a multitude of regulatory actions. The main challenge, however, for successful regulation rested in its dividedness and fragmentation. Production of chemicals is regulated either by their use (as a pharmaceutical, an intermediate, etc.), their environmental distribution (in soil, water, or air), or their properties (being toxic, carcinogenic, mutagenic, etc.) Up to the early 21st century, no comprehensive regulatory system did exist in the chemical sector, before the European regulatory framework REACH (Registration, Evaluation and Authorization of Chemicals) was proposed and implemented in 2007.

In my talk, I present both a historical and a normative argument. The historical argumentation rests on the analytical framework of chemical residues as a socio-material category (Boudia et al. 2018; Boudia et al. 2022). Residues, literally meaning remnants of chemical production, are made “invisible” after the main products of chemical technology have found their ways to markets and consumers. Their scientific, technical and legal “invisibility” is generated by the very same regulatory system that is supposed to deal with their hazardous properties. The normative argument asks for the inferences that regulatory knowledge should be able to



provide in order to successfully tackle the regulatory challenges of chemical residues (Reinhardt 2010).

Soraya Boudia, Angela Creager, Scott Frickel, Emmanuel Henry, Nathalie Jas, Carsten Reinhardt, Jody Roberts, "Residues. Rethinking Chemical Environments," *Engaging Science and Technology* 4 (2018), 165-178. DOI:10.17351/ests2018.245

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Ernst Homburg and Elisabeth Vaupel, *Hazardous Chemicals. Agents of Risk and Change, 1800-2000*, New York: Berghahn 2019

Carsten Reinhardt, "Regulierungswissen und Regulierungskonzepte," *Berichte zur Wissenschaftsgeschichte* 33 (2010), 351-364.

## **Charles Beasley**

London School of Economics and Political Science

## **Validity, Reliability, and Replication**

While the past decade has seen the replication crisis tear across the sciences, the debates have been overwhelmingly focused on formal issues such as p-value reforms, or questionable practices such as p-hacking or HARK-ing (Colling and Szűcs 2018). Recently, however, there has been a turn towards a more foundational issue: What is a replication? Answers to this question move beyond the mere categorization of practices of replication (Stroebe and Strack 2014) or arguments for the superiority of an existing type of replication, such as direct or conceptual (Pashler and Harris 2012), and instead venture to provide novel and general accounts of what replication amounts to. However, the existing attempts to account for replication have fallen short in their ambitions. They either continue to invoke bloated and convoluted typologies, distort the practice of

replication beyond recognition, or put forward proposals that are in no way actionable.

I will argue that replications are first and foremost experiments and that we can most fruitfully evaluate them in terms of their validity. Assuming that the validity of first order experiments can come in degrees, I will then argue that replications should also be seen as having degrees of validity. In doing so, I model replications as experiments along four dimensions: (1) 'With what degree of certainty is the phenomenon under investigation characterized and individuated?', (2) 'With what degree of certainty is the target experiment characterized and individuated?', (3) 'What is the goal of performing the replication?', (4) What are the criteria for relevant similarity between the causal structure of the replication experiment and its target?

By shifting to this account of replication that centers uncertainty, a clear sense of the diagnostic value of replication experiments can come into view. In doing so we can move beyond the language of crisis and towards more progress generating trust inducing practices.

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Irvine, E. (2021). The role of replication studies in theory building. *Perspectives on Psychological Science*, 16(4), 844-853.

Norton, J. D. (2015). Replicability of experiment. *THEORIA. Revista de Teoría, Historia y Fundamentos de la Ciencia*, 30(2), 229-248.

Pashler, H., & Harris, C. R. (2012). Is the replicability crisis overblown? Three arguments examined. *Perspectives on Psychological Science*, 7(6), 531-536.

Stroebe, W., & Strack, F. (2014). The alleged crisis and the illusion of exact replication. *Perspectives on Psychological Science*, 9(1), 59-71.

## **Charlotte Zito**

Università della Svizzera Italiana

### **Anaxagoras, Aristotle, Fundamental Particles and Dispositions: a New Argument Against the Infinite Regress Objection**

The aim of my presentation is to examine the metaphysics of properties of fundamental particles and to provide an innovative defense of dispositional essentialism against the argument of infinite regress by Psillos [Psillos, 2006]. My strategy will consist of two steps: I will argue that fundamental particles cannot be distinguished from their essential properties following Aristotle's theory of essences as it is developed in *Metaphysics*, VII.6. This means to conceive, say, an electron as essentially its mass, spin and charge, as indeed these are the values which allow us to identify a certain particle with its natural kind. After this I will claim that leptons, quarks and bosons possess only one state by adopting Anaxagoras' metaphysics of active powers [Marmodoro, 2017] that claims that the most fundamental blocks from which matter is built from cannot go from a state of potentiality to a state of actuality, as indeed they are constantly in one state. Applied to fundamental particles this means that it is not possible for them to change their status; indeed, a photon cannot suddenly change its property of having mass equal to zero. If something like this could happen, we would end up with a universe whose laws can change arbitrarily.

Thus, my conclusion will be that the Anaxagorean metaphysics of active one-state powers together with the Aristotelian conception of essences rules out any vicious regress, as the dispositional properties of particles are all that there is at the fundamental level and given that they are always active one-state powers, they do not need any further basis for their activation, as they are, again, always already active.

## **Cristian Soto**

CPNSS, LSE, UK  
University of Chile

### **Nomological Eliminativism: Writing the Last Chapter of the Laws of Nature's Biography**

Recent HPS investigations have contributed to shed light on the biography of laws of nature (Ott and Paton 2018, eds.; Daston and Park 2001; Ott 2009). The date of birth of the expression law of nature can roughly be traced back to early-modern natural philosophy, although some argue that we can find traces in late-medieval times and even in ancient Greek philosophy (Ruby 1986). On a different direction, it has come to be a matter of debate whether the life of the laws of nature, so to speak, may soon come to an end (Giare 1988, 1999; van Fraassen 1989), providing space for a view that calls for an understanding of science without laws. I call such view nomological eliminativism. Laws of nature, after all, may become an idle ontological posit, hence going the way of phlogiston or aether; likewise, linguistic conventions may gradually change, abandoning the laws of nature jargon in science and philosophy.

Among the main motivations for nomological eliminativism we find, first, that laws of nature are a vestige we inherit from the theological underpinnings of early-modern natural philosophy; second, that metaphysical views on laws of nature do not have a good fit with scientific practice; and third, that other elements from scientific theorising, such as models and symmetries, play the roles that were once attributed to laws.

One wonders, of course, how certain scientific practices could go about without laws, and how our views of ontology could be reshaped without them. In this article, after demonstrating that

nomological eliminativism's main motivations are largely insufficient, I further explore possible scenarios for the writing of the last chapter of laws' biography. I examine whether laws could undergo the fate of aether or phlogiston because of either ontological or conceptual change, hence showing that laws are dispensable after all. We shall conclude that, at present, the expression law of nature is restricted to provide a placeholder whose meaning can (and should) only be interpreted in view of local considerations regarding specific practices and histories of law-oriented epistemic disciplines.

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## **<sup>1</sup>Claudia Fernández & <sup>2</sup>Angel Nepomuceno**

<sup>1</sup>University of Málaga, <sup>2</sup>University of Seville

### **Interrogative Logic as Underlying Logic in Scientific Practices**

The well-matched union between logic and philosophy of science began with logical positivism and, in part, the structuralist approach. In the past decades, these disciplines have grown apart in isolation from one another. We want to reunite them by showing that an underlying logic to scientific practices can always be found.

We will present the main features of interrogative logic (a game with a player against an oracle (or model) with inferential and interrogative movements), i.e., the role of presuppositions and the epistemic nature of questions-answers. We want to suggest a representation of modal inferences (epistemic ones, in particular) within this logic.

We will also introduce a small modification of the interrogative rule, which allows us to tackle the problem of representing the logical treatment of abductive problems and, by extension, other forms of scientific reasoning. We will argue that this framework of the (modified) interrogative logic can serve as the representation of some scientific practices. Examples of applications of this idea will be given.

## **Claudio Davini**

University of Pisa

### **Explanation and Normativity. Challenging the Causal Role Theory of Biological Functions**

It does not seem entirely unreasonable to think that in the next few decades the rivalry between the consortium called ENCODE – ENCyclopedia of DNA Elements – and the Human Genome Project might be counted as one of the most relevant debates in the history of biology. Indeed, despite their common purpose, that is, sequencing the functional elements of the human genome, they do not agree about the percentage of the human genome to be considered functional [3, 4, 5] – while indeed the ENCODE consortium assigns function to 80% of the genome, the Human Genome Project's estimates amount to less than 10%.

But before rejecting or accepting one of those percentages, from a philosophical viewpoint it is necessary to discuss the meaning of biological function. Indeed, among other elements, the above

mentioned contrast is also believed to rest on a different way of conceiving such a notion. So first I introduce the two theories of biological function involved in the debate: the causal role theory [1, 2] – which holds that the function of a part of a system consists in its contribution to some system-level effect that effect has been picked out as especially interesting by researchers – and the etiological theory [6, 7] – which states that the function of a given biological trait is whatever it was selected for by natural selection. Then I argue that in order to effectively make sense of the explanatory dimension of biological functions – namely, the reason why a given trait is there – and their normative dimension – meaning that a theory of biological function should be able to elucidate that it is possible for a given trait to have a function that it cannot currently perform – the causal role theory cannot but make an implicit appeal to natural selection.

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2. Cummins, R., 1975, «Functional Analysis», *Journal of Philosophy*, 72, pp. 741–765
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8. Neander K., 2017, *Mark of the Mental: In Defense of Informational Teleosemantics*, Cambridge, MA: MIT Press

**Daniele Molinini**

University of Lisbon / CFCUL

**Proof Validity in Historical Perspective**

Several studies have revealed the limits of an understanding of the practice of proving theorems in mathematics only in terms of the notion of logical validity. What these studies highlight is that, when looking at their proofs, mathematicians sometimes adopt a richer and more general notion of validity that is not limited to logical analysis. For instance, several studies on the notion of purity of methods in mathematics have shown how, according to some mathematicians, a legitimate proof of a theorem is only that which appeals to notions that are not extraneous to the theorem in question. And this even when other proof approaches to the same theorem, equally valid from a logical point of view, are available. Another example comes from the study of the role of diagrams in ancient Greek mathematics. In that context, diagrams did not have a merely heuristic function and mathematicians relied on the manuscripts' diagrams as part of the arguments. The goal of the present talk is to contribute to these second order discussions on proofs by providing an investigation of the cross relations that exist between the practice of proving theorems and the social dimension in which this practice takes place. More precisely, using a case study from the history of mathematics, I will show how a philosophical view may constrain the conceptual tools used to prove theorems and affect the standards of proof validity that are adopted by a specific community of mathematicians. I will argue that such an analysis highlights how the concept of proof validity cannot be captured solely in terms of purely intra-mathematical considerations. Moreover, it reveals the key role that an historically informed study of mathematical practice may have in deepening our understanding of notions, like that of valid proof, that are central to philosophy of mathematics.



**David Lambert**

Bielefeld University

**First Steps to a Sound Pluralist Stance in Philosophy of Psychiatry**

Currently, pluralism is a default but sometimes not a particularly well-formulated stance for many philosophers of science. From a historical perspective, this default is a relatively recent development (Ludwig and Ruphy 2021). This may explain why concern with what it means to assume a pluralist stance has not been too extensive despite some influential exceptions (e.g., Kellert et al. 2006; Chang 2012; Ruphy 2016).

My aim in this talk will be to add to this discussion by approaching it from the metaphilosophical question of what it means to adopt a philosophical stance more generally (van Fraassen 2002; Teller 2004; Rowbottom and Bueno 2011; Boucher 2014; Boucher 2018a; Boucher 2018b). If we understand better the structure of a philosophical stance, then construing a pluralist stance profits from this improved understanding. According to analyses of the concept, a stance features some (relation to a) set of beliefs, attitudes, and values. We can classify them, and then we can group them together in various ways to generate a specific, coherent stance that is tailored to the needs of a field of research. In philosophy of psychiatry, a coherent pluralist stance—as in any other philosophy of the special sciences—will have to deal with the idiosyncrasies of the field (e.g., taxonomic, explanatory, causal as well as therapeutic, social, disciplinary, and other pluralities). That is, the beliefs, attitudes, and values associated with the pluralist stance must help us make sense of past and current scientific practices and be normatively useful since, as historians and philosophers of science, we want to be descriptively adequate of the practices

(Soler et al. 2014) and we think that certain ways of structuring research are preferable to others (e.g., Kitcher 2011).

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## **Deivide Garcia**

Federal University of Recôncavo da Bahia

### **Metaphors and scientific models in Darwin's Natural Selection**

Federal University of Recôncavo da Bahia

Metaphors and scientific models in Darwin's Natural Selection

This paper aims to offer an alternative account for understanding scientific models based on the metaphor approach. To do it, we borrow the of Darwin's use of metaphors, such as the introduction of powerful Being in his evolutionary theory from two books (2009 [1859], 2009 [1909]). According to Darwin, metaphors are useful to make economy of language, a way to brevity in explanatory matters (Darwin, 2009 [1859], p. 63). One example is "Natural Selection" as an intelligent mind, a Selector. On the other hand, Darwin extends the use of his metaphors beyond the limits of a mere brevity. Sometimes he applies a teleological grammar, such as "#given by the hands of Nature", or the "#face of nature bright with gladness" (Darwin, 2009 [1859], p. 49). This suggests the existence of Darwin's conflicting worldviews (Delisle, 2019) and opens the opportunity to think what role his metaphor of an intelligent mind plays in scientific models. According to our proposal, this role helps him to test his theory. To do this, we push forward issues of scientific models, as the imprecision in general understanding of scientific models, found in scientists and philosophers (Bailer-Jones, 2009; Frigg, 2020; Gerlee & Lundh, 2016). Finally, we present our account of models based on four features, a-simplification and selection; b-articulation of familiar-unfamiliar structures; c-accessibility and moderations of complexity, and finally d-local realism. We conclude by showing the adequacy of our philosophical blueprint for scientific models and metaphors.

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## **Eleni Angelou**

Philosophy Program CUNY Graduate Center

### **Is The Notion of Lawhood Continuous?**

Laws occupy a central position in the history of science: it is often admitted that the purpose of science is to discover the laws of nature. The hardcore scientific realist suggests that there is no distinction between scientific laws and laws of nature. It seems, however, that the two of them do not necessarily overlap. I analyze three approaches that endorse the distinction: a) that the laws of nature are inscrutable and all that can be accessed is scientific laws which are approximations of those of nature (agnosticism), b) that there are only regularities in nature and the job of science is to describe them (eliminativism), and c) that the distinction holds given the current state of scientific practice but the laws of science are progressively approximating the laws of nature until they eventually collapse into one another (approximationism). I reject approximationism on the grounds that there is not sufficient evidence in history that science progresses towards conclusively providing a theory of everything that would include absolute laws. I

argue that agnosticism pragmatically leads to nomological eliminativism. The latter should be preferred as it requires minimal metaphysical assumptions and explains the success of science.

## **Elisa Maia**

University of Lisbon / CFCUL

### **The Change in Practice in Analytical Chemistry – the Paradigmatic Example of the Determination of the Structure of Cholesterol**

Although familiar with the word cholesterol and being alerted by doctors and publicity for potential problems eventually related to its “amount” in the blood, most people have no idea of what cholesterol is, and how difficult it was to know its chemical structure. The importance of cholesterol, as a fundamental molecule in human/animal living processes, as a structural component of cell membranes and a precursor of steroid hormones or other vital substances like vitamin D and bile acids, is also usually ignored. In this communication, besides presenting some positive and negative features of this controversial compound, we intend to present the fascinating history of the discovery and isolation of cholesterol as well as of the challenges chemists had to face to establish its structural formula and finally to make its total synthesis and to determine the mechanisms of biological synthesis and degradation. All this process, that lasted more than two centuries, is a paradigmatic example of the inter-relations of the evolution of the conceptual frameworks in chemistry and the development of technology, in particular associated with the methods of analysis. The change in practice in analytical chemistry can indeed be illustrated by the evolution of the methodology of analysis followed by chemists in the process of trying to establish the structure of complex organic compounds

like this one. Using initially time consuming chemical reactions with large amounts of starting material, breaking down molecules, and recomposing later the “puzzles” of the fragments obtained, the analytical methodology evolved by the use of instrumentation gradually more sophisticated, producing quicker results and using much smaller amounts of compounds.

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## **Fabian Pregel**

University of Oxford

### **Deductivism: A New Appraisal**

Our topic is the philosophy of mathematics known as deductivism. Deductivism is the claim that a mathematical sentence  $s$  should be understood as expressing the claim that  $s$  deductively follows from appropriate axioms. Popular in the late 19th and early 20th centuries, deductivism then fell out of favour before being reinvented as structuralism later in the 20th century, a philosophy which in some form or another claims many adherents today. Surprisingly, given this history, there is little work devoted to deductivism, its history, its perceived failings, and the reasons structuralism supplanted it.

Deductivism is interesting and important for a host of reasons. Mathematicians take a result to be established only if it has been proved. It is natural to explore what happens if we take this one step further and take mathematical truth to be, not just established, but constituted, by the existence of a (possibly not yet known) proof. Second, many mathematicians profess to believe in deductivism or something like it. Third, deductivism is seen as

philosophically 'clean'. On the epistemological side, the deductivist's main task is to account for the epistemology of deductive logic—there is no further specific problem of mathematical epistemology. On the metaphysical side, the deductivist construal appears not to presuppose any abstract mathematical objects, which are often seen as problematic.

Our ambition is to offer an up-to-date and detailed appraisal of deductivism, in both its historical and philosophical aspects, that builds and improves on previous ones. We compare historical deductivist positions by Russell, Hilbert, Pasch and Curry. We then explore three objections to deductivism. We argue that the defects these objections highlight point to a semantic (structuralist) unfolding of the idea behind deductivism.

## **Federico Laudisa**

University of Trento

### **When did Locality turn into 'Local Realism'? A Historical and Critical Analysis**

According to a serious reading of the Bell 1964 theorem, quantum theory is a non-local but non-signalling theory: moreover, this result establishes that this status is not an accidental feature of a single theory, but applies to any theory that is supposed to extend quantum mechanics by incorporating its statistical predictions. The attempts to deflate the revolutionary impact of the theorem, however, started in fact very early and, with different tools and aims, still continue today. The more recent version of this deflationary attitude attempts to recast the issue of the meaning and implications of the Bell theorem in terms of a vague 'realism', a (far from well specified) condition whose conjunction with locality would be the alleged target of the theorem. Thus what is supposed to be the focus of the latter, jointly with the other (obvious)

assumption that quantum-mechanical predictions are to be preserved, is summarised in the expression local realism. Under the assumption of local realism, therefore, and provided quantum mechanics' predictions are taken for granted, a die-hard view takes the Bell theorem to be a result that does not establish non-locality but rather the impossibility of any 'realistic' account of the quantum phenomena. Since it can be convincingly shown that in the seminal Bell papers of the Sixties (Bell 1964, 1966) the crucial condition was only locality, with no need of any independent 'realism' condition (Laudisa 2008), I propose a historical and critical analysis of the stages through which, starting already from pre-Bell 1964 contributions (Jauch, Piron 1963), through important papers such as Clauser, Horne, Shimony, Holt 1969 and Wigner 1970, the locality condition almost indiscernibly turned into a 'local realism' condition, a circumstance which has led to serious misreadings of the import of the Bell theorem.

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## **Filippo Costantini**

Ca' Foscari University, Venice

McMaster University, Hamilton, ON

### **Leibniz's Characterization of Quantity**

The aim of this talk is to present the coordinates of Leibniz's notion of quantity in the 1680s. In those years, Leibniz conceived of *mathesis universalis* as a qualitative science of forms, where the notion of quantity has a subordinate role with respect to the notions of quality and similarity. Leibniz introduced the notion of quantity in an indirect way, via an abstraction principle (not very different from the way in which Frege will introduce the notion of number in the *Grundlagen der Arithmetik*). More specifically, Leibniz defines an equivalence relation – the relation of equality between two objects  $a$  and  $b$  – and he uses this relation to define what it means for  $a$  to have the same quantity as  $b$ .

This approach is extremely interesting, not only because it extends to other key notions, such as the notion of quality and the notion of *situs*, but also because it allows Leibniz to introduce a number of basic notions that he could not otherwise define. Moreover, this approach is in harmony with his philosophical reflections on the nature of mathematical entities as abstract and incomplete (as opposed to substances for which there is a complete concept).

In the first part of the talk, I shall explain the context in which this approach arises. The young Leibniz's dream of an "alphabet of human thought" was based on the idea that the analysis of notion could have led us to the discovery of the simple (i.e. not further analyzable) concepts. The recognition of the impossibility of such a project led him realize that, when dealing with terms referring to abstract objects, we should always consider them within the true sentences in which they occur. This centrality of the notion of sentence (or proposition) is what paves the way to the abstractionist approach of the 1680s.

In the second part of the talk, I will describe in detail this abstractionist approach. This will allow us to take a look at some key concepts of Leibniz's theory of quantity. Finally, I will point out the reasons why, starting from the 1690s, Leibniz would abandon this approach.

## **Gabriel Vallejos-Baccelliere**

University of Chile

### **The Protein Folding Problem and Recent Attempts to Solve It through Artificial Intelligence: A Philosophical Analysis**

In the last few years many science press media have declared that the protein folding problem (PFP) has been solved by artificial intelligence (AlphaFold, from DeepMind) that can predict the native 3D structure of proteins with very high exactitude [1]. It has even been said that, in the near future, this will replace techniques like X-ray crystallography and other commonly used to solve protein structures experimentally. But what does AlphaFold really solve?

In this work, we will perform an epistemological analysis of the PFP and the research agenda behind the pursuit of protein 3D structure prediction, and the place of Alphafold in this scheme.

First, we will consider the background assumptions behind AlphaFold and previous similar projects. Special attention will be paid to the role of theories and the biases that can emerge when large databases of experimental results are utilized [2].

Next, we are going to analyze what a native 3D structure really is [3]. Considering that proteins are highly dynamic and context-sensitive entities, the native structure turns out to be an idealization built based on various robust and detectable properties of proteins in restricted experimental contexts.

Finally, we will consider the role of purely predictive and

non-explanatory computational methodologies in structural biology. These methodologies will always need experimental and explanatory ones to be justified and calibrated; without them, it would be impossible to say, for example, when they have produced a novel prediction. But experimental techniques have also been benefited by the existence of these new and powerful computational methodologies, and not only structural biology but also other areas, like drug design. There is no such thing as an isolated methodology, so what matters is to analyse the role of each one and its peaceful coexistence and fruitful collaboration in the ever-increasing toolkit of biochemistry and structural biology.

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## **Giorgio Airoidi**

UNED, Madrid

### **'Thrice shalt thou deny me' or: three ontological reasons why the formalizations of the theory of natural selection betray Darwin's original idea about the origin of novelties**

Darwin's theory claims that phenotypic novelties appear and evolve as adaptations to environmental challenges under the creative action of natural selection upon random heritable phenotypic variations (Godfrey-Smith, 1999). While its original formulation in

the 'Origin' (1859) has a narrative form, several formalizations of the theory have been proposed, such as axiomatizations (Williams, 1970; Woodger, 1937), optimization programs (Charnov, 1976), population genetics models and the Formal Darwinism Project (Grafen, 2007).

These formalisations rely on primitive terms that, following Quine's suggestion (1953), reveal which entities and relationships we think the world is composed of. In this weak, epistemological sense, we can deduce the ontologies behind these formal models, to verify to what extent they actually reflect Darwin's idea.

It turns out that they do not with respect to the origin of novelties. This is in particular due to three weaknesses they all share. Firstly, they implicitly entail essentialist ontologies that do not explicitly include evolutionary novelties nor natural selection among their basic entities. Secondly, two of the entities they do include, phenotypic traits and ecological niche, cannot be fundamental entities of the biological world because of deeply interdependent and intentional concepts (Fodor & Piattelli-Palmarini, 2010). Finally, and most importantly, these ontologies make of selection an actualization power, and not a creative one, of a pre-existent design already encrusted in the environment. Far from providing an *explanans* of biological novelties, these formalization thus displace the problem of their origin from the organism to the environment. Moreover, these essentialist ontologies abstract from the temporal dimension of evolution, an important player in the generation of variations (Kauffman, 2000; Laland et al., 2015).

A successful formalization of the theory requires either a revision of the current essentialist ontologies or the adoption of a different kind of ontology, possibly a process ontology (Nicholson & Dupré, 2018), whose formalization could possibly include novelties as equilibrium states within the phenotypic space (Callebaut W & Rasskin-Gutman D, 2005).

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## **Giorgio Matteoli**

University of Turin

### **Historiography of Astronomy and the Birth of a General Historiography of Science: The Case of Jean-Étienne Montucla**

As it is widely acknowledged at least since Sarton (1936), Montucla's *Histoire des mathématiques* (1758, II ed. 1799-1802) stands out as the first attempt to write a comprehensive history of science from a

general point of view, i.e., the one provided by the mathematical sciences. However, very little is known about the context of emergence and publication of Montucla's work, the cultural arenas it was meant to intervene on, and the epistemological and historiographical agendas by which it had been prompted (Crépel, 2017). How did Montucla decide to dedicate himself to the (then not-so-popular) historical approach towards the sciences? Who were his closest role models in this enterprise? By retracing the earlier stages of Montucla's intellectual development (from the Jesuit Collège of Lyon and the Academy of Toulouse up to his arrival in Paris at the beginning of the 1750's, where he started his collaboration with the philosophes, entering most notably in the inner circle of D'Alembert's entourage) I will point out the role played on his education and scientific training by some astronomers who shared a keen interest in the history of their discipline, as recalled by Montucla and Lalande (1771) and (1803). One of them, the famous founder of the St. Petersburg Observatory Joseph-Nicolas De L'Isle, was even planning to write a general history of astronomy that remained unaccomplished. As I will show by relying extensively on manuscript sources, these mentors and friends would have figured in the *Histoire* of 1758 as direct sources or hidden inspiration, providing a strong link between the historiography of astronomy and the nascent general history of science as a literary genre.

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## **Graça P. Corrêa**

University of Lisbon / CFCUL

### **Theatre and Science: Historical Relations and Performance Perspectives**

This paper probes into the relation between theatre and science, with the aim of providing a critical awareness of their historical interaction, as well as of the changes that have taken place in the intersection between these divergent cultures.

Western theatre and science have a long history of interrelating, especially in their combined invention of stage technologies, starting with the ancient Greeks, continuing thru the early modern and modern periods, throughout twentieth century's modernisms and postmodernisms, and during our own "post-humanist" era.

Secondly, theatre has often dealt with the topic of science, not only by dramatizing the endeavors of scientists, but also by staging complex scientific ideas. Such a "theatre about science" became particularly dynamic in the twentieth century, at a time when science gained increasing recognition in parallel with a corresponding decline of support for the arts and humanities. Plays about science have been performed in a variety of aesthetic modes, ranging from conventional realism (Frayn's *Copenhagen*, 1998), post-symbolism (Glass's and Wilson's *Einstein on the Beach*, 1979), physical theatre (Landau's *Space*, 1999), to philosophical-performance lectures (Ait-Touati's and Latour's *Moving Earths*, 2020).

Establishing a third aspect of theatre-and-science interaction, major treatises on performer techniques and training have

adopted scientific principles of their contextual periods, helping pave a way towards a theatrical science. A few examples are Diderot's application of mechanics to physiology in his writings on theatre; Stanislavski's acting system based on the James-Lange theory of emotion; and Meyerhold's "Biomechanics" drawing upon Pavlov's studies on reflexology. Among the most recent directions of inquiry into this third kind of interdisciplinary relation, an engagement with cognitive and affective neuroscience stands out, as manifest in the practice-based research of Rhonda Blair and Bruce McConachie, among others.

Accordingly, this communication provides an overview of three kinds of interaction between theatre and science, which by no means exhaust the potentiality of their interdisciplinary combination.

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## **Guillermo Címbora Acosta**

University of Seville

## **Ludwik Fleck: From Biological Practice to Historical Epistemology**

The Polish microbiologist and philosopher of science Ludwik Fleck is known, fundamentally, for the influence he generated on Thomas



Kuhn's *The Structure of Scientific Revolutions* and for being one of the pioneers in applying sociological and psychological analyses to epistemology. For this reason, most of the commentators on his work have focused either on comparing the positions of Fleck and Kuhn, or on studying the cultural influences that led Fleck to develop a sociology of scientific knowledge. In this talk, our aim is to discuss another fundamental aspect of Fleck's work that has received much less attention: his analysis of scientific practices. In the first place, we will defend that his concern to account for these practices is what leads him to be interested in the sociological theories and the psychology of perception existing in his cultural environment. Secondly, we will try to show that, when these three perspectives (the study of scientific practices, the sociology of science and the psychology of perception) are integrated, the originality of the ideas of the Polish thinker appears more clearly. Finally, we will indicate the relationship that exists between these ideas and those of some of the main promoters of the philosophy of scientific practices (such as Ian Hacking, Andrew Pickering or David Gooding) and we will defend the interest and fertility of the perspectives opened by Ludwik Fleck a century ago.

### **Isabel Serra**

University of Lisbon / CFCUL

### **Galileo's Free Fall Motion: Experiment and Theory**

Galileo's creation of a new perspective on mechanics is seen as a fundamental step in scientific knowledge. Replacing the Aristotelian views with new conceptions of science, Galileo instituted the modern approach to the study of mechanical phenomena.

An illustrative example of the emergence of a new mechanics in

Galileo's work is the treatise "On local motion" inserted in *Two New Sciences*, "the book in which Galileo presented the mathematical theory of freely falling bodies which he had worked out some thirty years earlier".

Galileo's study of the free fall problem allows us to highlight his mathematical theory but also his insight into the scientific experiments he performed using strategies that have endured in experimental scientific research.

Although there has been widespread recognition of Galileo's work over the last five centuries, historians and philosophers of science are still today divided in their interpretation of its significance, both mathematically and experimentally. This is also the case for the work on the free fall problem.

In this communication, we intend to present what we believe to be the mathematical and experimental achievements of Galileo in the study of free fall, highlighting its importance in scientific development. We will also discuss some of the controversies that arise from different views and interpretations of Galileo's study which we will try to place within the framework of the philosophy of science.

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**Joan Bertran San-Millán**

University of Lisbon / CFCUL

**Peano's Geometry: From Empirical Foundations to Abstract Development**

In *Principii di Geometria* [1889] and 'Sui fondamenti della Geometria' [1894] Peano offers axiomatic presentations of projective geometry. While Peano's advocacy of the axiomatic method is well known, his view that the basic components of geometry must be founded on intuition is seldom considered (see, however, [Gandon, 2006] and [Rizza, 2009]).

I shall claim that there are two poles in Peano's construction of geometry. The first pole is the requirement of an empirical foundation of the basic geometrical concepts and propositions. Peano insists that the fundamental geometrical concepts (i.e., the notion of point and the relation of incidence between points) are acquired by experience and the axioms are determined by direct observation. I shall observe that, in a polemic with the Italian mathematician Segre, Peano rejects an abstract foundation of geometry that is disconnected from any intuitive character of the fundamental concepts. The second pole corresponds to the idea that geometry starts from axioms. These basic propositions are the result of a specific analysis of the properties of the basic concepts, but they do not properly define them. As Peano suggests, once the axioms are formulated, the specific nature of these concepts becomes irrelevant. I shall claim that Peano's notion of purity, the focus on the development of a logical apparatus that can regiment geometrical proofs, and his disregard of the specific meaning of the geometrical terms in the demonstration of theorems indicates his endorsement of deductivism.

By studying Peano's axiomatisation and his notion of purity, I shall argue that these two poles can be understood as compatible

stages of a single process of construction rather than conflicting options.

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## **Joana Beato Ribeiro**

IHC-NOVA-FCSH; CEHFCi-UÉ; PH

### **Assistance in History and from Medicine: the Fernando da Silva Correia's Research as Fellow of the *Instituto para a Alta Cultura* (1939-1944)**

Physicians have a long and close relation with writing and history, but in the middle of the twentieth century what was the role of a Portuguese hygienist to study the assistance since Antiquity, during the New State in Portugal? Which were the motivations to study the assistance as part of long durée of History of Medicine? And how his publications or his personal and family archive keep interesting data about his work?

When Fernando da Silva Correia (1893-1966) took a Ph.D. in Medicine, already had a full career dedicated to hygiene and public health and to the History of Medicine. His thesis, presented to the Universidade de Coimbra in 1937, assemble 1) a complete report of his work in a little town (Caldas da Rainha) and 2) a solid knowledge about the evolution of public health in Portugal.

Settle in these interests and in others like Hydrology or the

influence of queen Leonor de Lencastre in the modern times charity and assistance, Fernando da Silva Correia proposed to Instituto para a Alta Cultura, a research project that had, beside others tasks, the publication of *Origens e formação das misericórdias portuguesas* as main goal.

In this presentation, we'll try to answer the questions already exposed by analysing 1) the quarterly reports requested by Instituto para a Alta Cultura; 2) received correspondence and other information produced between April 1939 and April 1944 existing in Fernando da Silva Correia's personal and family archive and 3) the process of writing *Origens e formação das misericórdias portuguesas*, taking a look at the sources and bibliography, the methodological conceptions and the production context. This case study could also be complemented with a deeper understanding of the knowledge representation and the scientific practices (in History or History of Science and Medicine) at the time or even of the reception of Antiquity, which became a consistent study area more recently.

### **João L. Cordovil**

University of Lisbon / CFCUL

### **The Measurement Problem - Correcting a Reductionist Bias**

As it is well known, the measurement problem is a long-standing problem regarding Quantum Mechanics or, at least, of its interpretation. Roughly speaking, the measurement problem arises from the transition of a system in Quantum Mechanics from a superposition state to a definitive state. That is, how a system transforms from being in a "quantum state" to being in a "classic state". As is also well known, there are several attempted solutions to the measurement problem. Despite the vast array of options, most of the solutions presented assume that classic entities or

properties are metaphysically reducible (or identical, in some cases) to quantum entities or properties. Nevertheless, maybe we can question this micro-reductionist assumption, and perhaps this assumption is what makes the measurement problem, problematic. This paper aims to analyze the micro-reductionist hypothesis, its historical origins, metaphysical support and consequences to the historical formulation of Quantum Mechanics.

## **João Pinheiro**

University of Bristol / CFCUL

### **Is Robust Value Naturalism Evolutionarily Impossible?**

So far, evolutionary arguments have relied on defeasible and abductive reasoning when debunking realist theories of value, as when natural selection plays the role of an undercutting defeater or is said to be a scientifically unacceptable epistemic warrantor, respectively. Contrastively, we will develop a deductive evolutionary argument against causal-reductionist or naturalist theories of value, which, insofar as they agree with Street's (2006) criteria, we shall refer to as robust value naturalism. Briefly, we will argue that it is impossible for normative/causal properties to have played a selective role in the evolution of our evaluative attitudes and robust value naturalism to be simultaneously true. The inconsistency lies in that which normative/causal properties can constitute the selective pressures on our evaluative attitudes nomologically depends on our evaluative attitudes' causal powers, thereby violating Street's criteria. We conclude with a potential naturalist reply that suggests rejecting Street's taxonomy whilst preserving all objectivity worth wanting.

**José Ferreirós**

University of Seville

**The Genesis of Geometric Knowledge – History and Philosophy**

Geometric knowledge has been gained, again and again, by human beings in different cultural settings – Mesopotamia, ancient China, ancient Greece, the Islamic areas, medieval Europe, and so on. The roots of geometric knowledge have been the topic of heated debates in history, with views ranging from Kantian apriorism to forms of empiricism (e.g. Helmholtz) and conventionalism, among others. This talk will present some key ideas from an ongoing research project on the genesis of geometry, whose novelty is in approaching the question from an interdisciplinary viewpoint, combining historical studies, cognitive science, archaeology, and philosophy of mathematical practice. Some of the key theses that we defend are: 1. The need to distinguish three different levels: Visuo-spatial cognition, Proto-geometry, and Geometry proper. 2. The key role of corporeal experiences and the use of practical instruments (rope or rod, or gnomon, compass, etc.) in proto-geometry, which implies that geometric knowledge is not innate. 3. More particularly, the key role of diagrams in the emergence of geometric knowledge; diagrams are not mere figures, but cognitive tools whose use involves manipulative imagination. 4. The role of further idealizations in geometric theory, which also depends on epistemic goals and values that go beyond the practical. 5. The surprisingly wide spread of results that, in retrospect, are dependent on the Euclidean postulate – results found not at the level of basic cognition (visuo-spatial) but at the proto-geometric level. This raises a difficult problem of explaining why and how this happens.

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J. Ferreirós & M. García-Pérez 2020. Beyond natural geometry: on the

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## **Klaus Gaertner**

University of Lisbon / CFCUL

### **Why Cyborgs are Conscious**

In recent years the idea that humanity will, or already is, enhancing itself technologically is becoming more obvious. Not long ago, creatures such as cyborgs only existed in the sci-fi culture, i.e. in movies like "Star Trek". However as the technological evolution advances, we see potential or even actual development towards enhanced or cyborg-like human beings. Therefore, we need to ask ourselves whether or not our sci-fi idea of cyborgs is still accurate. This means, the answer to the question 'What is a cyborg?' is becoming more and more pressing. To help overcome this challenge, this paper seeks to investigate the possible restriction of what a cyborg is. The objective is to re-evaluate the original definition of cyborgs, first presented by Clynes and Kline (1960). To do so, I will take at face value the recently introduced Mind-Technology Problem (Clowes, Gärtner and Hipólito, 2021). This successor problem to the Mind-Body Problem claims that we need to re-conceptualize the nature of mind and its relationship to technological artifacts by asking ourselves how the mind is transformed, extended and enabled by our advancing (smart) technologies. To limit the scope of this rather vast enterprise, I will concentrate on merely one key element of the mind, namely phenomenal consciousness. Consequently the question I want to explore here is how phenomenality and human technological enhancement interact. The goal is to think about possible limits of how phenomenal consciousness can be transformed, extended or



enabled by our (smart) technologies which, or so I will argue, also provides limits to what a cyborg is.

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## **Lisa Zorzato**

Institute of Philosophy and Semiotics

### **The Puzzle of Fictional Models**

I argue that 1) some fictional models (FM) can play an explanatory role in science and that 2) scientific realism can be conciliated with the explanatory role of FM. The first point is usually denied by realists, since it is challenging the assumption of realism according to which an adequate explanation is grounded on the correspondence between a model and its target system: if so, how can a model that is fictional represent and explain reality? Nevertheless, it is an undeniable fact that FM have a strong explanatory power in science. The puzzle is still on the table for a philosopher of science.

Recently, Alisa Bokulich defended the explanatory role of FM proposing a 'moderate' version of realism, according to which models can be genuinely representational. Her position is grounded on the fact that FM can grasp real patterns in the world (despite their ontology being wrong) because they share with the scientific theory some generic structural features with scientific theories addressing specific physical situations.

I claim that the revised realism proposed by Bokulich is not necessary. Following her argument, I go beyond it: it is true that FM and a theory may share generic structural features, but FM are connected with the target system. I base my claim on lessons I

draw on Maxwell's use of FM. For this, I introduce the notion of 'a ladder of abstractions'. This refers to a hierarchy of structural correspondences between a FM and a theory that addresses a concrete physical situation. It is in this way that the model, if fictional, can grasp aspects of a real system in the world, and be representational in this sense. I conclude that scientific realism can accommodate FM as explanatory.

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## **Ludovica Conti**

Complutense University of Madrid

### **Arbitrary Abstraction and Logicality**

In this talk, I will discuss a criterion (weak invariance) that has been recently suggested in order to argue for the logicality of abstraction operators, when they are understood as arbitrary expressions (cf.

Boccuni Woods 2020). The issue of logicity of the abstractionist vocabulary was originally raised within the seminal abstractionist program, Frege's Logicism, and represents, still today, a crucial topic in the abstractionist debate. My double aim consists in inquiring this topic both from a formal and from a philosophical point of view.

On the one side, I will argue that, while weak invariance is not satisfied (except for specific exceptions, cf. [6], [8]) by first-order abstraction principles (APs), it characterises a wide range of higher-order ones. More precisely, by comparing respective schemas of first-order and second-order APs, we will note that logicity (in the chosen meaning) mirrors a relevant distinction between same-order and different-order abstraction principles. So, after discussing the controversial case of Ordinal Abstraction, I will note that, if we accept an arbitrary interpretation of APs, not only Neologicism (based on HP), but many current abstractionist programs and even the consistent revisions of Frege's Logicism (based on weakened versions of BLV) are able to achieve the logicity objective.

On the other side, from a philosophical point of view, I will discuss the role of arbitrariness as a condition for the adoption of the abovementioned logicity criterion. Particularly, I will argue that, on the one hand, the arbitrary interpretation could be considered as the most faithful to abstractionist theories, but, on the other hand, it includes semantic insights that are radically alternative to Logicism. In order to argue for this latter consideration, an analogy between the arbitrary interpretation of the APs and the semantics of some eliminative structuralist reconstructions of the scientific theories will be illustrated.

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## **Marco Gomboso**

University of Lisbon / CFCUL

### **A Hidden Connection: The Close Relation Between Metaphysics and Current Scientific Outcomes**

Recent years have seen a renewed discussion on the notion of monism, or the philosophical view that the world, even though regarded as a plurality of objects, is ultimately one thing. The concept is not new: it is possible to trace its historical background from the times of the presocratics. However, it is not easily accepted, for it looks quite counter-intuitive to deny fundamental reality to the objects we perceive. Still, contemporary philosophers of science such as Schaffer, Esfeld and Gribbin argued for some kind of oneness or holistic cosmos not only as the corollary of the study of traditional metaphysical tenets, but as the natural result of a close look at quantum mechanics, for instance. Whether this holism accounts for the rejection of any pluralistic theory is debatable; however, its solely coherent existence supposes a problem for the atomist. In this talk I'll argue that this old conception cannot be, at least, discarded, for it still poses challenging questions related to metaphysics and science. After doing a brief introduction on the historical background of the concept of monism in relevant figures such as Parmenides, Spinoza

and Bradley, I will discuss some contemporary approaches, evaluating both their strengths and weaknesses. Finally, I'll give my own perspective, arguing for a kind of monism based on not just the lack of basic properties of particulars and the necessity of a fundamental background, but on the notions of "presentation" and "immediacy". These notions are not used by the aforementioned authors (although Bradley would talk of "Immediate experience") but I think they have a connection to concepts such as "pure act" in Giovanni Gentile and "will" in Schopenhauer. I intend to demonstrate that rather than being mere epistemological categories they make explicit a particular character of reality we are not used to accepting.

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## **María de Paz**

University of Seville

## **Why Conventions? Exploring the Historical Roots of a New Epistemic Category**

In the winter semester of 1847/1848 Carl Gustav Jacobi gave a course on Analytical Mechanics at the University of Berlin. There, he characterized the principles of mechanics as 'conventions' introducing a new epistemic category not applied before to the mathematical domain. In 1852, a French naval engineer, Frédéric Ferdinand Reech published a course on mechanics that he had

taught at the École du Génie Maritime in the town of Lorient. There, he used the same word, i.e. 'convention' to characterize the principle of inertia. Half a century later the word was to become famous by the hand of Poincaré. But by then, the use of the category convention was already widespread in science as is shown in many works of the time such as Lange's, Duhem's, and others. With the only exception of Diderot's "On the interpretation of nature" (1754) who says that mathematics is like a game and thus a "matter of convention", Jacobi is the first to introduce conventions to the mathematical domain and as an epistemic category. The aim of this talk is to find and present tools to explore historically the genesis of this introduction. Thus, our main question is – which are the roots of this new epistemic category? An adequate answer to this question will enable us to clarify the pertinent role that conventions played in the transformation of mechanics during the second half of the nineteenth century.

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## **Maria Estela Jardim**

University of Lisbon / CFCUL

## **Early Models, Measurements and Photography in Fluid Motion Studies and its Impact on Early Twentieth Century Art**

The invention of the gelatin silver bromide in 1871 and the introduction of technical advanced cameras and faster lenses allowed the photography of moving objects. This development led

to further the basis for the study of fluid mechanics and aerodynamics.

The scientific improvement in the study of fluid mechanics was dependent on the development of techniques for flow visualization. It was Leonardo da Vinci who first made experiments under controlled conditions on the movement of wind and water.

Early experimental models were constructed at the end of the nineteenth century by several researchers in order to study air and water flow. However, it was the German physicist Ludwig Mach (1868-1951) the first scientist to publish photographs of air flow rendering visible the movement of the air around the vicinity of several objects.

When the French physiologist Etienne-Jules Marey (1830-1904) started his studies at the end of the nineteenth century on the flow of air over objects, his last research study on scientific photography, he was not aware of Mach's experiments. In 1899 he began his experiments in air motion studies, using a vertical wind tunnel filled with smoke. The images he obtained were photographed with a burning magnesium ribbon. A chronographic system measured the speed of each smoke thread in different parts of its course.

Henry Hele-Shaw (1854-1941), a Professor at the Liverpool University, who did in the 1890s experiments in hydrodynamics, also obtained streamline photographs of the flow in liquids.

In this paper several early models built to study fluid mechanics, related with measurements and photography, will be discussed as well as the importance of these experiments for the visualization of the invisible movements in fluids. It will also be argued the influence of some of the streamline photographs upon surrealist and futurist artist's work.



**<sup>1</sup>Marie Kaiser & <sup>2</sup>Rose Trappes**

<sup>1</sup>Bielefeld University, <sup>2</sup>University of Exeter

**Individual-level Mechanisms in Ecology and Evolution**

Philosophers have studied mechanisms in many fields in biology. The focus has often been on molecular mechanisms in disciplines such as neuroscience, genetics and molecular biology (e.g., Machamer et al. 2000; Bechtel 2006; Craver 2007; Craver & Darden 2013), with some additional work on population-level mechanisms in ecology and evolution (e.g., Skipper & Millstein 2005; Barros 2008; Raerinne 2011; Pâslaru 2018). We present a novel philosophical case study of individual-level mechanisms, mechanisms in ecology and evolution that concern the interactions between an individual organism and its environment. The mechanisms we examine are so-called Niche Choice, Niche Conformance and Niche Construction (NC3) mechanisms. Based on a detailed analysis of biologists' research practices, we develop metaphysical claims about the components and organization of NC3 mechanisms, the phenomena they bring about and how these phenomena relate to individual differences, which are a major explanatory target in this research field. We also demonstrate that a general representation of NC3 mechanisms is highly abstract, with more specific types of NC3 mechanisms in particular study systems exhibiting more complex components organized in more complex ways. Our case study highlights some distinctive features of individual-level mechanisms in ecology and evolution, such as complex and heterogenous organization and multiple phenomena, features which we argue indicate interesting paths for future exploration of the metaphysics of biological mechanisms.

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## **Maria Serban**

University of East Anglia

### **The Trouble with Construct Validity**

An important part in the methodological discourse of psychology focuses on establishing the field as a hard science. The longstanding operationalist tradition emphasised the commitment to experimentalism, to identifying and individuating measurable variables, and to developing local and general theories on the go and on the back of these measurements. However, the growing reputation and interest in psychology was often accompanied by a matching distrust of a science lacking general theories and formal frameworks for explaining the phenomena argued to fall into its domain. To acknowledge the problem of theory avoidance in psychology, the methodological discourse has been expanded with the notion of construct validity. Its main purpose was to flag that in validating the measuring procedures used routinely in psychology

one can achieve the theoretical progress desired by many.

This paper challenges the idea that construct validity has played this role of bridging the gap between measurement and theory assigned to it in the general methodological discourse of psychometrists.

I will start with a brief historical overview of how and why the notion of construct validity was introduced in experimental psychology. Then I will situate this notion in the broader methodological discourse of experimental psychology, which will allow me to articulate some challenges facing the practises developed around the notion of construct validity. I illustrate these challenges with the help of two case studies, following the outline of research into general intelligence and memory research. I conclude with some reflections on the proper place of construct validation in the methodological discourse and practices of psychology.

## **Mark Boespflug**

Fort Lewis College, Durango Colorado

### **The Science of Ethics: The Isomorphism of Science and Ethics as Domains of Inquiry**

If 97% of ethicists were to agree that there is a moral obligation to vaccinate during the pandemic, would such a consensus carry comparable epistemic weight to the scientific consensus regarding climate change? I argue that it would in light of the isomorphism of ethics and the natural sciences as domains of inquiry, drawing especially on the history of science and ethics. I claim that ethics parallels science in four ways: progress, revolutions, consensus and professional dedication. First, ethics, like science, makes progress. This is evinced in the rule of law replacing the divine right of kings, religious toleration, the abolition of slavery, women's rights, the environmental movement, animal rights, the illegality of torture, et

al. Second, ethical progress has been punctuated by revolutions in a way roughly parallel to the sciences. Such revolutions in ethics are marked not only by paradigm replacements and subsequent radical changes in social institutions—such as laws and other social norms—but also by developments in academic institutions such as the emergence of new fields (e.g., feminist ethics, animal ethics), new journals (e.g., *Environmental Ethics*), conferences, workshops and studies. Third, disagreements in ethics mask vast areas of consensus that roughly mirror the vast areas of agreement in the sciences. In addition to consensus regarding the items mentioned above concerning progress, there are a host of more prosaic ethical propositions that virtually all ethicists agree on (e.g., it's wrong to murder; giving to charity is good; sex-trafficking is wrong; ad indefinitum). Fourth, ethics involves a professional dedication parallel to that employed in the sciences which involves investment of extensive time and attention, widespread group collaboration, incentivization of dissent, division and specialisation of intellectual labour, anonymous peer-review, et al.

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## **Markus Carrier**

Bielefeld University

### **Methods of Conviction – Chemical Expertise in 19th-Century Poisoning Cases**

During the 19th century, forensic toxicology established its important—perhaps even necessary—role in court cases concerning poisonings. As Ian Burney has argued, it was especially toxicology's use of chemical methods to make poisons visible or to reproduce "the equivalent of the bloody dagger" (Burney 2012, 80) which made toxicology accessible and convincing to the judges and juries. Making the by nature invisible crime of poisoning visible and for everyone to see was the core strength and promise of chemical analysis in poisoning cases.

This talk will focus on how 19th-century French and German chemists / toxicologists reflected on this task and on the consequences concerning method selection in their textbooks. Good toxicological analysis should not only give scientifically sound evidence—in most cases against the defendant—but should also convince laypersons that this evidence was to be believed and to be followed. The discourse in the German textbooks especially stressed this point after mid-century judicial reforms which introduced juries in most German states. By presenting case studies from France and Germany, the talk will then focus on the

practical application of this textbook advice. I will argue that the act of making poisoning substances visible, i.e., the (re-)production and presentation of the 'pure' poison, was only one of at least two strategies to convince laypersons in court. The other strategy was the presentation of an explicit comparison to establish similarity or even identity between the analyzed substance and the suspected poison. This allowed chemical experts to be convincing and establish their authority in poisoning cases even when making the poison visible in the above sense was not feasible.

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## **Marta Passadeiras**

University of Lisbon

### ***Libri Astrorum: The Astrological Book in Early Modern Religious Libraries***

The Catholic Church was, arguably, the most influential and widespread gatekeeper of knowledge in early modern Portugal. As it is now widely recognized, religious libraries were actively involved in the process of acquisition, preservation and circulation of scientific books (Giurgevich and Leitão, 2016). In some cases, these libraries collected a significant and wide-ranging collection, including books of natural philosophy, medicine, mathematics, cosmography and astronomy. Amongst these disciplines was the knowledge that interprets the movements of the heavens correlating them with events on Earth, i.e. astrology. This presentation summarizes the results of the ongoing investigation of my master's thesis, which concerns the astrological texts extant at ecclesiastical libraries in early modern Portugal. At the core of this study is the examination of astrological and astronomical book

entries found in library catalogues and inventories of the most influential religious orders until their extinction in 1834. Taking in consideration the convoluted relationship between the Catholic Church and astrology, the existence of such widespread material might seem surprising at first. However, the abundance of entries already found suggests otherwise: astrology books were widespread across the country and were probably read, with few restrictions, at convents and monasteries. In most cases, books of astrology were not censored nor placed in different shelves, as the rules of Roman censorship determined (Romeiras, 2020). Assessing these catalogues may ultimately contribute to better understand the reading and practice of astrology in early modern Portugal.

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### **<sup>1</sup>Matteo De Benedetto & <sup>2</sup>Elio La Rosa**

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### **Patchworks as Indexed Epsilon Terms: A Neo-Carnapian Account of Theoretical Terms in Science**

In recent years, philosophers have increasingly conceptualized theoretical terms in science as contextual and indeterminate entities. A paradigmatic example of such conceptualizations are patchwork approaches (Wilson, 2006; Haueis, 2021b), i.e. a cluster of theories that model scientific terms as certain kinds of complex,

semi-connected, contextually-adjusting patches. Patchwork approaches have been successfully employed in historical analyses of several scientific concepts such as force (Wilson, 2017), hardness (Wilson, 2006), species (Aaron and Doolittle, 2021), homology (Novick, 2018), gold (Bursten, 2018), and neural column (Hauéis, 2021a). Despite the popularity of these approaches, it remains unclear how to understand these patchwork constructions within a formal semantics.

In this work, we will fill this gap by reconstructing patchwork approaches within an extension of epsilon calculus (Hilbert and Bernays, 1939), expanding the late Carnap's characterization of theoretical terms as epsilon terms (Carnap, 1961). Epsilon terms are syntactic devices expressing quantification by denoting an arbitrary choice functions over a given domain. Carnap saw in the indeterminate character of these terms a way of logically characterizing the open-endedness of theoretical terms in science (cf. Carnap, 1956). However, the kind of context-dependency and ambiguity allowed by patchwork approaches goes beyond what Carnap's use of epsilon terms can express. This is because, in patchwork approaches, the same scientific concept can enjoy different referents, different definitions, and contrasting inferential behaviors in different patches. In order to frame this additional degree of indeterminacy and context-dependency of patchwork approaches, we will employ an indexed version of epsilon calculus (Mints and Sarenac, 2003; Leiß, 2017). Indexed versions of epsilon calculus, originally developed in connection with linguistic polysemy (von Heusinger, 2000), add a contextual dimension to the range of choice functions denoted by epsilon terms. We will see how, thanks to this contextual dimension of the indexed epsilon calculus, we are able to give a Neo-Carnapian account of theoretical terms compatible with the kind of semantic indeterminacy and context-dependency that patchwork approaches prescribe.

We will demonstrate how our Neo-Carnapian account of



theoretical terms is able to reconstruct, within a formal semantics, the wide range of semantic phenomena exhibited by patchwork approaches, such as polysemic scientific concepts (Novick, 2018; Aaron and Doolittle, 2021), ghost concepts (Wilson, 2006), scale-dependent concepts (Batterman, 2013; Bursten, 2018), and incompatible inferences (Haueis, 2021a; Wilson, 2017). We will also reconstruct within our framework a paradigmatic case of a patchwork concepts from the history of science, i.e. the evolution of the concept of force in classical mechanics (Wilson, 2006). Our reconstruction will furthermore offer a novel perspective on the ontological and metaphysical status of theoretical terms, vindicating a kind of structuralism over theoretical terms reminiscent of Carnap's one (cf. Friedman, 2011).

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## **Michal Hladky**

University of Geneva

### ***In Silico* Methods. Computational Aspects of Demarcation**

The epistemic power of omnipresent computer simulations is often evaluated relative to experimental methods. A preliminary condition for such evaluation is identification of properties which make computer simulations different from experiments.

Using notions and results of model theory, I evaluate formal and material aspects of computation that have been suggested as properties demarcating computer simulations from experiments. This formal approach allows for an evaluation without any strong reliance on intentional states of researchers (goals like hypothesis confirmation, discovery of causal relations, surprise) or their metaphysical commitments.

First, I evaluate formal criteria revolving around abstract computation and deductive inference, that are often treated as indication that computer simulations are theoretical and not experimental. I show that deduction as demarcating criterion faces

a series of obstacles related to: i) the predicate mismatch between the languages of the sources and the targets; ii) emergent behaviour and inhomogeneous reductions; iii) incompleteness of theories relative to partial sampling; iv) huge space of possibilities in case of stochastic simulations.

Second, I show that material aspects of computation as demarcating criterion can be considered problematic because of strong metaphysical assumptions about i) abstractness of computation; ii) causality; iii) natural kinds; iv) identity. The most general criterion – identity – has to be interpreted as type identity, in order to avoid implausible notion of experiments. Furthermore, without strong metaphysical assumptions about natural kinds, the distinction between source and target classes, often used to characterised models and simulations, can be overcome by defining one broad experimental class that includes the computer systems and the targets (biological samples), effectively collapsing the sources and targets to a single type.

I illustrate my claims with examples from neuroscientific research - Blue Brain Project and I demonstrate that in silico experiments (methods) deployed in BBP can be reconstructed as simulations and as experiments.

## **Miguel Ohnesorge**

University of Cambridge

## **Pluralizing Measurement. Physical Geodesy's Measurement Problem and its Resolution**

It has been noted widely that derived measurements involve an epistemic circularity (Mach 1896; Chang 2004; van Fraassen 2008; Tal 2017). Conducting such measurement requires theoretical knowledge about their target, while our theoretical models of that target can lack evidence that is independent from these very

measurements. As a consequence, philosophers have argued that justification in measurement takes the form of bi-directional problems of coordination. Given the circularity of such problems, scientists need to modify measurements and theoretical models iteratively to account for prediction-measurement discrepancies. If they are successfully coordinated, measurements converge within the possible outcomes permitted by our theoretical model of their target.

However, coordination is significantly harder to achieve when measuring the parameters of complex physical systems such as the earth. Here, inferences from physical indicators to numerical outcomes are regularly affected by several layers of background perturbations, which scientists can neither predict theoretically nor shield their measurements against. I refer to these cases as hard problems of coordination, in which scientists struggle to bridge the gap between an idealized model representing their measurement target and the de facto complexity of that target. Despite growing philosophical interest in the geosciences (Smith 2007; Parker 2014; Belot 2015; Bokulich and Oreskes 2017; Miyake 2015; 2017a; 2017b; Bokulich 2018; 2020a; Watkins 2021), it remains insufficiently understood how such complicated epistemic conditions affect the dynamics of coordination. My key argument is that hard problems of coordination can be solved through operational pluralism. I characterise operational pluralism as a diachronic and iterative methodology, which has a tripartite structure of (i) introducing physically distinct measurement indicators, (ii) comparing outcomes, and (iii) explaining discrepancies based on perturbations uniquely affecting specific indicators.

My proposal is rooted in an extensive case study, in which I reconstruct how geodesists managed to measure convergent values for the earth's ellipticity between 1880 and 1924. This marked an immense achievement, solving a prestigious problem that had persisted since the seventeenth century (Torge 2017, 50, Ohnesorge

2021). Geodesists' achievement required the use of additional measurement indicators that are subject to different perturbational effects, vindicating the value of operational pluralism.

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## **Mousa Mohammadian**

Ahmedabad University

### **Theoretical Virtues and the Aim of Scientific Theorizing: A Unified Approach**

I argue that the aim of scientific theorizing is producing theories with the highest possible degrees of all theoretical virtues (e.g., internal and external consistency, empirical fit, accuracy, simplicity, explanatory power, predictive power, and broad scope). My defense of this proposal is structured around two questions: (1) Why all theoretical virtues are the constituents of the aim of scientific theorizing? (2) Why theoretical virtues (rather than puzzle/problem-solving ability, truth, or knowledge) are taken to be the aim of scientific theorizing?

The first question targets philosophers like Hempel and Sober who hold that some theoretical virtues are constituents of the aim of scientific theorizing and others (e.g., simplicity and internal consistency) are instruments (or means) of achieving the aim. I argue that an instrumentalist view of any theoretical virtue results

in major problems and counterintuitive verdicts about scientific rationality and the progress of science. Regarding the second question, I show that my proposal unifies three important rival accounts for the aim of scientific theorizing in the literature, namely, (i) Kuhn's and Laudan's accounts that the aim of scientific theorizing is finding theories with the greatest puzzle/problem-solving ability; (ii) the realist proposal that the aim is to find true theories; (iii) Bird's view that the aim of scientific theorizing is knowledge or justified truth.

I argue that if successful, this unification is quite striking. For, on the one hand, (i) is proposed by two prominent anti-realists while (ii) and (iii) are offered within the realist camp. On the other hand, following van Fraassen, many tend to understand the realism vs. anti-realism debate in terms of two opposing views about the aim of science.

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## **Noa Sophie Kohler**

Ben-Gurion University of the Negev

### **Bernhard Blechmann's Body, the Jewish Race, and the Scientific Verification of a Hypothesis**

Based on the case of B. Blechmann, my talk highlights one of the first (if not the first) attempts in 19th century academic physical anthropology to evaluate the hypothesis that Jews constituted a "race". I briefly present the case study and place in its historical context – the development of physical anthropology into an academic research field in the 19th century. I will then explain how and why this case study sharpens our view on the first modern academic attempts of understanding and investigating the notion of "race" (here: the "Jewish race").

Claims of a biological distinctiveness of Jews had existed long before the 19th century and entered the academic discourse via ethnological literature. For his dissertation at Dorpat university, the Jewish anthropologist B. Blechman (1882) took over sixty different measurements of one-hundred male Jews in order to juxtapose his findings with the contemporary, international, anthropometric literature on Jews. The way he interprets his results vis-à-vis the existing literature and general notions of a "Jewish race" is



interesting, because he on the one hand hypothetically accepts that “races” exist, but on the other, his research findings do not fit any such concept. What makes his dissertation particularly interesting is the so far overlooked fact that he included his own body measurements into the data. He is simultaneously researcher and research object and combines a view from within and from without. Thus, his dissertation is an example of the active engagement of Jewish anthropologists with the question of whether they represent a race, right from the start of the academic institutionalization of anthropology, and in a methodological manner that was considered the most up-to-date research method.

This challenges the accepted research opinion by historians that Jews were considered a separate race apart by non-Jewish anthropologists, and only later Jewish anthropologists used the tools of race-science in order to defend themselves against this notion (Efron 1994, Falk 2006/2017; Lipphardt 2008; Hart 2011).

Bernard Blechmann, *Ein Beitrag zur Anthropologie der Juden*, Dorpat 1882 [A contribution to the anthropology of the Jews].

John M. Efron, *Defenders of the race. Jewish doctors and race science in fin-de-siècle Europe*, New Haven 1994.

Raphael Falk, *Zionism and the biology of Jews*, Cham 2017 [Hebrew 2006].

Mitchell B. Hart, *Jews and Race. Writings on identity and difference 1880-1940*. Massachusetts 2011.

Veronika Lipphardt, *Biologie der Juden: Jüdische Wissenschaftler über Rasse und Vererbung 1900-1935*, Berlin 2008 [Biology of the Jews: Jewish scientists on race and heredity].

## **Paulina Gennermann**

Bielefeld University

### **About the Nature of Flavors: International Flavor Regulation in the 1970s and 1980s**

Since the 1950s chemical food additives became objects of intensified toxicological testing and governmental regulation in Germany and internationally. The fast-growing chemical industry and the industrialization of food production caused and promoted the expansion of diverse types of food additives, while the control of possible carcinogenic or toxic effects did not keep up with this expansion. But notably after the Second World War, scientists and politicians started to deal more intensively with the used chemicals. In Germany, the so-called “Farbstoffkommission” (color commission) of the German Research Foundation was the first expert commission which organized a controlled analysis of colors, preservatives, and other food additives. However, flavors were not considered as urgent to be analyzed and regulated. It was in the 1970s that flavor regulation intensified. In this context, the differentiation of natural and non-natural flavors was heavily discussed and was more than once a topic of controversy. During my talk, I wish to talk about this complex and controverse differentiation of flavors. I will present the various definitions and perceptions of natural and non-natural, outline the discussions and regulatory suggestions of the responsible commission, and I will discuss the developed notion “naturidentisch” (“nature identical”) as an interesting compromise in this controversy.

Heiko Stoff, *Gift in der Nahrung: zur Genese der Verbraucherpolitik Mitte des 20. Jahrhunderts*, Stuttgart: Franz Steiner Verlag, 2015.

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## **Paulo Castro**

University of Lisbon / CFCUL

### **Pilot Wave Theory and the Hydrodynamic Quantum Analogs Movement**

In recent years there has been much interest in a Louis de Broglie proposal for quantum mechanics dynamics. At the celebrated fifth Solvay conference, in 1927, de Broglie suggested that a particle and its associated quantum wave would exist simultaneously, and that the motion of the former would be guided or piloted by the later. This became known as the Pilot wave theory approach to quantum mechanics. Given the conceptual problems of the pilot wave theory, mostly dealing with non-locality, and owing to the very strong idealistic position championed by Niels Bohr, the Copenhagen interpretation of quantum mechanics (QM) would prevail, becoming the standard paradigm.

However, in 2005, the experimental work of Yves Couder and Emmanuel Fort at the University of Paris, once again sparked the old concerns in a part of the scientific community, about the lack of realism and intelligibility in QM. Couder and Fort discovered that it is possible to have a droplet bounce on a bath of oil, generating a wave field that in turn, guides the droplet trajectory, complying to de Broglie's picture. Thus began the nascent field of Pilot-wave hydrodynamics, later evolving to the Hydrodynamic Quantum Analogs (HQA) movement, headed by John Bush group at the MIT. In this talk I wish to give notice of some of the pertinent research problems I think History and Philosophy of Science may address here. From an historical research stand, the HQA movement seems to open yet another chapter in the history of QM. A tension

between realism and idealism seems once more to emerge, requiring further analysis. From a philosophical point of view, the analogical reasoning claims in HQA experimental cases, must be inspected and considered its possible consequences to the ontological ground on which QM presently stands.

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## **Pier Luigi Pireddu**

CIUHCT

### **Between “Balance in Nature” and the Ecosystem Concept. A Historical-philosophical Discussion**

The concept of balance-in-nature emphasizes a harmonious and orderly view of nature, in balance between its parts. The conceptual repercussions of such a vision have continued until recent times and are still the subject of discussion today. In particular, they persist within the historical- philosophical debate in ecology, the

subject of this proposal. With C. Linnaeus, the idea of balance-in-nature was named in his treatise *Oeconomia Naturae* (1749). Following the implementation of the theory of evolution, the central idea underwent a restructuring: no longer a harmony guided by Providence, but mechanisms driven by evolutionary laws. Nevertheless, it was with the crystallization of ecological science that the debate took another turn; hence an answer to the question "how to define balance?" in broader and more quantitative terms. The concept incorporates three perspectives: population, community and system ecology. The focus here is around the latter two. A pioneer in this case was S. Forbes – with Lake as a microcosm (1887) – whose ideas were subsequently implemented by F. Clements' paradigm of ecological communities as complex organisms. The theoretical structure of Clements was criticized by Tansley, who coined the term ecosystem (1935) emphasizing a dynamic equilibrium between biotic and abiotic components. At the same time, C. Elton (1930) expressed a clear position: the idea of a balance-in-nature does not exist and has never existed. Up to G. Hutchinson, who questioned whether systems tend to a state of stable equilibrium (1948).

The idea of nature tending toward balance has influenced theoretical-experimental research throughout history. Today, the balance-in-nature concept has been overtaken by more precise notions, such as the study of the ecosystem concept and its stability. There is a historical relationship between stability and balance-in-nature, which leads to determine how this concept has not disappeared but survives in other guises. Posing doubts even, about its very survival.

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## **Raffaele Grandoni**

University of Warwick

## **History of Science and its Ethical Role: The Legacy of Georges Canguilhem**

The main feature of the post-Foucauldian historical epistemology (e.g. Hacking, A. Davidson) lies in retracing how the social, cultural and political context determines the emergence of scientific concepts and, in turn, how science plays a role in the government of populations and individuals. However, this tradition fails to

provide a normative standpoint from which to judge how relations between science and non-scientific activities affects our lives. A solution, I claim, can be found in one of the sources of these authors: the French philosopher and historian of life sciences Georges Canguilhem.

With my talk, I will address how in grounding it on a vitalist philosophy, Canguilhem turns the history of science into a tool for ethically evaluating political uses of scientific concepts, without introducing any normative criteria from the outside. I will show that Canguilhem's history of science shares the main feature of post-Foucauldian historical epistemology – i.e. revealing the role of socio-political values in the formation of scientific concepts and retracing the process through which they acquired their autonomy – while also providing the tools for an inherent ethical critique concerning processes of normalisation legitimised by science. My idea is that by defining life as the living being's unconscious creation of better ways to relate to its environment, Canguilhem developed a critical approach to all attempts (including scientific ones) to uniform human subjectivities under strict norms. From this, I claim that this vitalist background does not only enable Canguilhem's history of science to evaluate socio-cultural-political influences on scientific concepts, but it also entrusts it with the ethical aim of opposing (from an objective standpoint and without undermining science's validity) science-led policies that constrain human beings' capacity to autonomously create their own norms.

**Raoni W. Arroyo, Jonas R. B. Arenhart, Décio Krause**

University of Campinas

### **Lessons (Un)learned from Metaphysical Underdetermination: A Methodological Appraisal**

Underdetermination of theory by data is a familiar topic of the

general philosophy of science. At first, it was thought to be hypothetical at best [1], but nowadays it is well-established that quantum mechanics (QM) exemplifies it well [2], viz. with the solutions to the measurement problem [3, 4] e.g. Bohmian mechanics, Everettian QM, and collapse-based QM [5]. Metaphysical underdetermination is a further problem. It appears when a scientific theory is compatible with more than one metaphysical profile, and it is widely known that QM also exemplifies it well with the discussion concerning the fact that quantum objects can be metaphysically understood both as individuals and as non-individuals [6, 7].

The first kind of underdetermination clearly provides for an anti-realist argument against scientific realism. Thus in the case of two (or more) competing theories to account for the same phenomena—often positing different entities in its ontological catalog and different dynamics with different state spaces and axioms [4, 8, 9]—it is not clear how to choose which one is true in a sense that is of interest for scientific realists. It is not obviously true, however, that anti-realism may reap any benefit from the second kind of underdetermination.

This talk presents the traditional debate over quantum individuality and the birth of the term “metaphysical underdetermination” (§1). Three reactions to metaphysical underdetermination are analyzed: (§2) one that employs extra-empirical virtues to favor the non-individuality metaphysical profile [10, 11]; (§3) one that justifies the use of individuality [12]; finally, (§4) the one that considers metaphysical underdetermination to be an argument for scientific realism [13, 14], as long as the realist content concerns structures, not objects [15-17]. (§5) wraps it all up with epistemic considerations, viz. that once physics does not decide between metaphysical profiles, we should adopt a philosophical attitude of (in)tolerance towards them [18].

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## **Rui Sampaio da Silva**

University of the Azores

### **Gadamer’s Concept of Hermeneutic Experience as a Bridge Concept Between Art and the Human Sciences**

In *Truth and Method*, Gadamer claimed that art, duly understood, can illuminate the nature of knowledge in the human sciences. It might seem odd to use an aesthetic model to clarify epistemological questions, but the human sciences or *Geisteswissenschaften* were understood in the German tradition in opposition to the natural-scientific method and under an aesthetic model inspired by Kant. As a result, the philosophy of the human sciences was deeply influenced in the 19th century by a “hermeneutics of reconstruction” whose aim was to reconstruct other minds or subjective experiences. Gadamer agrees that art offers a model to understand the human sciences, but only if one recognizes, going beyond Kant, that art, as representation (*Darstellung*), is a form of knowledge, to the extent that it reveals aspects of reality that could otherwise go unnoticed.

The experience of art is also a form of hermeneutic experience, the experience of understanding other people or human life, and it is precisely this concept of hermeneutic experience that connects art and human sciences. Gadamer contrasts scientific experience, which is repeatable and confirmable, with hermeneutic experience, which is unrepeatable and negative; it consists of a refutation of prejudices or expectations. Following Rilke, he claims that art, by transforming our view of reality, challenges us to change our life,

but he also claims that the human sciences have a similar, transformative effect, by exposing interpreters to other social, historical and cultural horizons, and thereby challenging their prejudices.

From a critical standpoint, Gadamer's view of the human sciences is one-sided; it correctly highlights the humanistic dimension of the human sciences, but neglects the importance of empirical and quantitative methods in the study of human reality. Moreover, his hermeneutic reflection is committed to the Geistes- and Naturwissenschaften dualism, which is inadequate to understand the social sciences and its pluralistic methodology.

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## **Samara Greenwood**

University of Melbourne

### **How is Science Shaped by Context? An Integrated Approach**

In 2008, Peter Galison famously outlined ten key problems for history and philosophy of science, the first of which was the problem of context (Galison, 2008). While HPS scholars have provided rich accounts of scientific episodes within their social and intellectual contexts, the question remains, how should we understand the more general relationship between science and its varied contexts? This is clearly a complex question, one which I

argue requires a novel investigative approach. In formulating my methodology, I have drawn on the work of two leaders in Integrated HPS, Jutta Schickore and Hasok Chang (Chang, 2011). Both advocate approaching complex research questions by simultaneously investigating historical episodes and theoretical frameworks until the two perspectives are “gradually reconciled” and “brought into equilibrium” (Schickore, 2011, p. 471).

Recently, I have used this approach to investigate the interaction between primate studies and second wave feminism during the early 1970s. While several scholars have written about this period, most notably Donna Haraway, many outstanding questions remain (Haraway, 1989; Strum & Fedigan, 2000). For example: how did feminist concerns first enter primate studies, and how were they able to gain broad traction early in this field, while being almost entirely ignored in other disciplines? In my studies, I have found a key part of the answer lies in the interconnected actions of several female students and scholars who were actively engaged in both scientific research and the concerns of second wave feminism during this period. Collectively, these ‘dual-focussed’ individuals were able to help reconcile competing scientific and social values through a variety of means including conversation groups, informal circulation of key essays, organising influential conference presentations and seminars, as well as translating their insights into actionable steps for the general scientific community through peer-reviewed methodological papers (Altmann, 1974; Lancaster, 1973; Slocum, 1975). In doing so I have found concepts such as Klein’s ‘hybrid experts’, Gieryn’s ‘boundary work’ and Galison’s ‘trading zones’ highly useful for developing a deeper understanding of the processes at play (Galison, 1999; Gieryn, 1983; Klein, 2017). In outlining my research thus far, I aim to show how an integrated HPS approach has helped open up a complex problem for productive investigation.

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## **Sylvain Lavau**

Aristotle University of Thessaloniki

### **What is a Theorem (in Practice)?**

This talk advocates the benefits of a sociological perspective for the philosophy of mathematical practice [Mancosu, 2008, Carter, 2019, Hamami and Morris, 2020]. Drawing from the literature of the sociology of sciences, it defends a community-centered approach of the study of mathematical practice [Cispert, 2000, Barany and MacKenzie, 2014] and assesses the role of the notion of

metamathematics [Kitcher, 1984] in mathematical change and in stabilized mathematical practices. It relies on the case study of the emergence of geometric control theory at the beginning of the 1970s and of the citational practices associated to the community of control theory since the mid-1990s.

Control theory is a field at the junction of mathematics and engineering which emerged in the aftermath of the second World War following the need for the understanding of automation and servomechanisms [Brockett, 2014, Lewis, 2018]. The case study shows that the introduction of geometric tools in control theory at the end of the 1960s induced a change in the metamathematical views that control theorists had on their objects. It is then demonstrated how membership to the community of control theory shapes the production and the reception of the theorems of Stefan [Stefan, 1974], Sussmann [Sussmann, 1973] and Nagano [Nagano, 1966]. Interpreting the historical development and citational practices of this community through the perspective of metamathematics, this talk concludes by discussing the role of the orbit theorem in control theory, both as a cognitive label [Rav, 1999] and as a social marker of membership to this community.

The object of this talk is two fold: 1) assessing the role of metamathematics [Kitcher, 1984] in the stabilized practice of the community of geometric control theory, 2) substantiating the philosophical inquiry by bibliometric tools applied to a case study (statistical analysis of a corpus of citing literature [Small, 1973, Eades, 1984, Newman and Girvan, 2004]). The talk aims at showing that the philosophy of mathematical practice can benefit from sociological inputs.

*This talk is based on a paper published in the special joint issue of the Revue d'Anthropologie de la Connaissance and Trilogia: Rencontres entre STS et Philosophie des sciences et techniques. [Lavau, 2021]*

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## **Tannaz Najafi**

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University of Geneva

### **Avicenna on Time and Persistence**

One very interesting and peculiar suggestion has been made by Avicenna regarding the way objects are in time. (See McGinnis, J., & Avicenna. (2009, p. 255)). This fascinating suggestion has nonetheless remained quite unheard and unstudied for far too long. Henceforth the aim of this paper is to resuscitate this forgotten idea and investigate more its consequences and inspiring suggestions also with respect to our current debates and metaphysical positions in philosophy of time and persistence through time. It may come up at first glance that Avicenna seems to suggest, as the four-dimensionalist account of persistence through time, that objects that are in time have temporal, or what he calls earlier and later, parts.

However, once we analyze it more carefully, we understand that these parts are given by the relation of participation of Platonic descendants. In this case one of the Forms is in fact Time, while motion participate to it. The relation of participation has therefore a special position in Avicenna's theory. It has the special role of accidentally giving temporal parts to objects that persist through time.

This, I claim, has two important consequences. One is that by considering time as a unique Form to which objects participate, we can avoid many of the issues that were in the center of medieval debates. In particular we have here a very early and powerful solution for the problem of the multiplicity of time given by Averroes' theory but argued also by Roger Bacon and Bonaventure. Finally, the other consequence is that quite uniquely in the



literature and in history, Avicenna gives us a theory that can bring together two of the metaphysical account of persistence through time usually considered to be absolutely incompatible, the three- and four- dimensional view of persistence of objects through time.

## **Tiago Mesquita Carvalho**

University of Porto

### **Telework and Frictionless Dreams at the Crossroad of Information Society**

This proposal deals with the phenomenon of telework and the historical, methodological and philosophical questions raised by its resurgence. In the first sense, telework comprises a late advancement in the history of network developments (transport, energy, information and communication networks), generally aimed at overcoming various physical and cultural barriers. Telework, however, cannot be apprehended as subsumed under such determinations. Its analysis shows methodological disparities between related disciplines which, although often supportive, face central limitations regarding the nature of technology. Some of these disparities are not problematic in themselves, since they arise due to the open character of technology and how it allows itself to be shaped by social actors.

Overall, the plastic ambiguity of technology befalls the analysis of telework. It is well-known how the pandemic context boosted its adoption as an effective prophylactic policy. In phenomenological terms, the unexpected implementation of telework via digital devices triggered a variation in both noetic and noematic contents: the background context horizon on which face-to-face work occurred was suspended, but the loss of such familiarity consented a research along its invariant lines. Among others, telework comprises issues such as the meaning of (dis)embedded

(tele)presence and tacit knowledge for human sociability, the intrusion of professional space-time into domestic realm and the lifeworld data-intensive transformation.

In general terms, the massive telework experience around the globe sets clear limits to the unencumbered possibilities announced by network utopias at social, anthropological and axiological levels. Criticism of telework should nevertheless stress how the emergence of the flexible "virtual organization" endorses new subjectivities defined by greater individual autonomy and choice around hybrid work models and their further disconnection from local and personal networks. Discussions around the future of (tele)work must ultimately acknowledge how they assume a plural liberal social setting where technology is paradoxically seen as neutral and controllable.

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## **Ties van Gemert**

Tilburg University

### **Between Obscurity and Complexity: Early French Philosophy of Logic**

In the introduction to his book, *L'ordre et les jeux. Le positivisme logique en question* (1982), Dominique Lecourt makes some acute remarks on the reception of the Vienna Circle in France and, in particular, on the reception of mathematical logic. He notes that in recent years it has become fashionable to deplore the indifference that French logicians, mathematicians, and philosophers exhibited in the face of the developments of mathematical logic in the first decades of the twentieth century. According to Lecourt, this narrative is too simple, it is plainly false to assert that the excitement and enthusiasm generated by the conception of mathematical logic did not find an echo in France.

For him, the names of Louis Couturat, Jean Nicod, Jacques Herbrand, Albert Lautman, and Jean Cavailles suffice to call attention to the shortcomings of this narrative. Yet these names evoke little to nothing among philosophers today - except for a few specialized historians and a small circle of French epistemologists. It seems that if these five philosophers ever made a contribution to the important debates on mathematical logic in early twentieth-century philosophy, these have been largely forgotten. In passing, Lecourt remarks that even from their sometimes premature and at other times incomplete works, it is crystal-clear that the philosophy of these Frenchmen would have developed into another pathway than the one taken by the logical empiricists. He even argues that their philosophy contains hidden paths that have been deserted, but which - if brought to light - can bear on the questions that philosophers are still occupied with and attend to today. Unfortunately, Lecourt does not unfold this thought experiment, he does not feel the need to conduct this kind of

speculative, reconstructive history. The aim of this presentation is to develop precisely this thought experiment and to explicate what kind of philosophical trajectory ensues from the reflections on mathematics and logic of these five Frenchman. Along the way, I will also compare their itinerary to that of the Vienna Circle. To conduct this project, I will reconstruct the philosophical views on mathematical logic of these five philosophers and examine the communal vision that results from their undertaking. Altogether, I hope to show how this unexamined chapter in the history of early twentieth century philosophy can not only change our preconceptions of early twentieth century French philosophy, but also broaden our view of the debates concerning the fundamentals of logic and mathematics present at the time.

## **Tudor M. Baetu**

Université du Québec à Trois-Rivières

### **Two Accounts of Extrapolation**

Biomedical research relies on extrapolations of findings to individuals, populations, species and, in general, biological systems other than those observed or tested in an experiment. What happens *in vitro* is assumed to reflect what happens *in vivo*, findings obtained by studying animal models are generalized to humans, and findings concerning a particular individual are thought to hold true for other members of the species. Yet the objects of inquiry of the life sciences are heterogeneous, often to the point that each biological system is potentially unique. This variability entails that extrapolations involve a risk of error that can have dramatic consequences for scientific knowledge and its application in practical contexts.

The tension between the need to extend findings to systems different from those observed or tested and the inherent risk of

error associated with such practices is known as the problem of extrapolation. The problem has been tackled from two diametrically opposed standpoints. According to the hypothesis-generator account, valid extrapolations from a source to a target system are circular, since they rely on knowledge of relevant similarities and differences that can only be obtained by investigating the target, thus removing the need to extrapolate; hence, extrapolative reasoning can only be useful as a method for generating hypotheses. I reject this view in favour of an inferential account, focused on extrapolations underpinning the aggregation of experimental results, and explore two lines of argumentation supporting the conclusion that these extrapolations can be validated in a noncircular manner. The first argument relies on formal proofs of inferential validity demonstrating that it is possible to reason from prior knowledge of causal structures in order to determine whether a claim can be extrapolated. The second argument builds on the fact that the hypothesis-generator account overlooks key inferential and experimental practices resulting in progressively better-informed extrapolations.

## **Tuomas Pernu**

University of Eastern Finland  
King's College London

## **A History of the System**

The notion of system is essential to all of science. But what are systems? Is the term referring to the same thing in all the wide range of disciplines it is being used in? There is no philosophical discussion addressing these questions. Recently, however, they have received attention in engineering (Hitchins 2009; Dori & Sillitto 2017; Sillitto & al. 2017; Yang & al. 2019; Dori & al. 2020; Kasianiuk 2021; Salado & Kulkarni 2021). This is not surprising, given that the aims of

engineering are in providing us with efficient and robust devices – systems – for the manipulation and control of nature.

Here, the issue of defining “system” is approached historically, by asking: through what kind of developments have we arrived at the current variety of usages of the notion? Five stages are identified. First, the etymological roots of the term are in antiquity and the origins of the idea of control or feedback system can be traced to these times (Mayr 1970). Second, important elements of the modern notion were defined during the enlightenment, by Cartesian geometry and Newtonian mechanics. Third, a decisive step was taken during the 1900th century, with the rise of thermodynamics and statistical mechanics; the term “system” becomes ubiquitously used in mathematics and physics. Fourth, systems come in explicit focus in the mid-20th century, with the rise of cybernetics (Wiener 1948) and systems theory (von Bertalanffy 1968). Finally, in the 21st century a variety of methods, in a wide range of fields, are aimed at analysing complex systems (Ladyman & Wiesner 2020).

Can this evolution be viewed as a continuous and consistent narrative? Not without heavy reinterpretation. The system theoretical (entity based) notions, currently in focus in engineering and complexity analyses, seem fundamentally different to the abstract (phase space based) notions used in mathematics and physics. Perhaps unifying these views is possible – but not without recognising the historical roots of the differences.

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## **Yael Friedman**

University of Oslo

### **Plural Medicine: A New Stream of Holistic Medicine**

The concept of holistic medicine has been given a variety of interpretations throughout history. In this talk, I will propose a systematic analysis of holistic medicine. I will differentiate between three streams of holism in the Western medical context: mind-body medicine, anti-oppressive medicine, and plural medicine. The rationales behind those streams include accounts from both the history of ideas and the philosophy of medicine and biology. I will introduce them and their relevance to the medical practice today. Then, I will focus on what I recognize as the new holistic stream of plural medicine, which acknowledges biomedical science, the reality of experience, and social reality. I will show how recent theoretical contributions in biology and developments in

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medical technology require an epistemological change that blurs the sharp traditional dichotomy between holism and reductionism.



## BIOGRAPHICAL NOTES

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**Jutta Schickore** is Ruth N. Halls Professor of History and Philosophy of Science and Medicine at Indiana University. Her research interests include philosophical and scientific debates about scientific methods in the past and present, particularly about (non)replicability, failure, error, and negative results; historical and philosophical aspects of microscopy; and the relation between history and philosophy of science. Her latest book is *About Method: Experimenters, Snake Venom, and the History of Writing Scientifically* (University of Chicago Press, 2017).

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**Marco Gomboso** I’m an Argentine Sociologist and Philosopher. I graduated in Sociology at the University of Buenos Aires, Argentina and I have a Master of Arts in Philosophy from the University of Groningen, The Netherlands. I have worked as a university teacher for many years, in different areas such as Sociology, Philosophy and Argentine History. In the last years I have worked on the topics of identity, the end of modernity, as well as on monism and the ultimate character of reality according to the British Idealist philosopher

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**Maria Serban** I am a philosopher of science focusing on modelling

practices in the life sciences and social sciences. My current academic home is the University of East Anglia. My research is, for the most part, in the philosophy of biology and cognitive neuroscience. In my work I take a methodological approach which I think can better capture the interactions between the different facets of scientific knowledge: exploration, prediction, concept formation and explanation. My previous positions were at the Technische Universität Berlin, at the University of Copenhagen where I was part of the project: Living Machines? Philosophical perspectives on the engineering approach in biology, at the Center for Philosophy of Natural and Social Sciences at the London School of Economics, and at the Center for Philosophy of Science at the University of Pittsburgh. I did my PhD on the structure of explanations in cognitive neuroscience at the University of East Anglia.

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**Marcus B. Carrier** has studied History and Chemistry (B.A., 2013) and History, Philosophy and Sociology of Science (M.A., 2016) at Bielefeld University, Germany, and at the University of Notre Dame, USA. Since 2016, he is a doctoral researcher at the Bielefeld Graduate School in History and Sociology at Bielefeld University and works in the DFG-funded project "Forensic Toxicology in Germany and France during the 19th Century: Methods Development in Judicial Context" lead by Carsten Reinhardt

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**Matteo De Benedetto** I am a postdoctoral researcher at the Ruhr University Bochum in the Emmy-Noether research group “From Perception to Belief and Back Again”. I recently got my Ph.D. in Philosophy at the “Munich Center for Mathematical Philosophy”. My research focuses on the phenomenon of conceptual change, broadly understood as the many philosophically interesting ways in which our concepts change. My research encompasses several areas of philosophy, such as General Philosophy of Science, Philosophy of Mathematics, Philosophy of Cognitive Science, Logic, and History of Analytic Philosophy.

**Michal Hladky** is a PhD student at the Department of Philosophy of the University of Geneva, with research focus on simulations in neuroscience. He was first exposed to computer modelling during his studies of material engineering and microelectronic components (MA engineering and MA research, INSA Lyon).



**Miguel Ohnesorge** is a PhD Student at the University of Cambridge, working at the intersection of the history of physics and the epistemologies of measurement and modelling. In his thesis, he reconstructs the history of physical geodesy from Newton's Principia to the early 20th century, analysing how scientists constructed the first accurate models of the earth's figure and gravity field. He has also published on other topics, including industry bias in privatized science, scientific realism, and the colonial history of physical science in South Asia. He was awarded the 2021 Du Châtelet Prize in Philosophy of Physics for his contribution to the epistemology of physical measurement.

**Mousa Mohammadian** is an Assistant Professor of Philosophy at the School of Arts and Sciences of the Ahmedabad University, India. He received his PhD in History and Philosophy of Science (Philosophy of Science Track) from the University of Notre Dame. His research primarily focuses on the general philosophy of science, metaphysics of science, and the history of philosophy of science. His publications include "Beyond the Instinct-Inference Dichotomy: A Unified Interpretation of Peirce's Theory of Abduction" (Transactions of the Charles S. Peirce Society), "Abduction – the Context of Discovery + Underdetermination = Inference to the Best Explanation" and "Theoretical Virtues and Theorizing in Physics: Against the Instrumentalist View of Simplicity" (Synthese).

**Noa Sophie Kohler's** research interests lie in two areas that sometimes overlap: one area is race and ethnicity concepts in history and contemporary genomic studies; the other area is Jewish history. She is research fellow at the Jacques Loeb Centre for the History and Philosophy of the Life Sciences at Ben-Gurion University of the Negev (since 2017). Her current research subject is "Ethnicity, Race and Jewish history in biological research. Research

concepts and technological sophistication”. Within this framework, her latest publication is N.S. Kohler, What are Jews: interrogating genetic studies and the reification of race, *Journal of Anthropological Sciences* Vol. 100 No. (2022), part B, pp. 1 – 16. She holds a PhD from the Jewish History Department at Ben Gurion University (2010).

**Paulina S. Gennermann** studied history and biology during her bachelor at the universities of Bielefeld and Paris VII from 2012 to 2016. Following the intention to combine history and natural sciences, she continued her studies with the master’s program “History, economics and philosophy of science” which she finished in 2018. In 2019 Paulina S. Gennermann joined the Bielefeld Graduate School in History and Sociology (BGHS) at Bielefeld University. Her PhD Project (supervised by Prof Dr. Carsten Reinhardt) is about the history of flavors and the flavor industry in Germany and Europe in the 20th century. She is working in the history department, section of the historical studies of science, at Bielefeld University and holds a scholarship of the German Academic Scholarship Foundation.

**Paulo Castro** I graduated in Anthropology at University Nova de Lisboa in 1996. In 2014 I obtained my PhD in Philosophy at the University Lusófona de Humanidades e Tecnologias, proposing an Epistemology of Choice related to the existence of free will and the impossibility of mechanically simulating human intelligence in AI. In 2015, I joined the Philosophy of Natural Sciences Research Group, at CFCUL, working on Philosophy of Quantum Physics. Three years after, defending a return to scientific realism in physics and a unification between the quantum and macroscopic scales, I started working on the Philosophy of Pilot wave theories. Although this is my main theme of research, I keep reflecting on Artificial Intelligence present implications, on the limitations of algorithmic thought and on AI ethics.

**Pier Luigi Pireddu** I am 27 years old and I was born in Alghero, Italy. I received my bachelor's degree in philosophy in 2019, with a thesis in history of science in the field of astronomy, at the University of Cagliari. During my three-year degree, I spent seven months in Spain, at the Universitat de Barcelona (UB), with the "Erasmus + study" project. In 2021, also at the University of Cagliari, I completed the master's degree continuing to explore issues in the history of science, taking an interest in ecology. In particular, discussing a thesis entitled "History of ecology: the relationship between George E. Hutchinson and Vladimir I. Vernadsky and the origins of the ecosystem concept". After graduation, I started – thanks to the Erasmus "Universities for Europe Project" – a research internship in Lisbon at CIUHCT, continuing now my experience with a PhD.

**Raffaele Grandoni** (1993) is a PhD student in philosophy at the university of Warwick. His research, funded by Midlands4Cities, consists in a historical reconstruction of the political and critical aspect of Georges Canguilhem's history of sciences. His main area of expertise is French epistemology (esp. Bachelard, Canguilhem and Foucault) and biopolitics, though his broader area of interests ranges from contemporary political philosophy to history and philosophy of sciences.

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**Rui Sampaio da Silva** is Assistant Professor at the University of the Azores, Portugal, and member of the LanCog Group – Centre of Philosophy of the University of Lisbon. He was visiting scholar at the Free University and Humboldt University in Berlin, as well as at Brown University. His main research areas are philosophy of science, epistemology, hermeneutics, philosophy of action and theory of rationality. At the University of the Azores, he taught courses on Logic, Philosophy of Science, Philosophy of Language, Hermeneutics, Epistemology and Contemporary Philosophy.

**Samara Greenwood** is a PhD Candidate in History and Philosophy of Science and, in 2022, was awarded a Graduate Research Teaching Fellowship at the University of Melbourne. Samara's thesis explores the relationship between changing social and intellectual contexts and scientific practice through a mixed methods, integrated approach. Key research questions include: What counts as a context? What are the various pathways through which science is shaped by context? How might we develop a richer, more multidimensional framework for understanding the science-context relationship? Samara was awarded the Ian Langham prize by the Australasian Association for the History, Philosophy, and Social Studies of Science for the best presentation by a postgraduate at the 2021 AAHPSSS Conference.

**Sylvain Lavau** After an education in maths and physics, I obtained a PhD in geometry at the University of Lyon in 2016. Several postdocs later (Porto, Bonn, Paris), I ended up at the Euler Institute in Saint Petersburg, where I plan to stay for a few years. My field of research includes singular foliations, Lie algebroids, and their

'higher' counterparts such as Lie  $\infty$ -structures on graded manifolds, and their applications in mathematical physics. Recently, after an additional curriculum in sociology and in philosophy of science, I got caught in the philosophy of mathematical practice. In contrast with the foundationalist and the logicist traditions that have been prevalent in the philosophy of mathematics during the XXth century, this intellectual movement advocates the study of mathematical practice in the philosophical inquiry. On this side of my research work, I am currently striving to develop stronger ties between the sociology of science and the philosophy of mathematical practice.

**Tannaz Najafi** is a PhD fellow at the research Centre of Philosophy of Sciences of the University of Lisbon (CFCUL) and at the University of Geneva. Under the joint supervisions of Christian Wüthrich (UNIGE), João L. Cordovil (CFCUL) and José Croca (CFCUL), she is carrying out a research project focused on the concept of time in some fundamental theories of physics. Her main interests are in philosophy of physics, time, probabilities and logic. Occasionally, she also dedicates her time to the philosophy of migration.

**Tiago Mesquita Carvalho** is currently a researcher and lecturer at the Philosophy Institute (IF) in FLUP with a project concerning technology, responsibility and catastrophes. He has degrees in both environmental sciences (IST-UTL) and environmental philosophy and aesthetics (FLUL). In 2019 he gained his PhD in FCUL with a thesis on how the good life demands the deliberate use of artifacts, crossing both virtues ethics, philosophy of technology and science and technology studies. His thesis was awarded the FCIências ID Award in 2019. Before joining IF he was a research assistant in the CoLABOR team, aiming to build a technological impact assessment methodology in work and employment. He was part of the FCT funded projects "Trabalho,

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**Tuomas Pernu** I finished my PhD at the University of Helsinki in 2013 (theoretical philosophy, jointly with physiology &

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