Monday, 24 March, 11:00 am – 1:00 pm, KH 1.011 (Senatssaal)

Symposium: Science in Philosophy Education

Bettina Bussmann
University of Salzburg

Anna Breitwieser
University of Salzburg

Gregor Greslehner,
University of Vienna

The philosophical and educational need to deal more intensively with the role of science in philosophy and ethics lessons comes from two directions: firstly, from the world we live in, which is becoming increasingly scientific. In most areas of our lives, scientific ways of thinking, theories and results are the decisive authorities which we often accept uncritically. Secondly, science denial and other forms of science scepiticisms are on their way. Both of these problematic developments have entered teacher and university education. We cannot outsource the task for science reflection to the science subjects - which have their area of Nature of science (Nos) - because a) science teacher still tend to skip teaching it and b) science reflection is a proper philosophical discipline that should be taught.
This workshop presents the theoretical legitimisation for science-oriented philosophy, gives examples of problematic practices and suggests concepts and materials that can be used to implement better teaching and to create the awareness for a better science communication.

Epistemic responsibility in teacher education (Bettina Bussmann)

Philosophy and ethics teachers generally work with philosophy textbooks that either completely exclude empirical findings or only integrate them for specific philosophical purposes. Empirically- informed or even interdisciplinary philosophising remain a rarity in university teacher training - even though curricula and international education plans have been calling for this for a long time.

I will present a paradigm case of integrating empirical findings that are supposed to produce well-founded philosophical judgements. I will call this case the *unreflected delivery function* of empirical findings and show how this integration makes well-founded judgments difficult and even hinders them. Cases like these lack the awareness of epistemic responsibility. In order for the teaching of philosophy and ethics to fulfil its epistemic responsibility, I suggest that domain-specific epistemic norms should be developed and discussed. I will propose two epistemic norms.

Philosophy's key role in bridging science integration and reflection through dialogue (Anna Breitwieser)

Current educational goals require that teachers pursue science integration (goal of science integration) and that students are equipped with the skills and knowledge to critically evaluate knowledge and science (goal of science reflection). However, these two goals are often promoted and pursued independently. This separation is also evident in philosophy education, as an analysis of several philosophy textbooks demonstrates. In my talk, I will first explain why it is problematic to address science integration and reflection separately. Then, I will illustrate how these two aspects should be linked. The presentation concludes with a proposal for bridging science integration and reflection through a science-oriented dialogue, supported by concrete examples from practice.

The role of metaphors in teaching complex biological systems (Gregor Greslehner)

When students or non-experts are introduced to complex biological systems like the immune system, instructors and science communicators frequently rely on metaphors to present the entities and activities in question. There is one immediate benefit: metaphors allow to understand unfamiliar phenomena through the lens of something familiar (along the lines of Lakoff and Johnson's seminal 1980 book "Metaphors We Live By"). In the case of the immune system, the prevalent war metaphors of fighting and protecting against foreign invaders (i.e. pathogens) are dominating how immunology is taught. There are a number of non-trivial problems with this approach, however. Chief among them is a misrepresentation of the many regulatory, developmental, and repair-related functions of the immune system in interaction with the microbial world that fall outside this narrative. Not only is there a danger of spreading a misrepresentation of the underlying multi-faceted biology when immunology is taught to non-immunologists in this way. Even more so, when generations of immunologists have been brought up with such metaphorical narratives which overshadow other important aspects of the system that do not fit the metaphor - in short, when the metaphors are so deeply engrained in the teaching of a discipline that it is forgotten that they are just metaphors with limited use and applicability. The role of metaphors must be reflected upon, especially when communicating scientific content to students or laypersons. Otherwise, we face the dangers of reinforcing misconceptions and people's willingness to believe fake news or crude pseudoscientific claims about the immune system and health interventions like vaccines.

Monday, 24 March, 2:30 pm – 4:30 pm, KH 1.011 (Senatssaal)

GAP-Symposium: Practice-oriented interdisciplinarity: success and obstacles for collaborations between neuroscientists and philosophers of science[1]

Markus Kunze
Medical University of Vienna

Isabella Sarto-Jackson
Konrad Lorenz Institute of Evolution and Cognition Research

Philipp Haueis
Bielefeld University

One central goal of philosophy-of-science in practice is the direct engagement of philosophers with scientists (Boumans and Leonelli, 2013). The success of this approach depends on an effective interaction between philosophers and scientists, which varies with the form of interdisciplinarity. In reflective approaches, interaction can be distant (e.g. via reading papers or occasionally talking to scientists), whereas collaborative approaches require intense interaction between philosophers and scientists around a common problem (Kaiser et al., 2014). Taking this a step further, 'philosophy in science' requires the direct and long-standing involvement of philosophers contributing directly to scientific projects (Pradeu et al., 2024). These philosophical accounts stress that interdisciplinary collaboration lead to philosophical accounts of science that (i) are developed alongside current scientific practice, allowing for iterative feedback and refinement, (ii) can be tested in well-defined scientific fields, and (iii) can illustrate their relevance and utility to scientific communities. Since contemporary neuroscience is a hotbed for interdisciplinarity involving philosophers, this field is a fertile testing ground for the aforementioned benefits of interdisciplinarity. Despite many common interests and topics, however, these disciplines often remain widely separated, far distant and even isolated in practice (Gouveia, 2022). Interdisciplinary institutions (e.g. graduate schools, summer schools) are often oriented towards neurophilosophy, whereas the relevance and promises of philosophy of science for neuroscience is rarely a focus. Discussions of the relation of both fields often focus on combined methods such as neurophenomenology (Gouveia, 2022). Beyond the graduate level, close interdisciplinary exchange remains rare due to divergent publication pressures and career demands. Thus, an explicit discussion of how collaborations between philosophers and neuroscientists implements the beneficial features (i)–(iii) is currently missing. The goal of the symposium is to close this gap by using three collaborative projects between neuroscientists and philosophers (of science) to discuss the challenges and promises of interdisciplinarity in neuroscience. The symposium will address the following questions: (1) Which benefits and costs does direct interdisciplinary exchange provide for a better understanding of (neuro)scientific processes and the development of novel concepts in philosophy of science? (2) Which types of direct interdisciplinary collaborations were successful in the neurosciences? (3) What implications do these collaborations have for philosophical discussions of interdisciplinarity? (4) How can interdisciplinary collaborations foster the application of ideas from philosophy of science in neuroscientific practice? Markus Kunze will address questions (2) and (4) demonstrate how concepts from philosophy of science contribute to a conceptual framework of model organisms that can be directly used by neuroscientists to plan, perform and interpret their experiments. Isabella Sarto-Jackson will address questions (1) and (2), by illustrating how the complementarity of approaches and skills allowed philosophers and neuroscientists to challenge a gene-centered perspective on some fields of neuroscience (and psychiatry) and to emphasize the relevance evo-devo approaches to brain research. Philipp Haueis will address questions (3) and (4) by emphasizing that in interdisciplinary collaboration tacit and progressive mutual influences but also coincidental observations can provide novel insights, leading us to think beyond intentional collaboration and common problems when reflecting on fruitful interdisciplinarity.

[1] This symposium is kindly sponsored by the Gesellschaft für Analytische Philosophie e.V. (GAP)

The use of model organisms in neuroscience – receiving philosophical support for a complicated problem (Markus Kunze)

Model organisms are important tools in today´s neuroscience and many key insights of neuroscience have been obtained by studies in model organisms (Yartsev, 2017). The use of model organisms is characterized by the transfer of information or understanding from one species, in which the investigation has been performed, to another species, which is of primary interest and often called the target organism. Despite a long and successful use of model organisms and its wide applicability, this approach has also been criticized: for low reliability because of differences between model and target organism; for low success in drug development; and for the inability to recapitulate key symptoms of patients with psychiatric disorders (Bolker, 2017). The lack of a widely accepted conceptual framework of model organisms, which is oriented on neuroscientific practice, limits collaborations between scientists and clinicians, is an obstacle for discussions between advocates and critics of model organism, and complicates the communication with the public. I will describe the development of such a conceptual framework for model organisms that was made possible by collaboration with a philosopher (Federica Malfatti from Innsbruck, Austria). It relies on concepts that have originally been developed in the philosophy of science and were now adapted for practical use in neuroscience. For that purpose, we used: the concept of representation as central property of model organisms (Ankeny and Leonelli, 2011), the analogical relation between model and target system (Hesse, 1966), and the concept of models as tools (Currie, 2017). I will suggests that (i) two different types of use of model organisms should be distinguished in neuroscience, because they address different types of question; (ii) model organisms are tools in larger research projects in which they fulfill a specific role which helps to define criteria that must be met by the relation between model to target organism; (iii) model organisms are not intended as ideal representations of their target organisms but as a compromise between epistemic benefits and representational risks; the term epistemic benefits is used to indicate the advantages for the learning process that are mediated by the differences between the model and the target organism, whereas representational risk highlights the possibility that the differences between model and target organisms may mislead the learning process. The described collaboration took advantage from the complementarity of education and background knowledge, which allowed the discussion partners to compensate for a (partial) lack of understanding of the other domain of expertise (including the literature). Moreover, the neuroscientist could take advantage of the higher terminological and conceptual sensitivity of the philosopher, which revealed imprecisions and ambiguities. Several discussion rounds revealed misinterpretations of philosophical concepts by the neuroscientist and of scientific practice by the philosopher. Some examples will illustrate such clarifications and how they fostered the development of the concept. In summary, this study case illustrates that some philosophical concepts can be of direct use to practically working (neuro)scientists upon proper framing and adaptation to real-world applications.

Reconceptualizing neurodevelopmental timing by seizing insights from EvoDevo (Isabella Sarto-Jackson)

The dialogue between philosophers of biology and evolutionary developmental (EvoDevo) biologists is a paradigmatic example of how interdisciplinary collaborations can lead to significant progress by affording a deeper understanding of biological phenomena (Jablonka & Lamb, 2005). Hence, the question arises how philosophy can also contribute to advancements in contemporary neuroscience. This seems particularly challenging given neuroscientists´ strong commitment to cutting-edge technology for pushing to the forefront of research (Bickle, Craver, & Barwich, 2021). Neuroscience´s technophilia seems to stand in contrast to philosophy´s traditional methodology. EvoDevo offers a successful exemplar in which groundbreaking insights have come from a reconceptualization of existing paradigms (Müller & Pigliucci, 2010) rather than just exploiting innovative techniques. The discourse between philosophers and EvoDevo scientists has led to a rethinking of canonical evolutionary approaches by challenging reductionist views. Reconceptualizing the role of genes in both phylogeny and ontogeny has prompted researchers to move beyond gene-deterministic thinking to privilege an organismal view driving evolutionary diversity (Baedke & Fabregas-Tejeda, 2023). Recently, neuroscience has emulated key concepts from EvoDevo, such as heterochrony, to elucidate neuroscientific questions (Suarez & Halley, 2022). For example, heterochrony seems to have driven the evolutionary expansion of the human neocortex (Charrier et al., 2012) shifting the interpretative framework from a reductionist to an organismal account of brain development. However, migration of concepts and theories across disciplines can be epistemically risky (Lin, 2019). Here, philosophers can contribute to interpreting scientific findings by scrutinizing underlying assumptions and biases, e.g., adaptionist versus "evolutionary factors" explanations (trade-offs, spandrels, or drift). Philosophical approaches are particularly promising in this context as they prompt researchers to venture deeper into conceptual questions when investigating neuroscientific issues under an EvoDevo lens. For instance, neuroplasticity enables organisms to adapt to fluctuating environments (Axelrod, Swanne, & Carlson, 2023) characteristic of the human cognitive niche. In humans, neuroplasticity is fostered by heterochrony that results in prolonged postnatal brain development. Yet, while neuroplasticity drives variability that allows for adaptation, it also introduces the risk of neurodevelopmental aberrations and psychopathologies (Sarto-Jackson, 2022). This illustrates an epistemic tension between adaptationist and non-selectionist explanations of human brain development and evolution. To solve this tension, integrating different conceptual frameworks will be helpful for allowing a re-interpretation of neuroscientific and psychiatric findings. A similar pluralistic strategy has been successfully pursued in EvoDevo where "methodological adaptationism" was extended by the "evolutionary factors" framework (Lloyd, 2015). Fostering integrative epistemic endeavors is one of the core missions of the Konrad Lorenz Institute for Evolution and Cognition Research that provides an enabling space for exchange and collaborations between philosophers and biologists in the institute´s fellowship program as well as in interdisciplinary workshops. It can be expected that exchanges between philosophers and neuroscientists will contribute to redefining neuroscientific research agendas possibly leading to a radical reframing of the role of intrinsic and extrinsic factors in developmental timing during different ontogenetic life stages; the etiology of psychopathologies and potential intervention strategies; and the paradox of how disadvantageous cognitive traits can persist in populations despite their negative impact on reproductive fitness.

Serendipity and intellectual osmosis: two overlooked factors in interdisciplinary collaborations? (Philipp Haueis)

This talk analyzes two episodes of interdisciplinary exchange from my 12 year-long, ongoing collaboration with the Cognitive-Neuroanatomy-Lab led by Daniel Margulies (CNRS-Paris, formerly MPI-Leipzig). The lab investigates principles of spatial organization in the cerebral cortex and their role in human cognition. One such principle are "cortical gradients", i.e. that cortical features exhibit systematic and continuous progressions across the cortex. One such progression is the principal gradient of functional connectivity, which runs from primary sensory areas to the default mode network, and seems to describe the role of representational abstraction in different cognitive functions (Margulies et al., 2016). The first interdisciplinary exchange concerns the formation and extension of the gradient concept. My 'public' contribution to this project was to apply the philosophical framework of multiscale modeling to the use of "gradient" in connectomics, resulting in a new wiring diagram of mesoscale circuit gradients (Haueis, 2021), and the philosophical insight that multiscale modeling can serve exploratory purposes (Haueis, 2022). I would describe this interdisciplinary exchange as intellectual osmosis, referring to the spontaneous and largely tacit exchange of ideas. On the one hand, my long-standing practical engagement with the lab's research implicitly shaped my thinking about conceptual development in neuroscience. On the other hand, my previous collaborative work on fuzzy boundaries (Haueis, 2012) might have also implicitly shaped the search for continuous progressions and adoption of the gradient concept in the lab. The second episode of interdisciplinary exchange involves the organization of two workshops, which illustrates the role of serendipity in interdisciplinary collaboration (Darbellay et al., 2014). In his talk at the first workshop in Bielefeld, Prof. Margulies discussed the strategic ambiguity of "gradient" – vacillating between the uncontroversial claim that the cortex contains systematic progressions and the controversial claim that it has no discrete boundaries (Petersen et al., 2024). This remark sparked philosophical research into strategic ambiguity and conceptual engineering – a topic I had not been explicitly looking for. In the second workshop on concepts for understanding brain organization in Paris, both a philosopher and a neuroscientist independently gave talks on the role of Deep Convolutional Neural Networks (DCNN) for explaining brain organization. At the subsequent academic retreat, this sparked a long conversation on the explanatory role of DCNNs in neuroscience, resulting in a joint position paper with practical guidelines on the use of these tools. This was a happy coincidence, since our workshop description did not mention DCNNs at all. The role of intellectual osmosis and serendipity highlights the importance of tacit and nonintentional factors in interdisciplinary collaboration (Stone, 2013;Darbellay et al., 2014). These factors are easily overlooked by philosophical frameworks which center interdisciplinarity on common problems (Kaiser et al., 2014) or on philosophers intentionally working on a particular scientific problem (Pradeu et al., 2024). Similar to the scientific discovery process itself, however, it may be epistemically uncertain what exactly the problem is one is collaborating on (Rheinberger, 1997). The role of nonintentional and tacit factors in these situations needs to be reflected in accounts of interdisciplinarity alongside explicit and intentional ones.

Tuesday, 25 March, 10:45 am – 12:45 pm, KH 1.011 (Senatssaal)

Symposium: The Status of Medical Knowledge and its Interfaces with Science and Philosophy of Science

Yael Friedman (Host)
University of Oslo

Guido I. Prieto
Bielefeld University

Robert Meunier
Independent researcher

Cornelius Borck (Chair of panel discussion)
Institute for History of Medicine and Science Studies (IMGWF), University of Lübeck

In the proposed symposium, we will bring to the fore the multifaceted nature of medicine and the challenges this poses for characterizing its disciplinary nature and epistemic status. To address these challenges, we shall draw on core concepts in philosophy of medicine as well as on recent work in philosophy of science, including discussions on the demarcation problem, values in science, and disciplinarity boundaries. The symposium will thus unfold the notion of medicine in the conceptual space defined by the relations between science and values, science and practice, and science and technology. In medicine as a field in which these relations are closely tied together, those questions become more prominent and, therefore, can yield valuable insights for philosophy of science in general. The symposium consists of three talks (3X 20-minute talk + 5-minute Q&A) followed by a panel discussion (45 minutes) chaired by Cornelius Borck (IMGWF, Lübeck).In the first talk, Yael Friedman will argue that the science/pseudoscience and science/art dichotomies traditionally used to characterize medicine are insufficient to capture the complexity of medicine. In addition, the talk will show that these dichotomies gloss over important relations between science and society, like the question of trust in scientific institutions. In this respect, medicine could be a model field for philosophy of science to draw insights regarding other scientific disciplines (e.g., climate science). Guido I. Prieto will focus on the deceptively simple question “What is medicine?” His answer will be that medicine is not a discipline but a system of disciplines that includes crafts, services, science, and technology. He will explore the far-reaching consequences this unique disciplinary status has on how the philosophical problems of medicine are characterized and approached. Through the case of biomarkers, Robert Meunier will address the question of useful knowledge in medicine, showing how non-epistemic values embedded in medical practice influence biomedical science. The case of medicine can inform other cases in which the technological interface between application-oriented research and a field of practice is mediated by co-produced values. The question of the relation of medicine and science is mirrored in the question of the relation of philosophy of medicine and philosophy of science. Thus finally, drawing on the insights from the three presentations we address this question more generally.

Medicine as science or art: moving beyond dichotomies (Yael Friedman)

Philosophers have debated the epistemic status of medicine since Antiquity. Aristotle famously suggested that medicine is not an episteme but a technê (art, skill, craft), this is, practical knowledge aimed at caring for and curing patients. This suggestion kicked off a long-standing debate on the nature of medicine and its relation to science. This paper challenges the traditional dichotomous views of medicine as either a science or a non-science. By examining the historical and contemporary perspectives on this topic and drawing upon recent advancements in medical technology and the philosophy of science, I argue that the prevailing dichotomies—science/pseudoscience and science/art—are inadequate for understanding the complex nature of medical practice. In light of recent answers to the demarcation problem (Pigliucci, 2013; Resnik et al., 2023), I show that in order to understand medicine we need to take into account epistemic virtues some of which belong to the realm of science, while others belong to fields that are traditionally excluded from science (even including pseudoscience). Additionally, I will demonstrate that the traditional dichotomic characteristics often attributed to science and art—value freedom vs. value-ladenness, objectivity vs. subjectivity, generality vs. specificity, precision vs. intuition, and certainty vs. uncertainty—are not mutually exclusive so that the boundaries between science and art are blurred.By exploring these themes, I aim to illuminate the multifaceted nature of medicine as a field that incorporates elements of both science and art. Following Cunningham (2014), I will argue that there is no clear division of labor between them. I will discuss how the contemporary trends of patient-centered care, evidence-based medicine, and the increased use of health-related data further complicate the traditional dichotomies and necessitate a more nuanced understanding of the status of medicine. By moving beyond the restrictive confines of traditional dichotomies, we can gain a more accurate and comprehensive understanding of the nature of medicine. I will show how the use of these dichotomies glosses over the important issue of trust in medical institutions, communication of medical experts' disagreements, and patients' and public participation. Addressing those issues from the perspective of medicine can provide useful tools for other scientific disciplines.

References:
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Resnik, David B., and Kevin C. Elliott. 2023. "Science, Values, and the New Demarcation Problem." Journal for General Philosophy of Science 54 (2): 259–86. https://doi.org/10.1007/s10838-022-09633-2.

Medicine as a system of disciplines (Guido I. Prieto)

Considering its potentially far-reaching consequences for how medicine is conceptually and epistemologically approached, it is rather surprising that the question 'What is medicine?' has received very little attention from philosophers of science and philosophers of medicine in particular. The standard answer to this question centers on the goals and praxis of medicine and has been called the 'curative thesis.' It states that medicine has to do with preventing disease and curing ill people—or at least mitigating the negative effects of disease and reducing pain and suffering. In contrast, the 'inquiry thesis' focuses on the competencies and cognitive dimension of medicine and postulates that the core business of medicine consists of understanding and predicting disease rather than curing and preventing (Broadbent, 2018). Other positions in this debate postulate nuanced versions of either of these two main theses (Harris, 2018; Smart, 2023) or some combination thereof (Metz, 2018; Fuller, 2021).In this paper, I will show that disagreements arise because the different answers to what medicine is underscore different facets of medicine. Thus, it is certainly the case that curing and preventing on the one hand, and understanding and predicting on the other hand, are central goals and competencies of the medical enterprise. However, none of these characterizes medicine as a whole. Drawing on Bunge (2013), I will argue that the reason for this is that what we call 'medicine' is not a discipline but a system of disciplines that deeply differ in their goals, methods, and values. Among these disciplines, there are professional crafts (e.g., surgery, obstetrics) and services (e.g., nursing, administration), as well as scientific (e.g., cancer biology, toxicology) and technological (e.g., pharmaceutics, normative epidemiology) research fields. I will make the case that medicine's disciplinary structure is distinct from that of other fields such as biology and that it does not map neatly onto the categories of multi-, inter-, and trans-discipline. Finally, I will explore the implications of this way of characterizing medicine for how conceptual and epistemological problems of medicine are approached from the philosophy of medicine.

References:
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Medicine, medical research, and usable knowledge: the case of biomarkers (Robert Meunier)

Broadly understood, the term ‘medicine’ is often taken to cover both medical research and medical practice (i.e., working with patients). Medical research produces knowledge that can be used in and improve medical practice or health related measures and policies. Research can be more or less integrated into practice. Either way, the demand of usefulness of medical knowledge sets medical research apart from research in other fields in the life sciences, say developmental biology, where knowledge about biological systems is not expected to be directly translated into practical concerns. Instead, medical research is similar to other fields of so-called applied research. Neither interested in defining the boundaries between research and practice in medicine, nor in clearly distinguishing basic and applied research, this contribution seeks to characterize the processes and products of making use-oriented knowledge from an epistemological and axiological point of view. For this purpose, the talk will focus on biomarkers as one type of product of (bio-)medical research.As defined by the US FDA, biomarkers are measurements of characteristics that can be used as indicators for biological, pathological, or pharmacological processes. The measured characteristics can be biochemical, visual, behavioral, or other features related to individuals or populations. The category of a biomarker overlaps with that of a clinical sign. However, (a) biomarkers not only indicate disease, but also other states, such as drug response and disease susceptibility; (b) measuring biomarkers is typically taken to be more technologically demanding than observing signs or to rely on non-classical clinical tools (a category that obviously changes over time); and (c) biomarkers are expected to detect processes earlier (e.g., before a disease or drug has led to lasting damage) or to be more specific for a given condition (with many clinical signs being unspecific). Furthermore, biomarkers can be turned into commercial products. Biomarkers are typically statistical facts. To discover and validate a biomarker means to establish such facts about relations between measurements and disease related processes. I assume that research activities delineate facts understood as relations between entities or processes. My hypothesis is that usable knowledge, which constitutes the goal of application-oriented research, is characterized by the delineation of facts in which some of the relations and the relata belong to social, economic, or normative kinds. This is what makes the resulting knowledge claims applicable in a given context in which these kinds are constructed. The case of biomarkers is well suited to investigate how medical practice as embedded in a socio-economic system establishes social, economic, and normative kinds that medical research then connects to biological kinds to establish hybrid facts, such as biomarkers. These hybrid facts, involving natural as well as social, economic, and normative kinds are value-laden in that the construction of social, economic, and normative kinds expresses established values in a socio-economic system. The case not only sheds light on how research and practice relate in medicine, but supports an account of how non-epistemic values shape facts in application-oriented research fields such as (bio-)medical research.

Tuesday, 25 March, 2:30 – 4:30, KH 1.011 (Senatssaal)

Symposium: Accuracy of prediction and freedom of choice

Lena Kästner (Host)
University of Bayreuth

Silvia Milano
LMU Munich

Astrid Schomäcker
University of Bayreuth

Vincent C. Müller
FAU Erlangen-Nürnberg

Patricia Rich
University of Bayreuth

This session discusses AI-based recommendations and AI-assisted decision-making. It consists of a keynote lecture delivered by Silvia Milano and three short commentaries offering perspectives from AI ethics, decision theory, and philosophy of mind. The presentations will be followed by short Q&A and a panel discussion with all speakers.

Keynote:
Accuracy of prediction and freedom of choice in algorithmic recommendations (Silvia Milano)

We live in an increasingly datafied world, where information is abundant but difficult to navigate. In this context, we have become accustomed to interacting with recommender systems that personalise and structure the information we access in digital environments, which have emerged as one of the foremost applications of machine learning today.
I will start by tracing a brief history of the development of recommender systems, from early applications of collaborative filtering to more recent developments including generative models.
I then expand on the core formulation of recommendation as a prediction task, aiming at predicting interactions between users and items. I consider three key assumptions that characterise this problem formulation: i) that past data are evidence for future interactions; ii) that interactions are evidence for users' preferences or utility; iii) that accurate predictions improve the outcome of recommendations for users.
I will end this talk by reviewing whether and to what extent predictive accuracy in these terms can support users' freedom of choice by providing a helpful framing or, to the contrary, misses the mark while raising concerns about nudging and manipulation.

Commentaries:

- **Accuracy, freedom, fairness: trade-offs in recommender systems? (Astrid Schomäcker)**
- **Autonomy and praise or blame for decisions (Vincent C. Müller)**
- **The ecological rationality of recommender systems (Patricia Rich)**

Moderator: Lena Kästner

Wednesday, 26 March, 10:45 am – 12:45 am, KH 1.011 (Senatssaal)

Symposium: Assessing the representational roles of model organisms: A view from DEKI

Guido I. Prieto (Host)
Bielefeld University

Roman Frigg (Chair),
London School of Economics and Political Science

Lorenzo Sartori
IMT School of Advanced Studies Lucca

Wiktor Rorot
Konrad Lorenz Institute of Evolution and Cognition Research

Sabina Leonelli
Technical University of Munich

Alejandro Fábregas-Tejeda
Bielefeld University

Widespread empirical practices in disciplines as varied as developmental genetics, toxicology, and cognitive science, rely on so-called model organisms. These are reared and standardized in laboratory settings in attempts to gain projectible, general insights about biological processes in other organisms and human-targeted biomedical applications. In recent years, discussions on the epistemology of model organism-based research have emerged in the philosophy of science. A central topic of contention is the representational status (or lack thereof) of model organisms qua models. Some scholars argue that model organisms have a primary representational role and thus can be considered models. In contrast, others put this into question and sustain that model organisms are specimens, surrogates, or tools rather than models. In one way or another, adjudicating the representational status of model organisms requires committing to a view of how scientific representation works and what counts as a model. Among the diverse extant positions on representation and models, the 'DEKI account' proposed by Roman Frigg and James Nguyen has proven especially useful in this context, partly because it is particularly wellsuited to deal with material models, i.e., models in which the vehicle or carrier of the representation is a material object such as an organism. This symposium convenes the senior author of DEKI and a group of scholars who have found in DEKI a fruitful framework for formalizing and spelling out the epistemic roles of model organisms. It aims to provide a platform to exchange ideas and move the debate forward in productive directions. Author 1 kicks off with a detailed account of how model organisms represent other organisms. He pays special attention to DEKI's 'exemplification' and 'keys' in explaining how these elements cohere in the justification of inferences drawn from research on model organisms, which cements the representational status of model organisms contra non-representationalist positions. The notion of a 'key' (i.e., a mapping between properties of the model and properties of the target) takes center stage in the next two contributions. Using research on biological signaling as a case study, Author 2 examines how inferences about human and basal cognition are drawn from model organisms. He argues that the establishment of 'keys' starts from the heuristic postulation of "key-sketches" that are adjusted and refined as research proceeds. In tune with Author 2's contribution, Author 3 contends that 'keys' shift according to research aims, background knowledge, and other contextual factors that constitute the model organism's "repertoire." This, in turn, results in changes in the "representational power" of model organisms. The author exemplifies these epistemic dynamics by tracking the changing role of model organisms in the emergent field of precision toxicology. Finally, Author 4 proposes amendments to DEKI and its previous applications to model organism-based research and contends that model organisms are not models proper but model carriers that display several dimensions of "modeling versatility." The author suggest that this proposal provides a way to resolve tensions between contrasting stances apropos the representational status of model organisms.

Model organisms as scientific representations: A matter of keys (Lorenzo Sartori)

Recent debate in philosophy of experimental biology shows considerable disagreement around the epistemological features of so-called model organisms: whether to consider them instances of epistemic representation analogous to models (Ankeny & Leonelli, 2020) or not (Weber, 2004, 2014; Levy &

Currie, 2015). I contend that this disagreement derives from a misunderstanding of the concept of representation, and its application to the specific context of model organisms. In this talk, I start from Ankeny and Leonelli's proposal and their endorsement of the so-called DEKI account of scientific representation (Frigg & Nguyen, 2020). Then, I develop and correct their account by more substantially applying DEKI conceptual resources, with particular focus on DEKI's concepts of exemplification and keying-up, the role of which remain importantly underdeveloped in Ankeny and Leonelli's analysis. The main result I reach is that a model organism-based inference about a designated target system (i.e., another organism) is valid when the model organism accurately represents that target, relative to the relevant properties the inference is about. A model organism accurately represents its designated target, if any, insofar as it exemplifies certain properties, and these properties are imputed to the target via the right key, namely a mapping function that translates the set of properties of the target into the set of properties possessed by the target. By recognizing that representation depends on interpretation, and not on similarity, I can turn to the non-representational views on model organisms and show that their anti-representationalism relies on an incorrect account of scientific representation.

References:
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Looking for keys to the brain: Keying-up in neuroscience (Wiktor Rorot)

Abstract: While cognitive science and neuroscience have been thoroughly transformed by the contemporary model organism-based approach to life science research, its impact is rarely explicitly recognized. One important consequence is that especially in cognitive science, focused on human cognition, it is unclear what source of evidence animal models provide. This is particularly salient in the context of the newly emerging research on basal cognition. The field focuses on organisms without nervous systems, or with a very limited one, such as bacteria, slime molds, or comb jellies. The increasing importance of work within basal cognition demands a careful analysis of how scientists interested in organisms with more complex nervous systems, for example primates, can make appropriate inferences and draw insights, rather than only loose inspiration, from this body of research. One possible route to answering this question comes from the representational view of model organisms advanced by Rachel Ankeny and Sabina Leonelli (reviewed in Ankeny & Leonelli, 2020; see also Sartori, 2023), which follows specifically the DEKI (denotation, exemplification, keying-up, and imputation) account of scientific representation (Frigg & Nguyen, 2020). While DEKI is largely focused on explaining how we can draw justified inferences from models, it also provides a useful perspective on the process of "keying-up," which is the process of constructing a mapping from (relevant) model properties to target properties, crucial in establishing a novel model. Drawing from modelbased philosophy of science (Wimsatt, 2007), I will argue that this process involves heuristically driven construction of "key-sketches," which are grounded, in the case of model organisms, primarily by three central assumptions: (1) localization of function, (2) structure-function correspondence, and (3) evolutionary sources of analogies and similarities. As empirical evidence accumulates, "key-sketches" are refined and transformed into complete keys, however this initial heuristic step can be critical in deciding the future of a particular animal model. To support this proposal, I will apply the notion of "key-sketches" to analyze the study of biological signaling beyond nervous systems, an important area in basal cognition. This case study allows us to see how novel model organisms are proposed, how they are keyed up, and what tensions this can lead to. At the same time, it offers a clear example of the role of heuristics in model organism research, which has been missing from extant accounts.

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Shifting key: The evolving representational power of model organisms (Sabina Leonelli & Rachel A. Ankeny)

This paper considers the use of model organisms such as Daphnia magna and Drosophila melanogaster within newer approaches to toxicological research, focusing on the emergent field of precision toxicology as an instance of the evolution of these models' representational power with respect to the well-established model organism repertoire (Ankeny & Leonelli, 2020). We first track the epistemic changes associated with the use of model organisms as models in precision toxicology. We then explain these changes by applying the DEKI view on representation (Frigg & Nguyen, 2020) and mapping how the ways in which properties of the model are mapped onto properties of the target (the 'key' in the account) is shifting in response to novel research context, background knowledge, and goals. In closing, we reflect on the ways in which the philosophical notion of repertoire (Ankeny & Leonelli, 2016), by fostering a better understanding of the conditions under which a key is identified and made plausible to the research community, facilitates the tracking of these developments in contemporary life science and assess how they may affect the construction and significance of model systems over coming decades.

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Representing with model organisms: Toward an integrated picture (Alejandro Fábregas-Tejeda & Guido I. Prieto)

In this talk, we argue that both parties in the debate over the representational status of model organisms—'representationalists' and 'non-representationalists'—have recovered important insights about model organisms, but they have missed the mark by trying to settle their disagreement on the issue of whether whole organisms *are* scientific representations. By focusing on this point of contention, we submit, scholars have overlooked the epistemic significance of the distinction between models proper and *model carriers*. For setting up this argument, we mobilize and refine the DEKI account of scientific representation (Frigg & Nguyen, 2020) by clarifying the notions of 'domain' and 'target,' and proposing a working definition of 'carrier.' We then contend that scientific models include only the interpreted parts of carriers rather than whole carriers. We take stock of these conceptual clarifications within the context of model organism research and offer an integrated picture of how representation with model organisms works. In contrast to Sartori (2023), we maintain that model organisms are not models but model carriers, only abstracted and selected 'parts' of which are included in biological models. These parts correspond to phenomena of interest that are interpreted as mechanisms or other kinds of causal processes within certain theoretical domains. The models can then be used to legitimately represent similar target phenomena in other organisms. Importantly, our account is able to satisfactorily reconstruct case studies from scientific practice and preserves what we call 'representational proportionality' between models and targets. Moreover, our framework suggests that model organisms are epistemically special within the scientific landscape due to their nature as ontogenetically changeable, standardized, and evolved material carriers. These characteristics afford six important kinds of *modeling versatility* that biologists marshal in their investigations: (i) synchronic target versatility; (ii) synchronic scope versatility; (iii) diachronic target versatility; (iv) diachronic scope versatility; (v) manipulation versatility; and (vi) discovery versatility. In presenting these dimensions of modeling versatility, we also further explicate key valuable notions that have been advanced by Ankeny and Leonelli (2020)—'representational target,' 'representational scope,' and 'representational power'—as these apply to modeling practices that involve model organisms. Our general account paves the way to reconcile opposing positions apropos the representational status of model organisms and build a more robust epistemology of model organism-based research.

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Wednesday, 26 March, 2:30 pm – 4:30 pm. KH 1.011 (Senatssaal)

Buchsymposium: Wissenschaftsleugnung *(Symposium will be held in German)*

Alexander Christian (Host)
Heinrich-Heine-Universität Düsseldorf

Frauke Albersmeier
Heinrich-Heine-Universität Düsseldorf

Ina Gawel (Host)
Leibniz Universität Hannover

Axel Gelfert
Technische Universität Berlin

Viele Herausforderungen der Gegenwart, wie der Umgang mit dem Klimawandel, die Sicherstellung einer effektiven Gesundheitsversorgung oder die Entwicklung nachhaltiger Technologien, sind nur durch gemeinsames, koordiniertes Handeln zu bewältigen. Um diese Herausforderungen erfolgreich zu meistern, ist es essenziell, auf wissenschaftliche Erkenntnisse zu vertrauen, um fundierte Entscheidungen treffen zu können und die Zukunft gemeinsam zu gestalten. Doch der zunehmende Zweifel an wissenschaftlichen Erkenntnissen, im Extremfall bekannt als Wissenschaftsleugnung, stellt uns vor eine ernste gesellschaftliche Herausforderung. Der Sammelband Wissenschaftsleugnung versammelt Beiträge, die dieses Phänomen aus unterschiedlichen Perspektiven beleuchten: von philosophischen Analysen über Fallstudien bis hin zu konkreten Empfehlungen zur Wissenschaftskommunikation. Die Autor_innen des Bandes diskutieren u.a. die Rolle von Weltbildern, ideologischen Positionen und dem Technofideismus bei der Wissenschaftsleugnung und zeigen auf, wie diese Tendenzen durch die zunehmende Vernetzung der Gesellschaft, die politische Polarisierung und die Verbreitung von Falschinformationen verstärkt werden. Die Beiträge zeigen, dass Wissenschaftsleugnung in verschiedenen Formen auftreten kann: von der offenen Leugnung etablierter wissenschaftlicher Erkenntnisse über die Ablehnung von wissenschaftlichen Konsenspositionen bis hin zum Einsatz von elaborierten Kommunikationsstrategien, um ideologische oder wirtschaftliche Interessen zu forcieren. Die Folgen von Wissenschaftsleugnung können verheerend sein, sie führt zu Falschinformationen, Falschentscheidungen, Vertrauensverlust und politischer Instabilität. Wissenschaftsleugnung kann den wissenschaftlichen Fortschritt behindern, die Fähigkeit der Gesellschaft beeinträchtigen, auf gesellschaftliche Herausforderungen zu reagieren und zu einer Fehlentwicklung in der Gesundheits-, Umwelt- oder Wirtschaftspolitik führen. Wissenschaftskommunikation spielt in diesem Kontext eine entscheidende Rolle. Sie muss Brücken zwischen Wissenschaft und Gesellschaft bauen und ein kritisches Wissenschaftsverständnis fördern, das über die reine Vermittlung von Fakten hinausgeht. Die Autor_innen im Sammelband plädieren mehrheitlich dafür (a) Wissenschaft für konstruktive Kritik offen zu halten und gleichzeitig vor illegitimer Kritik zu schützen, (b) die Funktionsweise wissenschaftlicher Methoden transparent darzustellen und (c) sich stets um das öffentliche Vertrauen in wissenschaftliche Institutionen zu bemühen. Ein offener und ehrlicher Dialog, der die Öffentlichkeit in den wissenschaftlichen Prozess einbezieht und unterschiedliche Perspektiven und Weltbilder ernst nimmt, ist hierzu notwendig. Nur so können die vielfältigen Ursachen der Wissenschaftsleugnung adressiert und die gesellschaftliche Meinungsbildung gegen die zunehmende Verbreitung von Falschinformationen gestärkt werden.Im Buchsymposium sollen drei ausgewählte Autor_innen ihre Beiträge vorstellen und danach in Form einer Plenardiskussion die u.g. Diskussionsfragen mit den Teilnehmer_innen besprochen werden.

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Diskussionsfragen:
Welche Formen der Wissenschaftsleugnung existieren und welche Schäden entstehen dadurch?, Wie kann Wissenschaftskommunikation Wissenschaftsleugnung entgegenwirken?, Welche Rollen spielen Weltbilder und ideologische Positionen bei der Wissenschaftsleugnung?, Wie können wir die gesellschaftliche Vertrauensbasis in die Wissenschaft stärken?, Wie können wir die gesellschaftliche Meinungsbildung gegen Wissenschaftsleugnung schützen?, Wie können wir Wissenschafts-kommunikation als Kompetenz an (Nachwuchs-)Wissenschaftler_innen vermitteln?

Technofideism and Science Denialism (Axel Gelfert)

The term „science denialism“ is often understood as the active attempt to undermine evidence-based consensus-building by self-declared „sceptics“, who cast excessive doubt on, or engage in outright denial of, established scientific knowledge against their better judgement. However, it has become apparent over the last few years that science denialism is a more multi-faceted phenomenon which can come in degrees of severity and be based on various argumentative mechanisms. The present paper provides an analysis of a hitherto neglected issue in this context: the connection between overly strong trust in technical applications and the playing- down of scientific facts. It might seem counter-intuitive, even inconsistent, to strongly believe in technical applications and at the same time deny the scientific evidence used to develop these applications. Yet, the „technofideism“ that is foste- ring radical science skepticism is not based on a rational consideration of risks and benefits associated with new technologies. Rather, it is an expression of a worldview. To cope with cognitive dissonance, proponents of this worldview would rather deny scientific facts than technological promises. Besides providing a theoretical analysis of technofideism and its mechanism, this contribution will use the examples of „geo-engineering“ and a historical case-study to discuss the implications of science denialism motivated by technofideism.

Science Denialism under Uncertainty (Frauke Albersmeier)

Science denial consists not only in the denial of scientific knowledge. It is not only directed against the robust expert consensus that a given fact is supported by overwhelming evidence. Science denial can also come in the form of negations of scientific dissent, of a lack of evidence or the existence of inconclusive evidence. Science denial can happen under uncertainty. In this capacity, it often precedes the denial of what eventually becomes knowledge. When we conceptualize science denial as the denial of a given scientific state of inquiry, we can capture these forms of denial that have as much potential to cause damage as the denial of scientific knowledge. The consideration of science denial under uncertainty puts into focus the potentially subversive roles that scientists themselves can play in undermining scientific progress and scientific literacy, especially when they are motivated not by ties to the private sector but a commitment to some scientific theory, model or method.

Science Communication in Academic Education (Ina Gawel)

Science communication should be an integral part of academic education for a number of reasons. I present five of these reasons in this article to promote the implementation of such formats in academic education. In addition, I provide some insights into a course on science communication previously held: The course includes case studies of science denial, philosophical approaches to analysing those examples, as well as the basics of science communication to educate about such cases. My article also provides an exemplary syllabus.