Stillman Drake Lecture/ Conférence Stillman Drake

Pierre-Olivier Méthot
Université Laval

Georges Canguilhem, Historian and Philosopher of Science: New Perspectives from His Complete Work

Long hailed as "primarily a historian of science" (Gutting 1989, p. 32) whose work in this field is "limited to a particular domain" (Foucault, 1985, p. 3), Georges Canguilhem's writings have often been contrasted with those of Gaston Bachelard, deemed more philosophical, and with those of Michel Foucault, oriented more directly toward social and political issues (for a critique see Roth 2013). The limited availability of Canguilhem's work to his students and colleagues during his lifetime, both in France and abroad, was also frequently interpreted through the lens of his later writings in history and philosophy of science.

This Drake Lecture will correct this and other misinterpretations of his contributions and will present some surprising discoveries made possible by the publication of his *Complete Works* between 2011 and 2025 that challenge received historiography. First, the *Complete Works* reveal the significant extent of Canguilhem's engagement with social and political issues of his time, challenging the image of him as solely a scholar of science and its history. His involvement in the resistance during in World War II, but also in debates surrounding the atomic bomb and the Algerian War, highlights his commitment to intellectual engagement beyond the purely academic.

The *Complete Works* series also led to the rediscovery of two intertwined philosophical projects. Originating in his medical thesis, Canguilhem actively pursued the project of a "biological philosophy" in the 1940s and 1950s –and even later– without, however, turning it into the larger "Critique of Biological Thought" he envisaged (Limoges 2018, p. 28-29; Méthot 2020). But there was another project on the role of norms and values that Canguilhem investigated during his career, and for which *The Essay on Some Problems Concerning the Normal and the Pathological* (1943) merely "[laid] the groundwork" (Canguilhem, OC II, p. 42; Limoges and Méthot 2025). The convergence of these projects from the mid-1940s to the early 1990s fundamentally reshapes our understanding of Canguilhem's work. It reveals a far richer intellectual landscape than previously imagined, one that extends well beyond the confines of epistemology and history of science (Testa 2024).

Canguilhem's *Complete Works* forces us to reconsider a final and deep-seated historiographical point: his personal engagement with psychology. Long limited to his strong critique of psychology as a science, the sixth and final volume uncovers Canguilhem's early and surprisingly positive characterization of a certain kind of psychology, as shown by the unfinished *Treatise of Psychology* (Limoges and Méthot 2024), co-authored with Camille Planet, and even more clearly so by his first and, until recently, unpublished book: *Philosophy* (1932).

The jury is still out as to whether and how Canguilhem's approach to historical epistemology and these other philosophical projects hang together and calls for future research. But one thing is clear at present to everyone: the publication of the *Complete Works* –owing to the resolute editorial and intellectual efforts of Camille Limoges– has given rise to a far more complete and compelling view of Georges Canguilhem's legacy. The stage is now set for a global reception of his contributions within twentieth-century French thought.

Georges Canguilhem, historien et philosophe des sciences : Nouvelles réflexions à la lumière de ses Œuvres complètes

Longtemps salué « avant tout » comme « un historien des sciences » (Gutting 1989, p. 32), l'œuvre de Georges Canguilhem, dont on a dit qu'elle était « austère, volontairement bien délimitée, et soigneusement vouée à un domaine particulier » de l'histoire des sciences (Foucault 1985, p. 3), a souvent été opposée aux écrits de Gaston Bachelard, jugés plus philosophiques, et à ceux de Michel Foucault, orientés plus distinctement vers des questions de nature sociale et politique (pour une critique, Roth 2013). En outre, le corpus des œuvres de Canguilhem, nécessairement incomplet, dont disposaient ses étudiants et ses plus proches collègues de son vivant, tant en France qu'à l'étranger, a souvent été interprété à la lumière de ses écrits plus tardifs en histoire et en philosophie des sciences.

Dans cette conférence, je montrerai que les *Œuvres complètes* de Canguilhem publiées entre 2011 et 2025 ont conduit à des découvertes inattendues qui bousculent l'historiographie reçue. Tout d'abord, les *Œuvres complètes* mettent en lumière l'engagement intellectuel de Canguilhem envers les questions sociales et politiques de son temps. Son implication comme médecin et résistant durant la Seconde Guerre mondiale est connue, mais ses prises de position dans les débats relatifs à l'utilisation de la bombe atomique, à la Guerre d'Algérie ou à l'enseignement de la philosophie montrent son engagement en tant qu'intellectuel au-delà du seul domaine académique.

Ensuite, la série des *Œuvres complètes* aura permis de redécouvrir et de distinguer deux projets philosophiques entrelacés : la « philosophie biologique », un projet né de sa thèse de médecine qu'il a activement poursuivi dans les années 1940 et 1950 – et même plus tard – sans jamais concrétiser sous la forme d'un ouvrage l'idée d'une « Critique de la pensée biologique » (Limoges 2018, p. 28-29; Méthot 2020). Mais il existait aussi un autre projet, plus général, sur le rôle des normes et des valeurs et pour lequel l'*Essai sur quelques problèmes concernant le normal et le pathologique* (1943) n'aurait constitué qu'un « travail d'approche » (Canguilhem, OC II, p. 42; Limoges et Méthot 2025). La coexistence de ces projets de longue date modifie profondément notre compréhension de l'œuvre de Canguilhem, et montre que cette dernière s'étend bien au-delà de l'épistémologie et de l'histoire des sciences (Testa 2024).

Enfin, les *Œuvres complètes* nous obligent à réexaminer un dernier point historiographique tenace : le rapport de Canguilhem à la psychologie. Longtemps limitée à sa critique virulente de la psychologie en tant que science, le sixième et dernier tome des *Œuvres complètes* révèle la caractérisation précoce et étonnamment positive par Canguilhem d'un certain type de psychologie, comme le montrait déjà le *Traité de psychologie* (Limoges et Méthot 2024), coécrit avec C. Planet mais demeuré inachevé et, plus clairement encore, sa première synthèse personnelle, jusqu'à récemment inédite : *Philosophie* (1932).

La question des relations entre l'épistémologie historique chez Canguilhem et ces différents projets philosophiques n'est pas encore tranchée, et son élucidation exigera d'importants efforts d'analyse et de recherche. Mais une chose est désormais évidente : la publication des *Œuvres complètes* – grâce aux efforts résolus de Camille Limoges sur le plan éditorial et intellectuel – a donné lieu à une vision non seulement plus complète et plus captivante de l'héritage de Georges Canguilhem. Les conditions sont désormais réunies pour une réception globale de son œuvre au sein de la pensée française du XX^{e} siècle.

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Organized Sessions/Séances organisées

Approaches, Technics, and Precision in Islamic Mathematics and Astronomy

(organizer/organisateur: Sajjad Nikfahm-Khubravan)

The astronomical tradition of the Islamic world began to form around the 8th century with the translation of the major Persian, Sanskrit, and Greek works into Arabic. Shortly afterwards, innovative methods and approaches, both in observational and theoretical astronomy, shaped a tradition that continued for centuries until the birth of modern astronomy and physics. This session comprises of two papers that touch on various aspects of this scientific tradition in historical perspective.

Osama Eshera
University of Maryland

A Medieval Arabic Commentary on Autolycus's On the Moving Sphere

Autolycus of Pitane's (d. ca. 290 BC) On the Moving Sphere (De sphaera quae movetur = Fī al-kura al-mutaḥarrika) and On Risings and Settings (De ortibus et occasibus = Fī al-ṭulūʿ wa-l-ġurūb) are the earliest extant Greek mathematical works. Both works were among the many Greek works translated to Arabic in the 9th century; and they were retranslated and revised many times thereafter, until the 13th century. This talk presents a medieval Arabic commentary on On the Moving Sphere that survives in a unique manuscript. The commentary will be situated in its

historical context; the mathematical scope and nature of the commentary will be described; and a few mathematically interesting points will be highlighted.

Sajjad Nikfahm-Khubravan
University of Maryland
The Promise and Limitations of Simplicity: Sharaf al-Dīn al-Ṭūsī and the Linear Astrolabe
The linear astrolabe, invented by Sharaf al-Dīn al-Ṭūsī (fl. c. 1180), is an innovative yet underappreciated contribution to the history of astronomical instruments. Adapted from the regular plane astrolabe, which relies on the stereographic projection of celestial circles, the linear astrolabe reimagines this principle in a simplified form. Ṭūsī demonstrated that projected circles could be reconstructed using only a stick and thread, significantly reducing the instrument's complexity. While this innovation maintained the basic functions of the traditional astrolabe, it sacrificed the artistic and aesthetic qualities that made the plane astrolabe culturally significant and visually captivating. These features, central to its symbolic and intellectual appeal, were vital in its historical context. This paper examines the linear astrolabe's development, compares it to the plane astrolabe, and explores its limited adoption, highlighting the balance between practicality, aesthetics, and cultural value in medieval Islamic scientific instruments.

Fateme Savadi
McGill University
A Comparison between Geographical Coordinates Reported in Abū al-Fidāʾ's Taqwīm al-buldān and Modern Data
The increasing availability of digitized manuscripts and developments in digital humanities have opened fresh avenues in history of medieval science. Idrīsī: An Open Library of Historical Geography of the Premodern Islamic World, funded by a Digital Humanities Advancement Grant from the National Endowment for the Humanities, aims to create the digital infrastructure for encoding, synthesizing, and analyzing toponyms and geographical data from the vast corpus of premodern Islamic texts. In the framework of the Idrīsī project, we extracted geographical coordinates reported in one of the most important geographical works of the premodern Islamic world, namely Abū al-Fidāʾ's (d. 1311) Taqwīm al-buldān. This work is important in that, for each locality, the author reported several sets of coordinates from various sources. Abū al-Fidāʾ systematically presented this data in tabular form and cited his sources. This presentation will offer a comparison between Abū al-Fidāʾ's coordinates with the modern ones."

Studying Science "In Context": the Role of Epistemic Authority

(organizer/organisateur: Kevin Kaiser)

Sophie Bretagnolle
Take seriously the inclusion of local and indigenous knowledge in scientific research
As one of the most influential scientific body on biodiversity, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) mentioned its vivid will to be inclusive towards indigenous and local systems of knowledge. However, this objective enters in conflict with the epistemic norms in occidental science. I will discuss the necessity to adopt a critical view on the epistemic norms occurring in occidental science in the light of the epistemic norms used by indigenous and local systems of knowledge. I will defend that rejecting the preconceived superiority of occidental epistemic norms can lead to specific epistemic advantages.

Kevin Chalas
Metaphysics of Science as Critical Social Metaphysics
Metaphysics of Science – the project to construct metaphysical systems grounded on our 'best' scientific theories, thereby coopting a presumed epistemic authority of science and enabling ambitions of a revisionist metaphysics (Guay and Pradeu 2020) – tends to assume dogmatic commitments to scientific realism and therefore miss the necessary contextualization of their constructs to an epistemological stance defining science's epistemic authority.
Here, I sketch a practice of the discipline grounded in modern epistemology (social/feminist epistemology), and thereby suited to be critical of the implicit values peddled by scientific communities.

Herein, metaphysical practice is both backward-looking/descriptive – in extracting the metaphysical preconditions of the practice of a given disciplinary matrix – and forward-looking/revisionist – in producing metaphysical representations that may guide future matrices to more ethically appropriate practices.

Kevin Kaiser
On methodology in philosophy (of science): a critique of the authority of tradition
The "digital turn" recently adopted by history and sociology of science is still somehow slow to be taken in philosophy of science. This delay seems to be partly explained by the primacy of "typical" methods in philosophy. In this talk, the epistemological virtues of suspending this methodological constraint in philosophy of science will be defended on the basis of the potential gains offered by digital methods.

This analysis will show that both descriptive and normative capacities of philosophical analysis are limited by this "methodological conservatism", one example been the actual exclusive focus on the "visible" part of sciences.

Nonhuman Animals and the Sciences

(organizer/organisateur: Andrew Lopez)

Andrew Lopez
The Nose Knows: Uexküll and Nonhuman Epistemic Agents
In this paper, I draw from the work of biologist Jakob von Uexküll for understanding how nonhuman animals interact with their worlds and how they come to know it. Specifically, I use his concept of Umwelt, in combination with the idea of a Bauplan, to show how nonhuman animals construct their world and how these shape their cognitive and epistemic capacities. Paying close attention to these features can help us develop a species-typical reliabilist account of knowledge for these animals. Finally, I tie this approach to recent work on animal cognition, showing how Uexküll 'sthinking can improve research in animal cognition. Specifically, Uexküll can help us to address previous failures in considering the sensory modalities through which animals experience their worlds, and how research questions have been uncritically shaped by what humans find meaningful and its relation to human sensory modalities.

Erik Nelson
Animal Dreamers and the Control Problem
Recent empirical work suggests that many nonlinguistic animals dream. If nonlinguistic animals dream, animal minds must have a way of solving what Cameron Buckner has called the 'control

problem.' The control problem is what minds face when they must distinguish and manage different types of processes and/or content. For example, a mind that is incapable of distinguishing memories from current perceptual experiences would be a mind that has failed to find a solution to the control problem. In other words, if nonlinguistic animals dream, then they must have a way of sorting dream processes/content from other sorts of mental processes/content. In this presentation, I first demonstrate that this problem is one that the minds of nonlinguistic animals must solve, even if they do not remember or even experience their dreams. Second, drawing from empirical work on chimpanzees' grasp of the appearance/reality distinction, I suggest that at least some nonlinguistic animals solve this problem by metacognitively distinguishing veridical from non-veridical experiences.

Keerthipriya P
Social animals in the Anthropocene: navigating life in the city
The world is becoming increasingly urbanized, forcing wild animals to spend more time in urban habitats which pose novel challenges. Some species utilize urban spaces better than others, and species have been classified as urban avoiders, urban dwellers and urban utilizers (Fischer et al. 2015). However, species that appear to be doing well in cities may still face negative health consequences (Meillère et al. 2024) and, even within a species, there might be differences in the ability to use urban environments based on individual personality and social behaviour. Further, human attitudes and conflict-reduction strategies may also shape urban wildlife communities and their behaviour (Schell et al. 2021). I will discuss how animal social dynamics and human tolerance can interact and affect animal well-being, the consequences of these effects for urban animal populations and their long-term persistence, and potential future avenues of scientific inquiry that could improve urban human-animal coexistence."

Beyond Knabenphysik. Women in the History of Quantum Physics

(organizer/organisateur: Daniela Monaldi)

Daniela Monaldi
The Gendered History of Quantum Physics
The book Women in the History of Quantum Physics: Beyond Knabenphysik (to be published in the summer of 2025) is the outcome of an international, interdisciplinary project launched as part of a broader effort to commemorate the centennial of quantum mechanics. It presents original analyses of the lives and work of sixteen women who, throughout the twentieth century, from various locations and in diverse ways, participated in the development of quantum physics. By focusing on lesser-known figures and introducing a gender perspective to historical studies of physics, we aim to challenge the conventional all-male narratives that often reinforce the masculine image of the field. From these richly detailed microhistories, several themes emerge, offering insights into the historically persistent gendered dynamics of physics research.

Patrick Charbonneau
Elizabeth Monroe Boggs: From Quantum Chemistry to the Manhattan Project
Elizabeth Monroe, married Boggs (1913–1996), trained as a mathematician at Bryn Mawr, as a mathematical chemist at Cambridge, and as a theoretical chemist at Cornell, before joining the Manhattan Project at the Explosives Research Laboratory. Although her contributions to the fields of computational quantum chemistry, statistical mechanics, and explosives had lasting legacies, her scientific career nevertheless ended with World War II. The birth of her son's suffering from a severe developmental disability prevented her from ever rejoining the research workforce. She

pivoted instead to a remarkable life of public advocacy for people with disability, building on her scientific training to move research and policy forward. This presentation retraces how Monroe Boggs went from early quantum chemistry enthusiast to implosion researcher for the nuclear bomb, and then a key figure of the post-war disability rights movement.

Michelle Frank
The Daughter Particle: Chien-Shiung Wu and Twentieth Century Physics
Chien-Shiung Wu conducted some of the most startling and historically important physics experiments of the twentieth century. My research situates Wu's science within an international historical and cultural context reflecting early twentieth century Chinese intellectualism, international politics and American social constructions of gender and identity. Lively debate continues today about whether Wu was improperly passed over by the Nobel Committee. The broader question, though, is how cultural and gender expectations of the post-WWII era, and beyond, continue to obscure the story of this twentieth century physicist's extraordinary contributions."

Commemorating Kathleen Okruhlik (1951-2024) I & II

(organizers/organisateurs: Lisa Gannett and Andrew Reynolds)

This session commemorates the life and influence of Kathleen Okruhlik as a researcher, teacher, doctoral supervisor, colleague, university administrator, academic and social community builder, and life partner. Kathleen was a long-standing member of CSHPS/SCHPS and president from 2010-2013.

Jim Brown
Personal Remarks

Margaret Schabas
Kathleen Okruhlik on Early Modern History and Philosophy of Science

Letitia Meynell
Okruhlik's Unassailable Feminist Heuristics for Scientific Epistemology

Shannon Dea
Lessons from Melusina Fay Peirce

Alison Wylie
Chilly Climate Activism and Feminist Critiques of Science

Lisa Gannett and Andrew Reynolds
Beyond the PhD: Our Intellectual Debts to Kathleen

How Psychology Makes Up Families: An Exploration of the Looping Effect in Family Life

(organizer/organisatrice: Dominique Mailloux)

This symposium will be presented in French, with bilingual slides. The talks use Ian Hacking's looping effect to illustrate how psychological scientific knowledge makes up the experience of contemporary families in Québec.

Marianne Laprise Falardeau et Dominique Mailloux
Comment les livres grand public destinés aux parents construisent-ils la parentalité ?
Les livres parentaux contiennent des modèles normatifs de la parentalité qui influencent les attentes et pratiques de nombreux parents. Cette étude décrit les modèles dominants ressortis d'une analyse qualitative critique des livres les plus empruntés dans les bibliothèques publiques d'une ville québécoise. Les conseils dominants retrouvés dans ces livres soutiennent que l'idée que les parents déterminent directement le développement de leur enfant et présentent l'expertise professionnelle comme la meilleure source de connaissances sur la parentalité. Leur discours prescriptif invalide les connaissances expérientielles des parents et favorise une compréhension décontextualisée de la parentalité. Au contraire, nous estimons qu'une vision plus équilibrée et réflexive, qui valorise les compétences et expériences des parents, en les aidant à concilier cette sagesse pratique avec les connaissances abstraites des experts permettrait de bâtir une compréhension plus contextualisée de la parentalité, qui répondrait mieux aux besoins variés des familles contemporaines.

Camille Tremblay et Dominique Mailloux
Production et reproduction des services curatifs de soutien à la parentalité pour les parents d'adolescent.es : ethnographie des pratiques et discours scientifique, professionnel et médiatique
Cette ethnographie institutionnelle prend racine dans le malaise qu'une intervenante en action communautaire a ressenti lorsqu'elle a pris conscience du manque de ressources préventives destinées aux parents d'adolescents. Elle illustre la façon dont la littérature scientifique et les services offerts à cette population se limitent à un angle curatif qui cible des problématiques spécifiques (ex. consommation de drogues, sexualité précoce, etc.), ce qui contribue à (re)produire une représentation négative de l'adolescence, qui est également véhiculée dans les médias. Ces représentations encouragent les parents d'adolescents à recourir à une aide externe seulement en situation de crise, ce qui façonne l'offre de service en renforçant l'importance des interventions curatives d'expert.es qui laissent peu de place à la participation des parents. Ces (re)productions créent des barrières relationnelles et systémiques qui dévalorisent la prévention, la création de communautés, l'échange de savoirs expérientiels entre parents et l'empowerment des familles.

Audrey-Maude Tremblay, Mathilde Thibodeau, Raphaële Villeneuve et Marianne Laprise-Falardeau
Développer sa sagesse pratique parentale : comment se frayer un chemin à travers les recommandations scientifiques?
Aujourd'hui au Québec, devenir mère implique d'être exposée à une quantité de conseils, information et jugements, souvent contradictoires et irréalistes, mais dont la plupart sont dits basés sur la science. Cette étude qualitative explore le parcours d'onze mères québécoises de classe moyenne qui, d'une part adhèrent à l'idée que les professionnels et scientifiques sont ceux qui savent le mieux élever les enfants et d'autre part se heurtent aux effets négatifs de leurs conseils : peur, stress, confusion, pression, surcharge et culpabilité. Pour trouver leur voie en tant que mères, elles doivent développer des stratégies pour continuer de se fier à la « science » tout en protégeant leur intégrité personnelle et familiale et en créant des espaces propices au développement de leur sagesse pratique parentale. Leur expérience ouvre des pistes de réflexions sur la façon dont l'on peut partager des connaissances scientifiques qui informent les parents sans discréditer leurs capacités d'agir et de comprendre.

Creative Transformations: Effective HPS/STS Teaching

(organizer/organisateur: Isaac Record)

Isaac Record, Ellie Louson and Rich Bellon
Collaborating With Undergraduates to Transform STS Pedagogy

If critical pedagogy entails disrupting unidirectional flows of meaning, how can STS education enroll undergraduates as active participants in constructing their education? This submission draws on insights from the project, "Collaborative Research and Education Architecture for Transformative Engagement with Science, Technology, and Society (CREATE/STS)". CREATE/STS explores the affordances and constraints of a framework for cultivating interdisciplinary teaching & learning communities that bring together faculty and undergraduates in STEM, humanities, and social sciences around shared interests related to ethics and justice about the future of science and technology. Our central contribution to conversations about the role of critical pedagogy in STS lies in positioning undergraduates as agents in the collaborative design of learning experiences. Infrastructures that invite student collaboration throughout the stages of pedagogical design and implementation are rare in academia. Across our four university implementations, we have observed the value of including undergraduates in such efforts. Though not without challenges, when successful, these infrastructures can disrupt the power dynamics between faculty and students, as well as across disciplines. Student participation encourages more collaborative, interdisciplinary curriculum design that fosters epistemic humility, cultivates solidarities, and elicits faculty and student excitement about learning from each other. By positioning students as both collaborators with the faculty as well as mediators between them, the project envisions a transformative shift toward a more inclusive and equity-oriented approach to STS pedagogy.

Creative Teaching Strategies for Required HPS Courses (Extended Roundtable)
At North American institutions, many HPS courses are taught to non-majors, as humanities requirements for science students, or otherwise fall within "service teaching." This roundtable takes as its starting point recent Communiqué articles which recommend framing HPS courses as useful for non-majors and building a culture of care within your class. We will then offer examples of creative pedagogical moves and facilitate a participatory discussion including but not limited to the following topics:

* Strategies for engaging non-majors
* Activating students' expertise
* Beyond the essay: HPS and digital humanities
* When HPS courses fulfill writing requirements
* Deploying HPS against the erosion of the humanities

CSHPS attendees with any level of teaching experience are welcome at this participatory roundtable, organized by teaching faculty within a high service-teaching college. We especially welcome grad students and those in instructor/adjunct roles to share your perspective on these issues.

Individual Papers/Présentations individuelles

Aizawa, Ken
Rutgers University, Newark
Zetetic Scientific Realism
Anjan Chakravartty has described three dimensions of realist commitment: metaphysical, semantic, and epistemological. According to Chakravarti, 1) "Metaphysically, realism is committed to the mind-independent existence of the world investigated by the sciences" (Chakravartty, 2017, p. 5), 2) "Semantically, realism is committed to a literal interpretation of scientific claims about the world" (Chakravartty, 2017, p. 5), and 3) "Epistemologically, realism is committed to the idea that theoretical claims … constitute knowledge of the world" (Chakravartty, 2017, p. 6).

In this paper, I propose that, insofar as historians and philosophers of science wish to understand certain episodes of scientific experimentation and confirmation—insofar as they wish to understand what scientists are doing—it will be helpful to have a weaker version of scientific realism. I propose a notion of zetetic scientific realism that does not include Chakravartty's third epistemological commitment.

The term "zetetic" is meant to bring out the fact that this realism is part and parcel of scientific inquiry explicitly rejecting the presupposition that an individual bit of evidence—a single experimental result—in support of some mind-independent entity yields knowledge, belief, or acceptance. One of the important features of zetetic scientific realism is that it allows historians and philosophers of science to acknowledge that scientists sometimes recognize the ontological implications of an abductive argument, even though they wish to resist those ontological implications.

Al-Juhany, Ahmed
University of Calgary
How Should We Think About Ageing? Or, Why We Shouldn't Think of Ageing as a Process of Mere Decline
Biomedical researchers often define ageing as a process of progressive decline—one that's caused either by an accumulation of molecular damage (Kirkwood 2005; Gladyshev et al. 2021) or by developmental programs gone awry (see Gems 2022). But social and critical scholars warn against equating ageing with decline. They argue that doing so perpetuates harmful ageist stereotypes (Gullette 2004, 2017; Levy 2009), exacerbates discrimination against older adults (Gullette 2004, 2017; Levy 2022), and leads us to ignore or even actively undermine older adults' capacities (Ramscar et al. 2014). Given these concerns, we should, if possible, look to develop biomedical accounts of ageing that do not reduce it to a process of mere decline.

In this article, I take up an ameliorative approach to the biomedical concept of ageing and argue for a non-reductionist account of it. I draw on developments in the biomedical science of ageing—called "geroscience" (Kennedy et al. 2014)—to argue that we can conceptualize ageing as the (i) complex array of health effects produced throughout our lives (ii) by the same mechanisms that tend to cause senescence (systematic functional decline) later in life. I show this account is consistent with predominant mechanistic and evolutionary models of ageing despite not reducing ageing to a process of mere decline. Given the harms risked by the decline-centric accounts of ageing, we should take up this non-reductionist alternative.

Ashton, Zoe
The Ohio State University
On Hidden Variables and Hidden Figures
In 1932, in his Mathe¬matical Foundations, John von Neumann published a purported proof of the impossibility of hidden-variable theories in quantum mechanics. It was accepted as a rigorous proof until 1966 when John Bell published a devastating objection to the proof. The proof contains a problematic assumption – that of the linearity of expectation for all possible observables.

On its own, this is an interesting story about how long it might take to correct incorrect rigor judgments in physics. But this talk focuses on an earlier, attempted correction – namely that of Grete Hermann's in 1935. Her objection, though very similar to Bell's, was ignored. In this talk, I argue that Hermann experienced an epistemic injustice. To do so, I'll begin by reviewing types of epistemic injustices. Then I'll provide a socially constructed notion of rigor in a community that can be influenced by tracker prejudices. I'll then argue that this helps to explain why Hermann's arguments were ignored. I'll argue that this explanation either encompasses some of the other available explanations and is more plausible than the rest.

Auffrey, Vincent
IHPST, University of Toronto
Eugenics and Public Health in Interwar Québec (1918-1939)
In 1920, the Association des Médecins de Langue française de l'Amérique du Nord met for the first time after a decade-long hiatus. Amid debates on the eradication of syphilis, alcoholism, and mental illness emerged the question of eugenics. Experts in the field of public health – namely mental hygienists – drew significant inspiration from eugenic research being conducted south of the border by American geneticists and psychiatrists and sought to emulate certain aspects of America's experiment with eugenics in French-speaking Québec. While they rejected eugenic sterilization, French-Canadian physicians were especially interested in premarital health examinations, restrictions on immigration, and eugenic family studies. Canadian historiography has emphasized the role of the Canadian National Committee for Mental Hygiene and Canadian Social Hygiene Council in promoting eugenics in English-speaking Canada; it has, however, remained relatively silent on the involvement of French-Canadian medical experts in the story of Canadian eugenics. This paper examines the position of French-Canadian physicians on eugenics amid the rapidly changing landscape of the 1920s and 1930s. Like in other Catholic settings, scientists and medical experts in Québec reacted to US sterilization laws, the rise of Nazism in Germany, and Catholic denunciations of eugenics by papal authorities. Despite widespread opposition to sterilization in Québec, I argue that the influence of the American eugenics movement on French-Canadian public health discourse and practices has been understated.

Bergeron, Vincent
University of Ottawa
Assigning Functions to Brain Structures: How Teleology Gets in the Way
A primary goal of cognitive neuroscience is to assign functions to brain structures. This task is highly sensitive to methodology, because it varies greatly with how cognitive functions are specified. But there is no generally agreed method of functional attribution among researchers. A serious problem arising from this is the fact that many different cognitive functions can be assigned to the same brain structure depending on the cognitive context. This failure to observe systematic mappings between cognitive functions and brain structures has led many to conclude that our

cognitive ontologies—i.e. our current descriptions of cognitive processes and their components—must either be incorrect or too coarse (e.g. Anderson 2014, Poldrack 2010, Price & Friston 2005). The solution, we are told, is to develop new cognitive ontologies, or at the very least revise our current ones, although there is little agreement on how to proceed. In this talk, I argue that teleological thinking is a primary obstacle to the successful mapping of cognitive functions onto the brain. I then offer a non-teleological approach to assigning functions to brain structures and discuss the implications of this approach for the development of cognitive ontologies that are better suited to the cognitive neurosciences.

The non-teleological approach I propose is based on an analysis of the notion of cognitive homology. In contrast with the well-known concept of structural homology in biology—defined as the same structure in different animals regardless of form and function—the proposed notion of cognitive homology captures the idea that the basic cognitive contribution of a given homologous brain structure tends to remain stable over long evolutionary time scales. I argue that this notion provides a powerful conceptual tool for the study of cognition. Since a cognitive homology will often consist of an evolutionarily conserved relationship between a homologous brain structure and its basic cognitive contribution, such structure-function mappings can be conceived as basic building blocks of human cognition.

Berkhout, Suze
University of Toronto

Postcards from the Edge of Science and Technology Studies: Art-STS Experiments, Circulations, Affects

Arts, Science and Technology Studies (ASTS) is an emerging domain of STS that offers novel ways of "knowing-making," offering experiments and methods for doing STS and philosophy of science by material means (Rogers et al. 2023). Artistic creation is a particularly powerful way to develop unexpected and emergent forms of scientific knowledge, rendering multiple and simultaneous meanings through practice, form, and content (Rogers 2020). In this paper, we discuss a set of ASTS practices developed within the Frictions of Futurity and Cure in Transplant Medicine project ("Frictions"), a multi-year research-creation study of clinical care and biomedical research in solid organ transplantation framed through feminist STS and crip technoscience (Frankel et al. 2024). Exploring how our collaborations and the coproduction of art might inform scientific knowledge in transplant medicine, we invite thinking across the boundaries of 'art' and 'science' to reimagine central challenges in the field. In particular, we consider our practice of making and circulating postcards, rendered from visual fieldnotes and visual artworks developed within the project. We look to the postcards as offering otherwise contested or invisibilized sensory knowledge, and consider their material significance in the field, as the postcards were shared at scientific meetings, conferences, and public disability art events. As an object, the postcard undoes conventional notions of transplant's dominant cultural (scientific and popular) scripts, as well as its orientation to space and time, while serving as a "gift"—offered in an exchange that parallels (while undoing) the conventions of transplantation as the "gift of life." As methodology, the creation of the postcards renders contested understandings tangible and knowable, becoming part of the circulation of affects surrounding transplantation. Holding the proliferation of transplant technologies alongside the technologies of arts-science collaboration offers a space for thinking through ableist exclusions in the imaginaries formed in relation to biomedical technoscience.

Boantza, Victor D.
Program in the History of Science, Technology, and Medicine, University of Minnesota
"Things stand for Words, and their Qualities for Letters": Deciphering Nature Between Mechanism and Experimentalism in the Scientific Revolution
Likening the study of nature to the act of mastering a language or deciphering a code was a common early modern metaphor that drew in part on contemporary parallels between the book of God and the book nature, Scripture and Creation. In an iconic statement, Galileo suggested that "this grand book, the universe … is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures." (1623) The use of linguistic and lexical imagery in the 'experimental tradition', though less known, was as important and evocative as its application in the 'mathematical tradition', to use one of Kuhn's famous historiographical distinctions. This talk examines several such seventieth-century instances: from Francis Bacon's Abecedarium nouvm naturae, part of his unfinished Great Instauration, through Walter Charleton's Epicurean-Gassendist Physiologia (1654) to Robert Boyle's assertion in the early 1660s that God created the world in order to provide humans "not onely Necessaries and Delights, but Instructions too; each Page in the great Volume of Nature is full of real Hieroglyphicks, where … Things stand for Words, and their Qualities for Letters." Despite a lifelong commitment to the mechanical philosophy, Boyle was keenly aware of the epistemological gap between mechanistic accounts and experimental inquiries. He thus developed a working hypothesis, still fundamentally subordinated to a mechanistic alphabet, in which key "hieroglyphs" represented empirically robust qualities/states of matter like fluidity, heat, fermentation, gravity, etc. Situating these examples in their intellectual, cultural, and practical contexts, with emphasis on the struggle to combine the mechanical and empirical approaches to nature, sheds light on the complex relations between matter theory, natural history, and experimentalism during the height of the Scientific Revolution.

Bolduc, Ghyslain
Cégep Édouard-Montpetit, CIRST
A Kantian Episode in the History of Ecology: From Emil Ungerer's Neo-Kantianism to Cornelis Jacob van der Klaauw's thinking on the unity of ecological systems
The contribution of Immanuel Kant's critical philosophy to 19th century natural sciences such as morphology, embryology and physiology has been well documented and debated by scholars in recent decades. But Kant's ideas may also have played an unexpected role in addressing a central question of early 20th century ecology: are ecological systems similar to organisms, and to what extent? Taking up Kant's discussion of natural purposiveness, Dutch ecologist Cornelis Jacob van der Klaauw (1935) developed an account of multispecies systems as wholes that, however, differ significantly from organisms. Although these systems exhibit a network-like unity which results from contingent teleological relations between their parts, they differ from organisms in that they are not themselves purposes of nature, i.e. self-organizing wholes whose parts interact as if they were developing in accordance with the purpose of the whole. In this presentation, we will first analyse Emil Ungerer's use of Kant's ideas on natural teleology (1922), particularly in his analysis of plant self-regulation (1926). References to Ungerer's work are ubiquitous in van der Klaauw's work on Kant's teleology and theoretical ecology, and we will show how Ungerer guided him in his reading of Kant's Critique of Teleological Judgement. We will then present van der Klaauw's approach to ecological systems and situate it with respect to other contributions to the "organicism debate" that took place in early ecology. In particular, we will explore the idea that Kant's discussion of natural teleology enables van der Klaauw to elaborate his ecological holism as a

middle way between ecological organicism and a reductionistic view of ecological systems.

Brigandt, Ingo
University of Alberta
The Role of Metaphors in Understanding Conceptual Change
It is well-known that metaphors are used in science (Hesse 1966, Kuhn 1979, Keller 2002, Reynolds 2022). This presentation turns to an underexplored issue: the way in which HPS scholars have employed various metaphors as a tool for understanding conceptual change in science. My focus will be on &HPS work on concepts from the life sciences.

Metaphors have been used to shed light on conceptual change in two basic ways: (1) to capture the (internal) structure of a concept, and (2) to characterize the behaviour of a concept. Examples of the former to be discussed include the notion of a concept's 'open texture' and of the 'patchwork structure' of a concept (Haueis 2021). While I point out that different such metaphors foreground (and obscure) different things, these metaphorical characterizations of a concept's structure are generally geared towards making room for a concept's ability to flexibly undergo conceptual diversification and change. I also examine the extent to which this is analogous to the productive ambiguity as well as the creation of coherence across disparate features seen in some metaphors used by scientists. Regarding characterizing the behaviour of concepts, my examples include the metaphorical notion of a concept undergoing 'adaptive radiation' and coming to occupy an 'ecological niche' (like a species) as well as the contrary idea of conceptual variants happening to undergo 'neutral evolution.' I argue that these metaphors fulfill explanatory functions for HPS work, not unlike some of the epistemic functions achieved by metaphors used in science.

Calzavara, Alexandra
Institute for the History and Philosophy of Science and Technology, University of Toronto
Health expertise, authority, and resistance: online health communities in the age of misinformation
The widespread proliferation of health-related misinformation online represents a critical and escalating challenge, prompting global health initiatives to enhance science literacy, implement fact-checking, utilize AI for misinformation detection, and leverage the authority of health experts on social media. Moreover, online health communities (OHCs) have become influential spaces where misinformation thrives and where health advice is often merged with controversial ideologies, such as anti-vaccination stances and skepticism towards scientific institutions. I present a case study of the pro-metabolic community (PMC), an OHC of 'lay-experts' in alternative health, to argue that conventional methods for addressing health misinformation may fall short. I posit that the PMC, by adopting the practices of formal scientific institutions to legitimize their own expertise and disseminate countercultural health ideologies, exemplifies a novel form of political resistance in the online health landscape. These dynamics may contribute to a growing misalignment between traditional public health strategies and the decentralized, community-driven movements shaping the future of healthcare in the digital age.

Chambers, Leah
University of King's College
Global Workspace Theory and the Problem of Evaluating Artificial Consciousness
The rapid emergence of increasingly powerful artificial intelligence (AI) in recent years has raised the daunting question of what it means to be conscious. By evaluating different challenges and potential solutions to artificial consciousness, philosopher David Chalmers seeks to answer the question, “Could a Large Language Model be Conscious?” in his 2023 paper of the same name. Chalmers’ paper is a starting point for my evaluation of Global Workspace Theory (GWT), a consciousness theory he explores in the paper, which was established by Bernard J. Baars in 1982. GWT centres around the idea that there is a place in the brain that collects and processes unconscious material to transform the unconscious into conscious material, allowing it to be distributed throughout the system. My paper examines the historical context that enabled GWT to be an appealing theory of consciousness for (AI) developers and argues that its consciousness criteria are especially lenient towards artificial consciousness. I argue that GWT is not a compelling theory of consciousness and that evaluating AI systems according to GWT is not a sufficient measure of consciousness. Through this argument, I demonstrate that consciousness testing depends on different theories of consciousness, making it hard to imagine a universally applicable consciousness test without a universal theory of consciousness. My paper is a starting point for considering how different theories of consciousness interact with the possibility of artificial consciousness.

Chartrand, Louis
Social Science and Humanities Research Council
A Relational Approach to Expertise Recognition
For an agent seeking expertise, recognizing an expert is a daunting task: their very need for expertise implies a lack of the resources required to evaluate someone’s claim to it (e.g., Milgram 2015). This "expertise paradox," rooted in the agent's limited epistemic assessment capacity, has been the subject of recent philosophical interest. Nguyen (2018) suggests circumventing the paradox by placing trust in a collective of experts—trust in an individual engineer, for instance, would derive from the visible achievements of the engineering profession as a whole. Quast (2021), on the other hand, argues that the burden lies with the expert, who must provide clients with the information necessary to make informed ascriptions of expertise.

In this paper, I argue that both approaches face significant limitations. Nguyen's collective trust model struggles to delineate the boundaries of an expert community in a way that aligns with the client’s goals, while while Quast's responsibility model falters when the client is themselves in a position of expertise. I propose an alternative approach: experts are often recognized not only by their knowledge but also by the special, caring relationship they maintain with the object of their expertise—a relationship observable through their endeavors and behaviors. I argue that this relational dimension is a crucial source of the trust and authority granted to experts and that it provides a more robust solution to the shortcomings of Nguyen's and Quast's accounts.

Chen Zhibin C.
KU Leuven (Katholieke Universiteit Leuven)
A Realist Aristotelian Conception of Indispensably Mathematical Explanations in Science
In debates on indispensably mathematical explanations in science, platonists argue that such explanations substantiate a commitment to the existence of abstract mathematical objects.

Platonists posits that the fact that 13 is a prime number explains the reduced predation of cicadas with 13-year life cycles compared to those with 12- or 14-year cycles. According to them, these indispensable explanations offer an "explanatory indispensability argument" (EIA) for platonism, drawing parallels with the reasoning used to justify belief in scientific entities like electrons. While I acknowledge the distinctiveness of mathematical explanations advocated by platonists, I argue that their case fails to guarantee a commitment to "full-blooded" platonist philosophy of mathematics. Specifically, the metaphysical gap between abstract mathematical objects and concrete physical systems undermines the explanatory power of platonic entities. Mathematical abstracta, even if they exist, are too detached from the physical world to constrain it, akin to how truths in the "story of mathematics" cannot govern physical reality.

I contend that Aristotelian realism offers a more plausible account of indispensably mathematical explanations in science. This perspective to mathematical explanations attributes explanatory power to the relationships between mathematical properties instantiated in physical systems. Unlike platonism, which fails to bridge the abstract-concrete divide, Aristotelian realism grounds mathematical explanations in the properties of physical systems themselves.

While Lange (2021) proposes a definitive framework of "explanation by constraint," I demonstrate that an Aristotelian realist view can be derived from a critical examination of platonist defenses against nominalism, including the generality and Moorean certainty criticism, which necessitates a clarification for the explanation mechanism between worldly properties and mathematical facts. This paper serves as a practice in pluralist understanding of mathematical explanations. For pluralists, mathematical explanations involve beneficial metaphysical posits, representations of science, and also indispensable explanatory parts of scientific theories, each requiring a distinct conception. From this perspective, I emphasize that this conception is Aristotelian regarding "indispensably mathematical explanations in science."

Ciftci, Asya
McGill University

Patterns in Data: A Case for Measurement Realism

This paper explores the relationship between patterns in empirical data and the philosophy of measurement, arguing for a mild measurement realism that views measurement outcomes as patterns in data. Patterns are central to scientific practice; they are identified, quantified, and interpreted across various scales. Dennett's (1991) argument for real patterns emphasizes the existence of regularities in the world. According to Dennett, patterns are "real" if they can be compressed without losing essential information. Applying this argument to measurement procedures, I argue that compression is involved in steps from calibration to statistical analysis, and a measurement outcome captures a real pattern when it results from processes that transmit information more efficiently.

However, compressing data and applying pattern recognition methods to obtain measurement outcomes is not simple. Measurement entails more than just locating an entity within a logical space, as van Fraassen (2008) claimed, but also modifying the geometry of data spaces by reducing dimensionality, applying projections, and employing scaling methods. The identification and quantification of patterns are highly contingent upon the successful architecture of data spaces. This raises concerns about conventionalism, which holds that the geometry and metrics used in data representation are matters of convention, potentially undermining measurement realism.

I address the conventionalist critique by shifting attention from fixed points and distances—as in Isaac's (2019) fixed-point realism—to patterns as entities built out of information. Although the geometry of data spaces is conventional, choosing different methods risks losing the pattern or capturing a distorted image. Two constraints—effective information transmission and avoidance of pattern distortion—ensure the correspondence between reality and identified patterns in measurement. Consequently, the choice of scales for calibrating measurements or the design of data spaces is not arbitrary but motivated by the need to preserve and transmit information accurately and efficiently.

Cimino, Andrea
KU Leuven
Franz Brentano on scientific induction
This paper aims to present and examine Franz Brentano's overlooked reflections on induction and his idea of an empirical-scientific metaphysics. It will show how Brentano, as a critical recipient of both an Aristotelian-empiricist lineage (e.g., Aristotle, Bacon, Descartes, and Hume) and empirical positivism (e.g., Comte and Mill), attempts to reform the project of an a posteriori metaphysics. Brentano's project seeks to develop a metaphysics that: (a) rejects speculative and dogmatic approaches, (b) is firmly grounded in experience by means of a theory of evidence relying on assertoric truth of perceptually given phenomena, and (c) systematically adopts "the natural-scientific method: intuition, deduction, and induction" (Brentano 1987, p. 303). More specifically, the paper will focus on the pivotal role of induction in Brentano's project, where induction eminently functions as an epistemic operator that connects factual truths, obtained through direct perceptual intuition of individual facts, to the universal laws that govern all phenomena.

Close Koenig, Tricia
Université de Strasbourg
Around the world in a paraffin block. Cancer, classification and circulating human remains
This presentation focuses on how cancer diagnosis, nomenclature and treatment were negotiated in the mid-twentieth century (c. 1920s-1960s), and on the epistemics of cancer classification, in a unique approach that focuses on the circulation of human remains and human tissue samples. From the turn of the twentieth century, cancer was increasing identified histopathologically. That is, from a tissue sample preserved in a paraffin block that was sliced, mounted and stained on a microscope slide. These samples traveled routinely from consulting, operating or autopsy tables to laboratories. But many of them continued on surprisingly long journeys. For example, the Registry of Bone Sarcoma centralised a collection of bone sarcoma samples in Boston but also circulated them around the United States in the 1920s. Concurrently, human tissue samples traveled between various laboratories in Paris and around France to integrate the biological archive of the Association Française des Etudes sur le Cancer and their Atlas du Cancer. Cancer tissue samples were equally sent from the Institut Pasteur in Saïgon and Hanoï to the Faculté de médecine in Strasbourg. More broadly the Institut Pasteur in Paris coordinated the exchange of human tissues between their Paris laboratories and Instituts Pasteurs in Africa and Asia, and beyond. Cancer tissues travelled around the world following colonial collecting practices.

I show that the materiality and circulation of human tissue samples is integral to epistemic categories and definitions of cancers. It is also a facet of the circulation of human remains in colonial contexts that has received little, if any, attention.

Contessa, Gabriele
Carleton University
Mistrust of Science as a Collective Failure
Over the last few decades, academics and social and political commentators have become increasingly concerned about declining levels of trust in science among citizens of liberal democracies. This decline is evidenced, among other things, by the refusal of many to accept the scientific consensus on various issues, ranging from the reality of anthropogenic climate change to the severity of COVID-19. According to the standard, individualistic diagnosis, this mistrust is primarily attributed to the epistemic failings of individuals who distrust science. This paper develops and defends an alternative, collectivistic diagnosis. According to this diagnosis, the mistrust is primarily the result of a collective failure. I offer three arguments to support the collectivistic diagnosis over the individualistic one.

First, I argue that, contrary to the assumptions of the individualistic diagnosis, individuals are often ill-positioned to determine which sources of scientific testimony to trust and, consequently, which scientific claims to accept.

Second, even if individuals could identify which scientific claims to accept (and which to reject), they would still struggle to use these claims to make better practical decisions. This difficulty arises because most relevant decisions are, in fact, collective in nature (or, at the very least, influenced by a choice architecture shaped by collective decisions).

Third, much of the supposed mistrust in science is actually a symptom of a broader failure to make collective decisions based on the best available scientific knowledge. I argue that this failure is primarily due to a dereliction of policymaking duties by elected officials. Their inaction often burdens citizens with the task of making complex decisions on their own or delegates these decisions to technocrats who lack democratic legitimacy and accountability.

Dart, Bradley C.
Memorial University of Newfoundland
Nicholas of Cusa and the Measure of All Things: On the Symbolic Method, Weight-scales, and Conjectural Knowledge
Nicholas of Cusa (1401-1464) was not just a theologian and cardinal but maintained an active interest in natural philosophy. His Idiota de Staticis was completed in 1450; it is the final work in a series of dialogues between an Orator and a Layman. In this text, the Layman outlines various applications of weight-scales (balances): comparing the weight of objects, measuring the power of a magnet, and the diagnosis of illnesses and administration of correct dosages by comparing the weight of urine or pulse rate. In fact, Cusa here provides the first description of a hygrometer - a device used for the prediction of the weather by measuring atmospheric humidity through gravimetric adsorption (Kiefer & Robens, 2008). The motifs which are present in his theological works reemerge in the course of describing empirical results. In De Docta Ignorantia, the Maximum is the measure of all essences, while the entire text on weight-scales is about the measurement of natural phenomena. Just as we are unable to attain perfect knowledge of the Absolutely Maximum, Cusa also denies that we can have perfectly precise knowledge of weights (or any other empirical matter). However, we can come to know the scope of our ignorance and approach a conjectural type of knowing about God and the hidden aspects of nature by means of surmises in De Coniecturis. In both domains, the conduit for this conjectural knowledge is a mathematical, symbolic method. Consequently, Nicholas of Cusa provides a novel epistemology and conceptual

framework for both theology and science, exhibiting a powerful confluence between religious and empirical knowledge.

De Saegher, Thomas
University of Western Ontario
Wavefunction Realism is Still Empirically Incoherent
Ney (2015) dealt with Maudlin's (2007) charge that wavefunction realism (WFR) – a reification of the state on configuration space – renders quantum theory empirically incoherent (incapable of confirmation, if true); Ney separated Maudlin's metaphysical concern with macro-reduction from quantum theory's confirmability. However, WFR seems to be a substantive alteration of the structure of quantum theory; it is unclear that one can derive records of 3D macro-objects from a wavefunction evolving on some higher-dimensional space with no presupposed correspondences to 3D space. If the records of these objects in their surrounding environment are highly redundant, macro and local, then I offer a proof that such a derivation is, in fact, impossible with globally unitary quantum theory. The proof uses results from Quantum Darwinism (Riedel, 2017; Ollivier, 2023) and the Decoherent Histories formalism (Riedel, Zurek & Zwolak, 2016). In outline, decoherence does not generate branching histories for 3D macro-objects that are recorded redundantly in the environment at the approximate length-scale of human experience without first specifying a certain tensor product structure (TPS) to the environment's initial state. The TPS divides the environment into spatially non-overlapping subsystems about the size of the 3D macro-objects, which is (apparently) not something the wavefunction realist can presuppose, given their responses to "Monton's Challenge" (Ney, 2020; 2021). Thus, if all evidence for quantum theory comes from environmental records at a certain length-scale, like records in a lab notebook, then WFR renders unitary quantum theory empirically incoherent, because such a theory cannot derive the existence of these records.

Delmore, Tyler
York University
Field Maps and Popular Fronts: Behaviorism's Left-Wing, Anti-Authoritarian Cohort
Historical accounts of *psychological behaviourism*'s political tendencies often emphasize its relation to social engineering, utilitarian policymaking, and industrial management (Mills, 1998). Famous are Watson's boasts about determining the psychological characters of any "dozen infants," Skinner's embrace of volitional "determinism," and Hull's Rockefeller-funded work on organismic "switchboards."

But such figures do not exhaust the historical varieties of behaviourism. Many psychologists within mid-century America held views that directly opposed Watson et al.'s schemes, both for psychological-scientific and for political reasons.

I discuss a distinct lineage within behaviourism, descended from James and pragmatism, and sharing generally socialist, pacificist, and anti-fascist views. These figures, among them Edward Tolman, paired, (1) a concern to vindicate organisms as *centres of action* (contrasted to the *peripheralism* of Watson and Hull) and, (2) criticism of the foolhardy collaborations between Watson et al. and political actors.

In fact, it's possible to understand Tolman's famed "cognitive maps" precisely as an attempt to marry this concern for central action with a repudiation of the politically suspect actions of his fellow behaviourists. Published and archived material reveals, on examination, that Tolman's

"maps" were aimed at warning of the inadequacy and danger of the conditioning schemes advocated by Watson, Hull, and Skinner.

Due, Austin
East Tennessee State University

Does Talk Therapy Have Side Effects?

Medical interventions that are effective, i.e., that have the capacity to heal, also have the capacity to harm. Things benign as water and oxygen can kill in the wrong contexts. Talk therapy has some demonstrated effectiveness for treating some mental illnesses. Therefore, it follows that talk therapy can also harm. However, 'harm' is multifaceted in medical contexts. Negative 'side effects' are unintended harms caused by an intervention's causal capacities or mechanisms of action. 'Nocebo effects' are harms caused by a patient's expectations or conditioning factors. In 'somatic' medical contexts we can distinguish between these different kinds of harms appealing to distinct causal mechanisms. I argue here that in 'non-somatic' contexts like treating some mental illnesses, these two harm concepts cease to be causally distinct. This is an underexplored consequence of the 'uncomfortable closeness' identified between placebic mechanisms and the suggested mechanisms of action for talk therapies like cognitive behavioral therapy (CBT). In other words, the problem I illustrate here is not that it is difficult to 'figure out' if a harm is a side effect or a nocebo effect in talk therapy. Rather, the problem is that within the talk therapy context, these concepts no longer meaningfully identify distinct explanations for why a harm occurred. There is nothing 'at stake' or contrastively learned by using one concept over the other, unlike in 'somatic' medicine. I explore two possible responses that aim to 'save' the causal distinctness of these concepts in the 'non-somatic' context: (1) arguing for sub-mechanisms within expectation and conditioning that are operative in talk therapies and inoperative in placebic effects and (2) endorsing mechanisms of action for talk therapy not reliant on expectation or conditioning. Both responses fail, further illustrating the 'uncomfortable closeness' of placebic effects and talk therapy from the underexplored perspective of talk therapy's harms.

Ehsani, Sepehr
University College London

Examining Part–Part Interactions toward Improving Mechanistic Explanations in Cell Biology

This paper's aim is to contribute to the topic of the relative 'completeness' of mechanistic explanations in cell biology by focusing on the 'interactions' between the molecular parts invoked in such explanations. Mechanistic explanations, which are a mainstay of causal accounts in cell biology, are underpinned in large part by a network of part–part interactions, e.g. protein–protein or protein–nucleic-acid interactions. In studies that attempt to discover these interactions, regardless of the scale and mode of experimentation, there is a tacit assumption that an 'interaction' is constituted simply by the proximity between and/or enzymatic changes imparted on the two parts (of note, multipart interactions can generally still be thought of as being composed of a number of two-part interactions). However, very few substantive theoretical accounts of what may actually constitute an 'interaction' in the context of the cell have been put forth. Starting with the example of a mechanistic explanation of an important cellular phenomenon (the mitochondrial respiratory chain), I develop an account of protein–protein interactions, a key type of part–part interactions in the cell with implications for other types of molecular interactions. First, I map out four aspects relevant to the sequence of events taking place in at least a significant proportion of protein–protein interactions, and, second, propose (i) interaction-enabling properties of proteins and (ii) interaction-enabling properties of the proteins' environment as elements that could be explained

by relevant lawlike generalizations. These generalization-based explanations could answer contrastive why-this-and-not-that types of questions pertaining to different aspects of a protein–protein interaction of interest in a mechanistic explanation, which would otherwise be difficult to answer in purely mechanistic terms. This approach can help with the overall completeness of a given explanation.

Erciyes, Burcu
McMaster University
Feminism and Debiasing AI Outputs
Feminist philosophers of science have long argued for inclusivity in scientific practices as a prerequisite for achieving diversity in theory construction and assessment (Longino, Harding, Keller, Okruhlik). Such inclusivity is believed to contribute to a more objective understanding of the world. As AI tools become increasingly pervasive and influence various layers of social institutions, including knowledge-production, it is crucial to question the objectivity of AI outputs and the processes through which these outputs are produced. Generative AI models are known to reflect the biases embedded in the data they are trained on. One approach to addressing this problem involves eliminating biases during the training process by implementing limitations and rules designed to prevent the production of biased outputs. Another approach seeks to mitigate bias at the output stage through censorship or filtration of harmful results. Determining the objectivity of AI outputs will depend on whether we aim to accurately describe the general/dominant views that the data represents or whether we seek normative measures to achieve impartiality. (Deery and Bailey) If the latter is the goal, then determining how such controls should be implemented for effective results inevitably raises questions about who should be included in these processes and what values should guide them. This paper explores the extent to which feminist insights on scientific practices can be applied to AI development to achieve more objective outputs.

Feke, Jacqueline
University of Waterloo
Simplicity as an Epistemic Value in Ancient Greek Astronomy
Where did the epistemic value of simplicity come from? Why do we value simplicity in scientific theories and not complexity, such that scientists could impress one another with the abundance of intricacies in their scientific explanations? This paper will present why Claudius Ptolemy, the second-century mathematician and author of the Almagest, valued simplicity in his astronomical models. Ptolemy proclaims that in general it is better to explain phenomena with the simplest possible hypotheses, and when deciding on whether the Sun's system was eccentric or epicyclic—as both models yield mathematically equivalent results—he appeals to simplicity as the decisive criterion. Ptolemy takes the eccentric hypothesis to correspond to the Sun's actual system in the heavens, as then the Sun's motion would be accomplished by one circle rather than two. Analyzing Ptolemy's discussions of simplicity in the Almagest, this paper will point to early Greek philosophical deliberations on the nature of the gods as precedents for Ptolemy's valuation of simplicity, and suggest that the appearance of simplicity as an epistemic value in science likely has its roots in ancient Greek theological considerations.

Fox, Craig and Chris Smeenk
MacEwan University and Western University, respectively
Reconstructing the Past
Whereas the present (and future) depend upon the past, earlier states do not depend on later ones. And yet in order to know about the past, we must infer in the opposite direction. What must the world be like in order for past states to be knowable? We introduce a novel approach to understanding historical reconstructions, drawing on the foundations of statistical mechanics and interventionist causation. We identify two aspects of "worldly infrastructure," contingent features of the world that support trace-based reconstructions of the past. The first is a familiar causal asymmetry, that we argue is justified by assumptions regarding the independence of initial conditions. Second, we identify the physical conditions needed to produce persistent traces and ensure their utility in historical reconstructions. We turn to examples of astrophysics and geochemistry to illustrate the value of this approach. Differences in timescales between the dynamics that create traces and the equilibrium dynamics that erase them allows scientists to play multiple traces off of each other, and to safeguard against spurious causal inferences about the past. Finally, we will compare our assessment with other discussions of trace-based reasoning in the methodology of the historical sciences. Our worry is that the prevailing conception of traces in the literature is neither necessary nor sufficient for underwriting the kinds of knowledge claims about the deep past that scientists have warrant for.

Fulda, Fermin
University of Toronto
Active Matter and Biological Agency: A Hylomorphic Framework
What is the relationship between the agency of biological systems and their active material constitution? 'Agency' is the capacity of a system to adaptively respond to its conditions in a goal-directed manner, such as organisms attaining and maintaining stability by mitigating threats and amplifying opportunities to realize their life cycle. In turn, 'active matter' is the local capacity of a system to self-organize and move directionally by transducing energy into mechanical motion, such as molecular motors, cell migration, and swarming behaviors. This talk addresses the question using a recent study on chloroplast behavior as active (dense) matter and its role in photosynthetic optimization (Schramma et al. 2023). I argue that while the active matter model explains how chloroplast behavior is dynamically reorganized in response to light intensity, assumptions about cellular and organismal agency are necessary to explain why this reorganization occurs in a particular way, as opposed to others. These assumptions are manifested in the way spontaneous chloroplast behavior is represented as "physiologically relevant." The distinction highlights a division of explanatory labor: active matter models explain the physical (glass-like) dynamics of chloroplast behavior, whereas agential explanations situate this behavior within the overall adaptive dynamics of the system. To integrate these perspectives, I propose a hylomorphic framework that emphasizes the interdependence of physical (material) and agential (formal) explanations of biological systems. I address the objection that natural selection provides a more parsimonious explanation for the adaptive character of chloroplast behavior, relegating agency to a merely heuristic role.

Fuller, Jonathan
University of Pittsburgh
Modern Scientific Medicine's Demarcation Problem
In this talk, I use integrated history and philosophy of science (HPS) to characterize and resolve modern scientific medicine's demarcation problem. Scientific medicine and homeopathy are interesting case studies for the ongoing project of demarcating science from pseudoscience. Much of the demarcation literature formulates abstract criteria for demarcating science from pseudoscience generally. In service of a more localist approach to the demarcation problem, I reconstruct a specific demarcating difference, the like comparison criterion, invoked by nineteenth century adherents to an early model of scientific medicine. If it is to remain relevant today, I argue that the like comparison criterion must be updated in our current era of epidemiological, evidence-based medicine to recognize the importance of assessing study bias and mechanistic implausibility in contemporary medical science. Thus, while the boundaries of modern scientific medicine have more or less survived the passage of time, they must be reinforced to properly bound the new modern medicine that emerged over the last several decades.

Gillette, Kinley
The University of British Columbia, Vancouver
The systemic approach to democracy as a response to the problem of value-inflexibility
Many philosophers of science have given up on the value-free ideal. However, most have not accepted a free-for-all for value-laden science. Instead, they have shifted their attention to solving what has been termed the "new demarcation problem" – that is, the question of what the proper role for values in science is. One dimension of the new demarcation problem is a problem of democratic legitimacy. Given that science is both value-laden and often either publicly funded or a direct or indirect input for collective decision-making, some philosophers have science have argued that science's values ought to be chosen democratically. Yet an underappreciated obstacle to democratizing value-setting in science is the problem of value-inflexibility. Science is value-inflexible if it is value-laden but the values with which it is laden are difficult or impossible to change. In some cases, this problem seems unavoidable. In those cases, it might not be possible to solve the problem of democratic legitimacy directly. A promising alternative is to take inspiration from the so-called "systemic approach to deliberative democracy," which does not require every component of a democratic system to exemplify every democratic ideal.

Grenier, Olivier
Université du Québec à Montréal
An evidence-informed analysis of evidence-based education debates
The rise of evidence-based education (EBE) since the early 2000s has recently reactivated the 1980s paradigm wars in education sciences. Indeed, critics of EBE typically claim that it gives an epistemic privilege to experimental research and meta-analyses, and thus neglects the importance of qualitative research in education sciences. But is this the case? If so, why are researchers and philosophers of social sciences so critical of EBE? If not, then what is EBE, and which of its criticisms remain relevant? In order to find answers to these questions, I met with educational researchers, teachers and teachers' unions representatives in the context of the creation of the Institut national d'excellence en éducation in Quebec. The aims of these interviews were to define EBE more naturalistically – that is, what are the methods of EBE actually – and to explicit the arguments raised by supporters and critics of EBE within this specific political context. Thus, the arguments expressed during the interviews fall into two general categories : the epistemological

ones, regarding the capacity of EBE as a scientific perspective to inform teaching decisions and educational policies, and the more sociopolitical ones, regarding the influences of political agendas, kafkaesque management and private interests. Finally, I analyse these arguments to evaluate the depth of the epistemic disagreement between supporters and critics of EBE in Quebec.

Hamm, Ernie
York University
The Anthropocene, past and present
Recently the President of the International Union of Geological Sciences declared that geologists "have the Anthropocene … one of the few geological terms that the public understands – they acknowledge that as humankind our effects on the planet are measurable and long-lasting." If the public understands the Anthropocene, perhaps this is because they paid little attention to geologists who debated it, sometimes intensely, over the past 15 years. There is much to unpack in the brief Presidential statement, which was made after the International Stratigraphic Commission formally rejected the Anthropocene epoch. If "measurable and long-lasting" effects of human activity count as a definition, then some version(s) of the Anthropocene were going strong already in the eighteenth century, and there was refinement of the concept in the nineteenth and twentieth centuries. The rejected stratigraphic definition of the Anthropocene could count as the most sophisticated refinement of the concept to date. Yet some geologists who lauded the decision to reject, insisted that the Anthropocene could not be reduced to a line in the "mud" at the bottom of Crawford Lake. What is going on? This paper argues that the Anthropocene does have a longer history, and that it has not always had an easy fit with some of the key ideas that have guided so much of the geosciences over the past two or more centuries: the deep time of geohistory and the colossal forces of geodynamics. This does not preclude the Anthropocene from having an important place in geology, but that place needs to be better articulated and communicated.

Hudson, Robert
University of Saskatchewan
Methodological pluralism in Carnap and Feyerabend
Paul Feyerabend is noted for his advocacy of methodological pluralism, also called the principle of proliferation, or methodological anarchism. One can identify various epistemological benefits to being liberal in one's choice of methods. If we're looking at science, this liberality requires that we are also flexible in how observations are interpreted, since if observations can be uniquely interpreted and determined to be true, one could straight away identify the epistemological problems with a proposed methodology. This liberality in the interpretation of observations is a product of Feyerabend's pragmatic theory of observation, itself drawn, according to Feyerabend, from Carnap's views on protocol sentences set forth in the 1930s. On this view of observation, observational reports are defined causally, without the initial assumption of meaningfulness. The task of this paper is to explain Carnap's motivation for interpreting observation reports causally in terms of his metalogical perspective which views linguistic expressions as strings of symbols proposed under specified physical circumstances. On that basis one has a variety of choices on how to choose scientific, language systems, each based on one's practical aims. Still, for Carnap and for Feyerabend, there are broad methodological constraints on adequate scientific systems, constraints that constitute a form of value-freedom in epistemologically adequate, scientific inquiry. The goal of this paper is to describe the nature of this value-freedom, clarifying its source in

Carnap's metalogic and its subsequent appearance in Feyerabend's later work as a limit on the scope on his methodological pluralism.

Jensen, Nayani
University of Toronto
Art from the Archives: Dutch anatomists, Mabel Hubbard Bell, and creative engagement with history of science
What role might fiction and art play in the practice of history and philosophy of science?

Nayani Jensen spent a summer as artist-in-residence at the Alexander Graham Bell Museum and National Historic Site, where she was tasked with creating an art exhibit based on the life of Mabel Hubbard Bell to fill a gap in existing museum exhibits. Her collection of short fiction about the history of science "Like Rabbits" is forthcoming from Simon & Schuster Canada. Her fiction has appeared in in Nature, The New Quarterly and elsewhere, and she received the 2024 RBC Bronwen Wallace Award for short fiction from the Writers' Trust of Canada.

In this presentation, she will discuss the relationship between art and academia, and the practice of playing and creating from archival materials. She will discuss the roles art might play in public communication of HPS, the tension between the practices of fiction and history, and the growing genre of "fiction about science." She will also discuss the role creative engagement might play in filling archival silences, thinking 'against the grain' and asking different kinds of questions of history.

Jones, Andrew
University of Toronto, Institute for the History and Philosophy of Science and Technology
Nurturing Human Potential: Laura Huxley, Psychedelics, and Scientific Motherhood in the American Counterculture
In 1955, the British novelist Aldous Huxley reflected to his brother about the process of aging: "We both belong to that fortunate minority of human beings who retain the mental openness and elasticity of youth…why the majority of men and women, and even adolescents, should develop mental arterio-sclerosis forty or fifty years before they develop physical arterio-sclerosis is a great mystery."

Huxley's interest in the "openness and elasticity of youth" played a central role in his final novel, Island (1962), which depicts a fictional utopian society called Pala. The citizens of Pala are well-adjusted; they live in the present moment; they happily discuss sex, religion, and science; and they support social policies that foster peace and equality. As Huxley makes clear, this positive mind state is built through Pala's education system, which encourages children to nurture their natural sense of openness as they grow up. A key element of this education system is the moksha ceremony, in which children take a hallucinogenic drug called "moksha-medicine."

This presentation examines how Island influenced ideas about childhood and child rearing practices in the Human Potential Movement by looking at the work of Huxley's second wife, Laura Archera Huxley. While much has been written about Aldous Huxley's influence on the American counterculture, historians have said little about Archera. After Huxley died in 1963, Archera promoted the message of Island through her self-help books and her charitable organizations, which were designed to help parents maximize the potential of their children.

By focusing on Archera's work, this presentation considers how postwar scientific theories about child rearing and mothering were translated into countercultural contexts to produce hybridized

forms of knowledge. While Archera's ideas challenged mainstream theories of mothering, by placing the burden of human potential on mothers, they still imported "mother-blaming" into the Human Potential Movement.

Katic, Gordon
University of Toronto: Ontario Institute for Studies in Education
"Thumb-sucking Exercises:" Grasping for a Journalistic Philosophy of Science
What is the philosophy of contemporary science, health, and environmental journalism? In this time of mounting public distrust of expertise and of the media, there is an urgent need to critically re-examine the foundations of science journalism. Here, the history and philosophy of science (HPS) has important theoretical resources that can be potentially useful to journalists. How do working reporters understand and engage with these and related disciplines, and how does this affect their work? There is scant research investigating journalists' philosophical views, and even less about how they understand science. I interview 32 journalists across the media spectrum, asking them a series of questions designed to tease out a contemporary journalistic philosophy of science. Questions covered a range of epistemological and political topics, e.g. the role of values, the causes of public distrust, the importance of public deliberation and engagement, and more. Unfortunately, aside from a few exceptions, most journalists in my study struggled to articulate a philosophy of science. Journalists are not naive, and they do not see scientists in unproblematically value-free. Still, they have little to say about many questions that are central to contemporary HPS, especially related to the role of public engagement and deliberation regarding scientific values and priorities. Yet, this is not for lack of theoretical capacity. I find that the demands of journalistic labour leave little time for philosophical contemplation. Furthermore, certain professional attitudes sometimes denigrate such contemplation–these are "thumb-sucking exercises," in the words of one. Conversely, for a few subjects, reading HPS fundamentally transformed their journalism. Therefore, HPS can meaningfully improve journalistic practice. This research suggests that philosophers and journalists can have productive engagements; we would all benefit from a more philosophically-inclined journalism, and indeed a more journalistically-inclined philosophy.

Khan, Ashar
University of Waterloo
Philosophical Perspectives on the History of Causal Modelling in Obesity Research
A defining feature of obesity research history has been the ongoing debate about causality. This debate has persisted from the inception of the very first obesity model to the present day. Currently, at least two supposedly competing causal models of obesity exist: the energy balance model (EBM) and the carbohydrate-insulin model (CIM). These models reach seemingly different conclusions and make distinct claims about the causal relations involved in obesity modelling. Contemporary reflections on causal modelling in the obesity literature point to differences in desiderata as an explanation for this conflict. Meanwhile, philosophers have developed the interventionist approach to causal modelling, which roughly understands causes as manipulable handles. I argue that adopting an interventionist view of causal modelling can clarify the apparent conflict between the two obesity models, both historically and in contemporary discussions. To this end, I reconstruct the historical development of these models, highlighting how the interventionist view of causation aligns with scientists' arguments and helps organize areas of disagreement.

This approach opens the possibility of applying existing philosophical work on interventionism to unresolved problems in obesity research. Considering this, I argue that the CIM can be understood

as an expanded, fine-grained version of the EBM rather than an alternative. I then discuss the concerns involved in the expansion of detail in a model, emphasizing that this expansion depends on scientists' aims in constructing the model, the question of variable choice, and what constitutes manipulable variables.

King, Martin
Ludwig Maximilian University of Munich
Deep Learning and Model Independence
Despite probing physics at unprecedented energies at the Large Hadron Collider, the Standard Model remains empirically adequate, though incomplete. The lack of evidence in favor of any new physics models means that the search for new physics beyond the Standard Model (BSM) is wide open, with no direction clearly more promising than any other. This marks a turn towards what can be called 'model-independent' methods—strategies that reduce the influence of modelling assumptions by performing minimally-biased precision measurements, using effective field theories, or using Deep Learning methods (DL). In this paper, I present the novel and promising uses of DL as a primary tool in high-energy physics research, highlighting the use of autoencoder networks and unsupervised learning methods. I advocate for the importance and usefulness of the concept of model independence and propose a definition that recognizes that independence of models is not absolute, but comes in degrees.

Koberinski, Adam
Western University
A measurement-first realism for effective field theory
One chief challenge for any forward-looking scientific realism is to be able to identify what aspects of a current theory, over and above its empirical predictions, we ought to believe as (approximately) true today. Recently, a form of realism known as effective realism has claimed to solve this problem for the effective field theories (EFTs) that form the basis of particle physics and condensed matter physics: we ought to be committed to those entities and features of our current EFTs that are invariant under renormalization group flow. Here, I propose an alternative account of realist commitment, based on the stability of functional dependencies that connect the theory's phenomenology to experimental measurement procedures. This view can be considered a helpful elaboration of effective realism when the focus is EFT, in that it answers an empiricist challenge due to Ruetsche (2018). I end by articulating how measurement-first realism can more easily apply outside the context of EFTs.

Konoval, Brandon
University of British Columbia
The Mind's Isle: Unnatural History and the Early Modern Thought Experiment
Thomas More's Utopia (1516) provided the framework for a vibrant early modern literature that explored islands of the imagination. Nevertheless, distinctions between accounts of imaginary and of actual voyages and encounters were far from neatly drawn, with both sharing a characteristic insistence upon the trustworthy nature of the account and of its narrator; correspondingly, these accounts emphasized the privileged access enjoyed by the traveler in which readers, by definition, could not hope to share. Thus, this literature both drew upon and decisively framed broader epistemological concerns about the role of travel literature in the compilation of natural histories such as were addressed by Bacon and Robert Boyle, while mapping characteristic features of the

networks of accreditation that were crucial to the institutionalization of empirical inquiry (Shapin 1994).

The literature of the mind's isle could likewise provide insight into early modern thought experiments, both scientific and political. The subject of Bacon's New Atlantis and the structure of More's Utopia point to a classical predecessor in Plato's Timaeus, where both the story of Atlantis and an extended conjecture on the origins and fundamentally mathematical structure of the cosmos are offered side by side with concerns for political and institutional reforms. Galileo's use of imagined experiments to demonstrate hidden mathematical principles of motion can be seen to invoke a corresponding prospect: namely, that his readers are enjoined to seriously consider 'observations' in which they could not hope to share, informing the Utopian political vision of one of those readers, Thomas Hobbes.

Kucuk, Kardelen
University of Western Ontario
Network Models and Explanation in Psychiatry
Network modeling in psychiatry has gained considerable attention in recent decades, offering a novel way of conceptualizing psychopathology and providing more effective means of control and intervention (Cramer et al., 2010; Bringmann et al., 2013; Borsboom, 2017; Durstewitz et al., 2021). These models represent psychiatric disorders as networks of reciprocally interacting symptoms, where each symptom does not necessarily depend on a common underlying cause. This contrasts with latent variable models, which treat symptoms as manifestations of an underlying disorder, aiming to provide causal explanations for why disorders occur. Such explanations are essential for intervention and control, aiding diagnostic and therapeutic goals in psychiatry (Woodward, 2003).

An important question is whether network models can explain how and why psychiatric disorders emerge and whether their non-causal explanations serve as viable alternatives to causal ones for facilitating interventions. One prominent account of the explanatory power of network models appeals to their topological properties, which capture patterns of connections among symptoms and their interactions, giving rise to full-fledged disorders (Huneman, 2010; Rathkopf, 2018; Kostic, 2022). These "network explanations" address counterfactuals, answering "what if" questions and guiding possible interventions (Woodward & Hitchcock, 2003). For instance, high symptom network density can explain an individual's vulnerability to developing a psychiatric disorder, where different network configurations would not lead to the same disorder (de Boer et al., 2022; Kostic, 2022).

What I suggest is that, to enhance the causal informativeness of network models, their dynamics should be considered. This involves examining how symptoms evolve over time to understand how specific network structures become vulnerable to psychiatric disorders. I will discuss the data collection and statistical tools needed for this approach, as well as its limitations.

Laudisa, Federico
Department of Humanities, University of Trento, Italy
Bohr and von Neumann on the Universality of Quantum Mechanics
The Bohr and von Neumann views on the measurement process in quantum mechanics have been interpreted for a long time as opposed to each other. Actually, on the basis of results of the most recent scholarship, the Bohrian conceptual framework can be interpreted so as to support a coexistence of the use of the language of classical physics on one side – in order to account for the outcomes of the quantum measurement process – and the universality of quantum mechanics as a

theory governing the whole physical world on the other. This claim of coexistence allows then a more balanced comparison of the views of Bohr and von Neumann, in spite of the meager evidence concerning the actual interactions between the two. After recalling the von Neumann model of the measurement process (sketched in his 1932 book Die Mathematische Grundlagen der Quantenmechanik), for the comparison I will rely essentially on a single paper presented by Bohr at a conference held in 1938 in Warsaw (a conference attended also by von Neumann). This paper can be taken to show that Bohr himself was aware of the possibility to rely on the von Neumann model of the measurement process, in order to justify more robustly the above mentioned coexistence of the use of a classical language vis-à-vis the universality of quantum mechanics. As a consequence I claim that, in a more accurate history of the measurement problem in quantum mechanics, Bohr and von Neumann are far from being opposed to each other on the issue of the universality of quantum mechanics.

Lo, Arlene
London School of Economics and Political Science

Anti-Colonial Science? The Politics of Indigenous Knowledge Inclusion in Science-Based Policy

An aspect of the indigenous struggle against colonial oppression is the struggle for the inclusion of their knowledge in policymaking. Due to its perceived epistemic inferiority to science, indigenous knowledge (IK) and thus interests were systematically excluded in science-based policy. This paper advances an anti-colonial political philosophy of science with two central claims: (i) IK inclusion should be treated as a political, but not solely epistemic, matter; (ii) Indigenous peoples (i.e. the affected public), not just scientists, should have the power to make such political judgements in scientific inquiry. I use the Canadian impact assessment policy, which involves scientific research determining whether construction projects should proceed in indigenous territories, as the key case study. On (i), I argue that IK feeds into the necessary political value judgements in two stages of policy-relevant inquiry: conceptualisation of inquiry and interpretation of findings. IK is closely tied to indigenous peoples' values and worldviews so excluding IK in these value judgements has the direct political effect of excluding indigenous interests in policymaking. Therefore, IK inclusion is a political matter. Having scientists qua epistemic experts deciding on IK inclusion is a politically objectionable form of technocracy. On (ii), I argue that indigenous peoples, as the affected public, should have the power to make these political value judgements in inquiry. I defend this proposal against the democratic alignment view (i.e. scientists make judgements with democratically selected values) by attending to the politics of representation under coloniality. Scientists cannot permissibly act as representatives of indigenous peoples due to the structural and discursive political harms of scientists 'speaking for' the colonised. Achieving anti-colonial justice requires placing indigenous peoples in positions of power to decide for themselves scientific inquiries and related policy decisions that directly affect them. Should science be anti-colonial, we must reconfigure the social institution of science.

Marino, Patricia
University of Waterloo

Idealized Models, Counterfactual Inference, and Evaluating Social Interventions

Simple, highly idealized models are used in modelling social phenomena -- including inequality and oppression -- where reality is messy and complex. How are such models be useful? One proposal is that they allow us to engage in counter-factual reasoning -- to answer "what-if" questions and to draw inferences about the effects of interventions (Ylikoski and Aydinonat; see Grüne-Yanoff and

Verrault-Julien). In the work of O'Connor, Bruner, and others, bargaining and evolutionary models are used to show that inequality can arise even in the absence of direct discrimination -- when people bargain across groups, those in smaller groups end up worse off. We may learn about the limited effects of social justice interventions. Alternatively, models of processes with desirable outcomes may be used in "utopian-normative" roles, serving as "guides to action" (Boldyrev and Ushakov).

I argue that an ambiguity arises in the concept of "what if" inferences: there is a distinction between counterfactual reasoning saying what happens in a specified possible world and counterfactual reasoning addressing what effects are likely to result from changes or interventions to the actual world. The second requires not only similarity between the model world and the real world, but also more substantive assumptions that the regularities represented by the model are stable in the actual world -- that they apply with broad enough scope and sufficient independence from other factors that they function in the same way through changes to the actual world. I consider proposals for supporting such assumptions and suggest where they might be difficult to evaluate.

Maxwell, Matthew J.
University of Wisconsin - Madison

Measuring Fitness: Generality and Other Desiderata

The most common measure of fitness is an individual's expected number of offspring. It is well known, however, that this measure faces challenges. Individuals with the same mean offspring number but differing variances will have different numbers of descendants in later generations. This, however, is not the only worry for this simple measure of fitness. Problems of resource distribution, timing, and delayed selection also influence ultimate reproductive success. Together these counterexamples constitute what Pence and Ramsey (2013) call the "generality problem"---an adequate measure of fitness ought to include all influences on what we call "fitness," but most measures to date have not.

Generality, however, is only one desideratum on a measure of fitness. In all, I identify three distinct desiderata:
1. Generality: a fitness measure should take into account all influences on reproductive success.
2. Ubiquity: measured fitness should correspond to the contribution of reproductive success to the outcome of natural selection in all cases.
3. Uniqueness: the bearer of fitness should have a single unique measure of fitness---not several measures.

Unfortunately, I argue, we can't have it all when it comes to fitness. Any measure that is general must fail to be either ubiquitous or unique. Pence and Ramsey's own account illustrates the trade-offs, giving up ubiquity to save generality and uniqueness. They include all possible influences on reproductive success, but this entails that some irrelevant long-term contributors are included when discussing short-term outcomes---outcomes that are no less the product of natural selection.

These trade-offs are not limited to a particular account of fitness, such as the propensity interpretation. Statisticalists about fitness give up uniqueness to preserve generality and ubiquity, while some geneticists give up generality in service of ubiquity and uniqueness.

Meacham, Christopher J. G.
University of Massachusetts, Amherst
Laws and Grounding
A number of people (e.g., Rosen (2010), Bhogal (2017), Emery (2019)) have suggested that we should appeal to the notion of grounding to spell out the distinctive link between laws of nature and what the laws govern, i.e., instances of those laws. Recently, several papers (Wilsch (2021), Gravtol (forthcoming), Coates (forthcoming)) have raised objections to such proposals. In this paper I defend the thought that we can understand the link between laws and what they govern in terms of grounding. Building on earlier work, I develop a way of spelling out this link that captures a number of otherwise elusive distinctions between different views about laws of nature, including the distinction between reductive and governing laws, and the distinction between governing laws that produce and governing laws that constrain. I defend this proposal from the objections that have been recently made to this kind of approach. And I argue that proponents of governing laws should not be equally optimistic about productive and constraining understandings of such laws. For there are several reason to favor constraining versions of governing laws over productive ones: (1) they naturally accommodate temporally symmetric relations between laws and their instances, which better fits many of the theories considered by physicists, (2) they capture the way in which uninstantiated laws play a role in making the non-modal mosaic the way it is, and (3) they avoid the awkward commitments to holding that later states of the non-modal mosaic are more fundamental than earlier ones.

Mulder, Ruward
University of California in Irvine
The open-textured (history of the) "force" concept in modern relativistic geometric conventionalism
Since the emergence of models treating gravity as a varying spacetime geometry, a central question has been whether that geometry is unique, upending the operational approaches of Riemann, Helmholtz, and C.S. Peirce to measuring physical geometry directly with physical rods and clocks. Duhem, Poincaré, and Reichenbach (in)famously showed that alternative geometries can be holistically paired with compensatory "universal forces". But what counts as a convincing physical concept of force?

This paper considers the rigorous approach to geometric conventionalism initiated by Weatherall and Manchak's "The Geometry of Conventionality" (2014), which refutes Reichenbach's "theorem theta" under the assumption that universal forces should be modeled by a 2-tensor. I present their proof more intuitively and in more detail, and scrutinize this assumption, which Dürr and Ben-Menahem (2022) characterize as an overly conservative mistake. I argue that this conservatism can instead be positively reframed as a comparative method grounded in Newtonian forces.

Drawing on historical work by Max Jammer's Concepts of Force (1957) and Mary Hesse's Forces and Fields (1961), I highlight a disagreement between these authors over whether the force concept is pinned down by necessary and sufficient conditions or is more "open-textured" (Waismann 1947). Weatherall and Manchak's proof succeeds precisely because they adopt necessary conditions, aligning with Jammer's framing.

Finally, connecting the above to the modern debate, I argue for a force concept more aligned with Hesse's framing, by drawing on a Deweyan means-consequence relation (laid out in Westerblad 2024). The concept of "Universal Physical Geometry", implicit in the debate for more than a century,

is too logically strong to be of consequence. I propose the logically weaker "Differentiated Physical Geometry", relative to non-universal forces only: relativistic models that disagree on Universal Physical Geometry are considered symmetric when they agree on Differentiated Physical Geometry, in the spirit of Helmholtz' conception of geometry.

Muscant, Rebecca
University of Toronto

Expanding the Limits: A Normative Approach to Defining Disciplinary Scope

The scope of a discipline defines its boundaries and structures its inquiries, yet philosophical discussions often overlook how these boundaries are established. This paper critiques a model of scope proposed by Patton and Al-Zayadi, which ties scope exclusively to the acceptance of core questions and their subquestions by a disciplinary community. While this model provides a useful foundation, it does not account for cases where unaccepted questions still play a meaningful role within a discipline.

To address this limitation, we examine two case studies: intelligent design in evolutionary biology and childbed fever in 19th-century obstetrics. The first case supports Patton and Al-Zayadi's model, showing how the exclusion of questions presupposing intelligent design reflects a community's rejection of their assumptions. The second case, however, challenges the model by illustrating how obstetricians engaged with questions about the contagion of childbed fever, despite rejecting the premise that it was contagious. This demonstrates that scope can extend beyond accepted questions to include unaccepted but relevant inquiries.

We propose a revised framework for scope delineation, replacing question acceptance with a broader criterion: questions and theories belong to the scope of a discipline if they meet the methods and criteria employed by its community. This approach accommodates the complexity of disciplinary practices and provides a more flexible understanding of what constitutes a discipline's scope at a given time.

Our work focuses on the static question of what lies within a discipline's scope rather than how scope evolves over time. By expanding the criteria for delineation, this framework offers a practical tool for analyzing the epistemic boundaries of disciplines and invites further exploration into the normative methods communities use to shape their fields of inquiry.

Neswald, Elizabeth
Brock University

Diabetes management and consumer culture in the 20th century: Users, consumers, and market-making

Diabetes management has been part of cultures of consumption since the mid-nineteenth century through patent medicines and manufactured diabetic foods. The variety of diabetes aids in the marketplace increased dramatically after the introduction of insulin therapy. Managing an insulin regimen required numerous objects, and pharmaceutical and medical supply companies quickly developed equipment designed for a variety of users, both professional and lay. At the same time, insulin increased the lifespan of people with diabetes, and thus their needs, while public health screening and 20th century lifestyle changes expanded the number and diversity of people with a diabetes diagnosis.

This paper traces the changing marketplace for diabetes management equipment and how different groups – designers, pharmaceutical companies, healthcare providers, and diabetics – responded to and shaped these changes. While healthcare providers quickly acknowledged that self-management was a necessary part of diabetes care, the extent of patient expertise and autonomy was regularly questioned, as the material conditions of management evolved. These tensions are reflected in both the objects of diabetes management and in the marketing tactics of pharmaceutical companies. By the final decades of the 20th century, the perception of diabetics as more or less educatable and compliant patients had shifted to one of diabetics as active consumers, who not only made demands and choices, but also had needs they were not yet aware of and that could be addressed by ever more specific commercial products.

Offord, Alexander
University of Toronto, Institute for the History and Philosophy of Science and Technology
Dead Elephants, Electrical Futures: A Ghost Story
In 1903, a reportedly murderous elephant named Topsy was electrocuted to death at Coney Island's Luna Park, famously captured on film by the Edison Manufacturing Company. In the years that followed, multiple reports emerged of Topsy's ghost haunting the park and the people who had orbited her execution.

This paper reads Topsy's execution as an event in the history of technology in an attempt to explain why, at a time when elephant executions were frequent in the US, this particular execution more than any other haunted the culture which had produced it. I argue that Topsy's execution represented a conjunction of techno scientific ideologies: the human mastery over animals, the racial politics of "humane killing," and technological Utopianism. However, the material realities of her execution - including, especially, the behaviour of Topsy herself - undermined these ideologies. This paper attends to the ways that the practical problems of technoscientific spectacles such as this, as well as the agencies of the specimens deployed in them, could vitiate the codes and narratives they were intended to produce. I argue that Topsy's ghost haunted Luna Park precisely because the process of her execution revealed the hidden labors and dangers of early electrical work, epistemic uncertainties over what constituted humane killing, and the ambiguous status of human intellectual and moral superiority over animals.

Olley, Allan
Independent Scholar
To Sum Up: Early 20th Century Innovations in Fourier Synthesis
Fourier analysis provides a powerful way to mathematically model physical behaviour especially of phenomenon exhibiting complex periodicity. It also requires the execution of large amounts of arithmetic that often made it impractical in before the advent of the modern computer. In this talk I will examine some of the practices and material culture of Fourier synthesis in the early 20th century including Beevers-Lipson strips in X-ray crystallography and also more obscure procedures in astronomy. The work of L J Comrie and W. J. Eckert to perform Fourier synthesis in astronomy on punched card accounting machines will be discussed and their efforts to aid crystallographers in making use of punched card machines. Also a tradition of alternative specialized machines.

The differences between the techniques and technologies in astronomy and crystallography suggest technical differences, but also differences in their economy, time horizons and goals. It also suggests differences in the research culture and funding between British and US researchers

in the same field and the complexities of adoption of new technical innovations giving various demands of the use cases. Connections will be drawn between these efforts and later computer efforts at scientific computation in these fields including in the history of biomedical computing of Joseph November.

Popa, Denisa
University of Toronto (IHPST)
A Partnership of Compromise: Women's College Hospital and the University of Toronto
In 1956, the Department of Obstetrics and Gynecology at Toronto's Women's College Hospital (WCH) became affiliated with the University of Toronto's Faculty of Medicine (UofT). By 1961, several other departments had followed the same path and WCH became a full teaching hospital. This partnership only materialized after years of negotiations, and resulted in numerous changes at the hospital. For the first time in history– male physicians joined the staff of WCH. Founded in 1911, WCH was the first public hospital in Canada established and staffed entirely by women. This institution provided a safe space for female physicians to practice medicine at a time when members of the medical community were reluctant to open their doors to women doctors. However, this unique gendered space ceased to exist after WCH joined UofT's group of teaching hospitals. Drawing extensively on archival sources, this paper investigates the impact that this partnership with UofT had on the hospital's identity- namely the physical space and internal policies. Moreover, it also reflects on how the hospital's institutional and gender identity changed during this time. In addition to understanding the changing landscape of medical education in Toronto, this episode signifies the broader importance of gender and identity of institutions in Canadian medical history.

de Rege, Risa
University of Toronto
"This Hideous Caricature": The Materiality of Manufactured Mermaids
Our understanding of the natural world underwent massive changes in the modern era, connecting the far corners of the earth like never before. Explorers returned to Europe with strange new animals, including among them the alleged remains of mermaids. Hoaxes driven by profit and wonder, these so-called Fiji mermaids (made of materials like animal parts, wire, and clay) were displayed to fascinated publics. This paper explores how Fiji mermaids intersect with histories of animals, monsters, myths, science, and voyages, examining not only scientific but also emotional, philosophical, and artistic reactions.

First, I give historical context for the Fiji mermaid by briefly exploring the history of mermaids more broadly from primary sources. I then look at case studies of specific Fiji mermaids, from historical and contemporary sources, building on material culture, modern science, and my own encounters with these artifacts to explore their construction and provenance. Next, they are situated within animal history as monsters, hybrids, and biological entities, and I conclude by positioning Fiji mermaids at the intersection of animal history and material culture, blurring the distinctions between real and fake, science and myth, land and sea.

Saberi, Farid
Western University
How to Relate Major Transitions in Life and Cognition?
Recent innovative research has focused on major transitions in cognitive evolution, drawing from the existing literature on major transitions in the evolution of life. This prompts a careful examination of the distinctions and similarities between these two types of transitions. In this paper, I present four key claims. First, a theoretically fruitful approach to understanding major evolutionary transitions (METs) in life is to conceptualize them as a set of objectively similar events, akin to a natural kind concept. Second, this framework allows for discussing major cognitive transitions (MCTs), while emphasizing that METs and MCTs represent two distinct subsets of possibility-expanding evolutionary events, each defined by different criteria. Third, the works of Barron et al. (2023) and Ginsburg and Jablonka (2019, 2021) serve as successful examples of applying a transition-oriented approach to cognitive evolution. Both provide coherent definitions of MCTs along with fine-grained explanations of these events in unique manners. Finally, their contributions can be viewed as complementary rather than competitive.

I argue that MCT are primarily defined in terms of the evolution of biological structure in Barron et al.'s way (structure of nervous system). In the next step, we need to incorporate the behavioral and ecological outcomes of these transitions in its definitions as higlighted By Ginsburg and Jablonka. Besides their definitions, one possible way of reconciling Barron et al.'s explanatory strategy with that of Ginsburg and Jablonka is to hold that the evolution of the nervous systems enabling cognition and learning is driven by selection for immediate fitness as described by Barron et al. and not just corresponding to and following the evolution of learning. When the new computational architecture is in place, the sample selection and the developmental plasticity drive the evolution of cognitive capacities manifested in the form of types of learning as described in Ginsburg and Jablonka's account.

Schulz, Elizabeth
University of Leeds
The Non-Darwinian Tree of Life: The Evolutionary Tree Practice, 1860-1960
Most writing on the history of the Tree of Life (ToL) starts by crediting Charles Darwin and On the Origin of Species. Although scholarship typically concedes that Darwin was not the first to propose an evolutionary tree, scholars are adamant that his tree was unique and that he popularised the practice. Darwin does indeed offer a tree-like diagram in On the Origin; but, the popular conception of his evolutionary tree derives from his Notebook B 'I think' diagram – an illustration that is vastly different from that in On the Origin and one that was not available to the public until 1960. By tracking the 'tree practice' in over 200 texts published between 1860 and 1960, this paper argues that scientists and writers in the later nineteenth and the early twentieth century did not see the tree practice as exclusively Darwin's or Darwinian. Instead, scientists and science writers in the latter half of the nineteenth century often credited Cuvier with the idea. In the early twentieth century, they saw Lamarck as the main influence on the tree-practice. It was only at the time of the Modern Synthesis in the 1940s that Darwin became the main figure in the tree practice's story. This change in accreditation necessarily coincided with the 'hardening' of the Modern Synthesis which focused more narrowly on Darwin, adaptive radiation, and natural selection than evolutionary theory previously had (Gould, 1983). Simultaneously, the tree practice also became the reified and Darwinised 'Tree of Life' as we know it now.

Shaw, Jamie
Leibniz University Hannover
'Fund people, not projects': From narrative CVs to lotteries in science funding policy
There has been a recent increase in attention toward the proper targets of evaluation in science funding policy. Specifically, some claim that we should 'fund people, not projects' to allow for increased autonomy for researchers. Critics argue that this movement unduly opens room for biases against several marginalized groups of scientists. In this paper, I contribute to this discussion by accomplishing a few related tasks. First, I analyze the idea of 'funding people, not projects' and show that it actually suggests multiple positions. Second, I propose a mechanism for evaluating researchers through narrative CVs. Finally, I respond to critics by showing that we should shift the goalposts from debiasing peer review to arrangements of science funding policies that are debiasing as a whole. In doing so, I hope to clarify and assess the movement, while pointing to ways forward.

Sigsworth, Emma
IHPST, University of Toronto
Reconsidering the Cognitive Turn in Biology: A Case Study
There is a growing tendency, from both biologists and cognitive scientists, to bridge gaps between biological and cognitive explanations. Some researchers claim that cognitive concepts are required to understand fundamental biological processes, such as homeostasis and feeding. Others argue that the simplest organisms, such as bacteria and slime molds, possess cognitive capacities that resemble cognition observed in humans and other organisms with central nervous systems. The central objective of this talk is to better understand the motivations behind biologists' use of cognitive concepts and theories, especially in contexts where cognitive concepts are used to explain unicellular organismal behavior. What is meant to be gained, for example, in describing E. coli chemotaxis as a decision-making capacity, or the navigational behavior of the slime mold as a form of memory? Following Rama (2024) and Fulda (2017), I argue that one motivation for this so-called 'cognitive turn' is biologists' growing interest in the agency of individual organisms and the re-emergence of the organism as an important explanatory element in evolutionary theory. I use a case study involving external memory in the slime mold to show how biologists understand the organism as an active agent in a memory-making process that improves navigation (Reid et al., 2012; Reid et al., 2013; Smith-Ferguson et al., 2017). Building upon Fulda's (2017) critique of the view that agency presupposes cognition, I argue that the scientists in my case study inappropriately overextend the concept of memory by failing to distinguish between reactive navigation and memory. I conclude by arguing that unicellular behavioral studies such as this case study demonstrate the problems associated with the cognitive characterization of agency. This, in turn, should make us reconsider the cognitive turn in biology.

Soomal, Sajdeep
University of Toronto
The Ethnology of Dexterity: Daniel Wilson and Racial Politics of Technoscientific Precision
This article introduces the figure of the dexterous hand to query how modern chemistry has shaped racial capitalism during the long 20th century. Scholars have helpfully linked Adam Smith's "invisible hand" to a broader episteme of divine control over nature, showing how it slowly unraveled in the 19th century as modern liberals championed the "visible hands" of those powerful states, corporations, and individuals transforming lands and bodies using the techniques of modern chemistry. However, these scholars have neglected to consider how debates about the

powers of the European hand as a productive artificer unfolded within the context of slavery, empire and colonialism. This article offers a corrective, investigating how the technoscientific capacity of the “dexterous hand” became an enduring site of racial imagination, inquiry and intervention. To that end, I examine how the ethnological research conducted by Daniel Wilson at the School of Practical Science at the University of Toronto in the 1880s on the "dexterous hand' as an evolutionary product of European civilization was widely adapted to justify racial divisions of industrial labour.

Stroubakis, George
University of Waterloo
Scientific Explanation and Predictions: Redefining Scientific Practice
This paper revisits the relationship between scientific explanation and prediction, engaging with key philosophers like Heather Douglas, Nicholas Rescher, and Angela Potochnik. Traditionally, prediction and explanation were viewed as intertwined, based on Carl Hempel's symmetry thesis, but this view became unfavourable over the years. Recently, however, Douglas argued for reintroducing prediction into scientific explanations, asserting that predictions act as a regulatory force that enhances the quality of explanations by helping scientists differentiate between promising and unpromising theories. In contrast, Rescher cautions against relying too heavily on predictions, emphasizing that false theories can yield successful predictions while sound theories may not always do so. He highlights the complexity inherent in scientific theories, suggesting that predictions should not solely determine the validity of explanations. Potochnik complicates the discussion further by claiming that the idealizations used for explanations may not be compatible with those needed for predictions, arguing that they can serve different scientific aims but do not overlap. Both Douglas and Potochnik ground their arguments in scientific practice, acknowledging that "felicitous falsehoods" can be useful, albeit presenting challenges in achieving truth in scientific inquiry. Ultimately, while Douglas promotes a cohesive approach that combines prediction and explanation to navigate scientific complexity, both she and Potochnik agree on the centrality of understanding in science. The discussion underscores a fundamental tension in science: balancing robust theoretical formulation with empirical testing, maintaining that prediction is essential for scientific progress but also recognizing the limits of predictability. This dynamic interplay among the perspectives emphasizes the evolving philosophy of science and the nuanced relationship between explanation and prediction in the pursuit of knowledge and scientific discovery.

Vicedo, Marga
University of Toronto
Charlotte Perkins Gilman: A Pragmatist Approach to Constructing a New Humanhood
Charlotte Perkins Gilman (1860-1935) has been widely recognized as an influential American reformer and feminist thinker in the first two decades of the twentieth century. Her legacy, however, is controversial. Scholars interpret her views in divergent ways.
This paper examines Gilman’s work in the context of her reaction to evolutionary accounts of biological and social evolution. It argues that Gilman’s philosophical views can be best characterized as pragmatic. Like other pragmatists, Gilman believed that the world was an open system. Instead of accepting determinism, Gilman constructed a philosophy of action that gave primacy to human will. Influenced by a conception of science as an investigative enterprise grounded upon experiment, she supported a pragmatist epistemology. This epistemology makes possible a philosophy of action elaborated by pragmatists including William James, Jane Addams,

and John Dewey that renewed hope in the great American democratic experiment. For Gilman, this philosophy also showed how women's actions could have an impact on the course of social evolution.

Vos, Bobby
University of Toronto
The Mathematization of Nature and the Nature of Mathematization
What does it mean to mathematize a scientific discipline? While generations of historians of science have assigned a crucial role to the 'mathematization of nature' in the advent of modern science, the process of mathematization has received surprisingly little attention from philosophers of science. Drawing on the historiography of the Scientific Revolution, I show that a closer examination of the process of mathematization raises questions about the role of mathematics in science not addressed by the existing philosophy-of-science literature. Subsequently, I take up one such question in particular, namely: what, if anything, differentiates mathematization from similar processes such as quantification and abstraction? In articulating an answer, I first distinguish mathematization from quantification by drawing on the example of digital humanities. This research programme, while providing us with an example of introducing mathematical methods into traditionally qualitative intellectual disciplines, does not, I argue, constitute an example of mathematization. Building on this observation, I set out a view on which mathematization of an intellectual discipline consists in the systematic translation of the concepts, laws, and methods of that discipline into a mathematical language. Following this, I situate mathematization with respect to the process of abstraction. In particular, I argue, pace a recent proposal by Maarten Van Dyck, that mathematization is best thought of as a special type of abstraction. More specifically, I expound the view, inspired by Catarina Dutilh Novaes' characterization of formalization in logic, that mathematization consists in the process of de-semantification. The end result of these deliberations is what I refer to as the systematic semantic abstraction view of mathematization. I conclude by sketching how this view may be used to shed new light on the ongoing debate concerning the 'unreasonable effectiveness of mathematics in the natural sciences'.

Wadle, Douglas
Rochester Institute of Technology
Dimensions of Difference in Mental Imagery Experience
Vividness is a central theoretical construct in recent studies on individual differences in the experience of voluntary mental imagery. Individual differences are largely understood as differences in the vividness of imagery experiences. Nevertheless, there is no broadly agreed upon interpretation of 'vividness'. Some philosophers have responded by offering analyses of 'vividness' that they argue will be useful in mental imagery research. Others argue that the notion should be abandoned. I argue that – as they are currently developed – both responses rely on a view of imagery that is unhelpfully visuo-centric and conceives of visual experience/imagery as unrealistically static and uniformly 'vivid' (however construed). This obscures the temporal aspects of imagery experience as well as the aspects of control over, and effort required to have, imagery experience. By taking a more realistic look at imagery experiences, I identify previously overlooked or under-appreciated dimensions of variation in imagery and refine those that have been noted. The result is a fine-grained set of dimensions for assessing individual differences in mental imagery that improves upon 'vividness' and the previous analyses of it. I briefly discuss some in-progress empirical work drawing on these dimensions, with which I am involved. I then turn to the potential

benefits of such work for philosophical theorizing about the role of imagery in our mental lives. I conclude by revisiting the prospects for a reductive analysis of 'vividness' in terms of these dimensions.

Wald, Jonathan
Concordia University
Navigating a Weird World: Anticoncepts for Science and Technology Studies
Generally, scientists hope to better understand the world. The basic article of optimism is that with the right methods, the right equipment, and the right training, humanity will be better prepared to make sense of the world around us. What happens when that is no longer possible? As the Stephen Gardiner argues in his diagnosis of the inadequacy of moral philosophy to address the climate crisis, abrupt climate change and its accompanying sociopolitical upheavals disrupt many central philosophical concepts. Rather than give up on science, I argue for a version of science less dependent on the optimism of conceptual understanding. Drawing on empirical work conducted with climate scientists advising a regional government in Brazil, this presentation makes the case for an "anticonceptual" approach to science. Through instances of disasters that undermined both the institutions of science and stability of the phenomena meant to be understood, I argue that climate science as well as Science and Technology Studies must be prepared to face fundamentally "weird" events that stubbornly resist understanding. This argument engages with the Czech-Brazilian philosopher of science Vilém Flusser in conversation with theorists of the weird such as Mark Fisher and Graham Harmon to establish the broader significance of these anticonceptual approaches.

Wilkinson, Eric
University of Wisconsin - Milwaukee
Dawson's Critique of Social Darwinism
John William Dawson (1820-1899) was a Canadian geologist, paleontologist, and the first Principal of McGill University. He is often also remembered as a prominent contemporary critic of Charles Darwin's theory of evolution. Dawson initially argued that the fossil record and empirical data did not favour natural selection over special creation, but would accept evolution in his later writings. Although Dawson's criticism of Darwin and empirically-informed defence of special creation has received attention, his scientific critiques of social Darwinism have not been thoroughly examined.

Social Darwinists like Herbert Spencer used the idea of natural selection to explain differentiation and development in human societies. Dawson warned that Spencer's arguments had little empirical support, and that societal differences were better explained by social causes. He also criticized the social Darwinists' biological distinctions between 'civilized' and 'primitive' peoples, arguing that there are no major biological differences between human beings that would justify the distinction. I outline Dawson's unique but neglected scientific and philosophical critiques of social Darwinism.

Winsor, Mary P.
University of Toronto
Taxonomic Onomastics: Lessons from Linnaeus
In no other science is the problematic intersection between history and metaphysics more vividly displayed than in taxonomy, because the project of bestowing names on groups raises ontological

as well as epistemological issues. Honouring the late Michael Ghiselin, I propose that historians of systematics set aside, for a moment, our normal two themes – species and their classification – and pay attention instead to the names of taxa, which are proper nouns. Let us learn from onomastics. The Oxford Handbook of Names and Naming assembles studies by linguists who discuss the names given to ships, pets, rivers, towns, people, or mountains. The authors are unworried about the ontological status of these disparate entities, nor are categories or classification involved at all. The reality and uniqueness of each village or person is taken for granted.

It is well known that Linnaeus originally used only one word for a genus, adding several more words to create the full scientific name for each species, and that only later did he evolve the idea of using a one-word epithet, which produced the kind of binomial taxonomists still use. Less noticed is his explicit insistence on giving a single-word name to every taxon at the rank of order and class, regardless of whether he thought of the group as artificial or natural. The pragmatic methods of onomastics, vague as they are, invite us to study these single-word names, in the decades when botanists abandoned his artificial system, and zoologists followed Cuvier in hoping that the causes of natural groups could be discovered.

Yu, Haomiao
University of Guelph
Scientific understanding and misunderstanding
This paper studies scientific understanding and misunderstanding. It defines understanding as the epistemic success that requires subjective and objective components in the context of scientific explanations. We describe its objective component in terms of a correct scientific explanation. The subjective component is captured by the cognitive abilities and skills necessary to grasp or construct a correct explanation, plus a positive phenomenology (the phenomenon of an insightful "aha!" moment or a gradual increase of satisfaction). Finally, we frame understanding as the alignment between the subjective and objective components.

We then define lack of understanding as the epistemic failure that results from a lack of an explanation or from an incorrect explanation. This can occur due to insufficient abilities and skills, or to fallacious explanatory information. While the lack of understanding is widely acknowledged in the literature of scientific understanding, we argue that misunderstanding has not been addressed. We characterize misunderstanding by cases where one's epistemic inclinations do not align with an otherwise correct explanation. We define epistemic inclinations as the tendencies to receive a positive phenomenology from familiar types of explanations. We suggest that the lack of positive phenomenology leads to misunderstanding.

At the end, we provide a case study of misunderstanding in terms of the debate about distinctively mathematical explanations. The debate concerns whether understanding of some ontic facts can be achieved through purely mathematical framing of these facts, without information on the causal genesis of the represented facts. We argue that such a case of misunderstanding results from diverging epistemic inclinations. That is to say, the two sides in the debate disagree over the explanatory standing of mathematical explanations due to diverging epistemic inclinations. We then extend this case study to the debate between Newton and Leibniz over how to explain motion.

Yakubu, Yussif
University of Guelph
The Form of Darwinian Evolutionary Theory
After a century of population genetics (PG) as the main tool for formal expressions of Darwinian evolutionary theory (Okasha 2024; Gardiner et al, 2007, 208), some evolutionary scholars have observed (Grafen 2014), and here pointedly articulated by Birch (2014 p.176), that "no theorem or principle in classical PG even comes close to providing a formal vindication of [Darwin's] informal argument" for biological design. The reason is quite simple. Contemporary formal PG models engage almost exclusively in the mathematical manipulation of gene frequencies. Presumably, by tracking gene frequency changes, we are tracking the build-up to a biological design object (Huneman 2014). However, a change in frequency transforms a population, but not the object whose frequency is changing. Here, I discuss the structure of Darwin's informal argument and show how contemporary PG formalizations depart from it. The essence of Darwinian evolutionary theory is the claim that the appearance of design in nature comes about through the gradual accumulation of advantageous variations. So, a formalization of Darwin's theory must describe the gradual accumulation of advantageous variations. Formal PG models do not do this. I propose a way to directly formalize Darwin's own description of his informal argument.

Zanzarella, Ivano
University of Bari/University of Barcelona
Representing Chance and Probability: Iannis Xenakis Between Science and Art
In 19th century, thermodynamics introduced probabilistic laws to explain natural phenomena. Despite extensive research in the history of science about the epistemological significance of this paradigm shift in various scientific fields (e.g. physics, biology, astronomy, etc.), its theoretical scope crossing disciplines outside traditional science has been mostly underexplored.

My proposal aims to fill this gap by considering the influence of thermodynamics and statistical mechanics on musical acoustics. In this regard, I will refer to the seminal work "Formalized Music (1992)" by the engineer and composer Iannis Xenakis, in which sound is conceptualised as a phenomenon with macroscopic properties (e.g., pitch, intensity, duration, timbre) accountable in terms of its microscopic components (simple sine waves). These components are represented as sonic grains in an abstract mathematical space, where their distribution over time is governed by stochastic laws adapted from statistical mechanics and information theory, including notions of entropy and disorder.

I examine in depth the historical link between stochastic theory of music (STM) and its physical and mathematical origins (Maxwell, Boltzmann, Shannon), also analysing the conceptual parallels and divergences in defining concepts like entropy and probability across these domains.

Furthermore, I also show that STM marks a a pivotal moment in the history of the demarcation problem, exemplifying an extension of probabilistic scientific principles to an extra-scientific domain like music composition.