ABSTRACTS

Stillman Drake Lecture

Wednesday, 18 May, 1.30-3.00

Degrees of Vulnerability

Deborah R. Coen, Yale University

The science and politics of climate change hinge on a concept that fits awkwardly into the usual vocabulary of physical scientists: vulnerability. In 1979, the World Climate Conference seized on vulnerability as an organizing concept, and in 1992 the UN Framework Convention on Climate Change (UNFCCC) committed wealthy countries "to assist developing countries that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects." Yet there is little agreement over how to measure vulnerability to climate change. Drawing on recent feminist theory, I will suggest that the insistence that vulnerability can be measured illustrates just how impoverished a concept of vulnerability this is. This presentation will ask: why have scientists and policy-makers believed vulnerability to be measurable in the first place? The answer to this question lies, most immediately, in the science and politics of development in the era of decolonization. But it also reflects a deeper historical pattern that has shaped scientific interactions with the atmosphere since roughly 1750. Any attempt to forge a concept of climatic vulnerability better suited to the goal of climate justice must include attention to the ways in which the modern imperative to manage risk has constrained human relationships with meteorological instruments.

Résumés pour les contributions individuelles / Abstracts for individual papers

(Alphabetical by first listed author)

EPR, Dirac, and the Epistemology of Locality

Pedram Anvari and David Hyder, University of Ottawa

A number of authors have argued that the argument originally proposed by Einstein, Podolsky and Rosen in their (1935) "Can Quantum Mechanical Description of Physical Reality Be Considered Complete" can be made valid only by restating it in an entirely different form, while assuming absolute time (Redhead, 1987, Fine & Brown, 1988). Girardi and Grassi (1994) have questioned this claim, suggesting that this modified version can be carried through to completion without that assumption, but at the price of using counterfactual inferences. Finally, authors such as Dickson (2004) insist on the essentially counterfactual nature of the argument, while Shimony (2001) considers alterations to truth-tables, i.e. the ensemble-interpretation as pointing in the right direction.

This talk will make two interconnected claims; one historical, the second philosophical. First, Redhead's reconstruction reveals an important aspect of EPR's reasoning, and is one component of their approach; however, it will be argued, they also knew that such an argument would, on its own, leave Dirac cold, and Dirac was one of, if not the main addressee of their paper. Second, one can derive from later alterations of Dirac's position, as well as Einstein's much later comments, the actual thrust of the EPR-paper, and the price that must be paid to parry it. The resulting ensemble-interpretation, Einstein later allowed, could neutralize the argument. However, as will be shown in conclusion, that

interpretation, together with the locality-requirement, introduced an unresolved ambiguity in measurement-theory. It is no longer possible to say whose knowledge state is invoked by the QM-formalism once we head down that path.

Geometric Cognition: a Hub-and-Spoke Model of Geometric Concepts

Mario Bacelar Valente, Pablo de Olavide University (ES)

Here, we develop a model of the neural representation of geometric concepts. From the perspective of a philosophy of mathematical practices, we should consider actual practices in their historical context. We will develop a model for Euclidean geometry. To arrive at a coherent model, we found it necessary to consider earlier forms of geometry.

The models will be based on the hub-and-spoke theory. According to this theory, the neural representation of concepts is made in terms of spokes, which are modality-specific brain regions that codify modal features of concepts (e.g., visual and verbal representations). There are also integrative regions – the hub – which blends, in an amodal format, the different aspects codified in the spokes and gives rise to coherent concepts. The hub enables a modality-free codification of further aspects of concepts. Notice that we can address a particular concept directly in terms of 'spokes' and a 'hub' not has regions in the brain but as 'parts' of the concept.

Here, we will start by addressing the practical geometry of ancient Greece. Then we consider Hippocrates of Chios' work. We develop models for these two cases. Finally, we develop the model of the neural representation of geometric objects in Euclidean geometry.

Emotions as Conceptual and Extended: A Comparison of the Conceptual Act and Scaffolded Mind Theories of Emotion

Joshua Barden, University of Alberta

In various publications over the past two decades, Lisa Feldman Barrett has advanced the controversial idea that emotions are natural kinds despite being ontologically subjective entities. She argues that those who claim that emotions are not natural kinds because of their diverse biological underpinnings (e.g., Paul Griffiths) fail to consider that "collective agreement" on what functions certain behaviours play is partially constitutive of the reality of emotions. In brief, Barrett believes that social ontology, in addition to physical or biological ontology, must be considered by any account that purports to show that emotions are real.

In this paper, I demonstrate that Barrett's social ontology (which she borrows from John Searle) fails to do the work she thinks it can in her attempt to show that emotions are real. I argue that Barrett's "conceptual act theory of emotions" can be improved if she augments her agreement-based social ontology with the broader notion of a "scaffolded mind," which sees our affective and emotional capacities as intrinsically dependent on external physical and social environments for their constitution. By showing that "agreement" is just one part of the social environment that constitutes emotions, I relieve Barrett of the necessity of showing that conscious or unconscious agreement is the only social factor that can play a role in the development of emotions as ontologically subjective entities that are nonetheless real aspects of our social experience.

A Shift of the Concept of Ecosystem Services: is there Something New with the Nature's Contribution to People Concept?

Sophie Bretagnolle, Université du Québec à Montréal

In 2018, an argument emerged between scientists studying or using the concept of ecosystem services (ES). The ES concept met a huge success since 2005 and is used as a central concept in several

international initiatives (e.g. Natural Capital Project, TEEB, SEEA, UNEP) in charge of studying the relation between humans and ecosystems and biodiversity. However, the Intergovernmental science-policy Platform for Biodiversity and Ecosystem Services (IPBES) decided to lower the role of the ES concept in their conceptual framework in aid of the Nature's contributions to people (NCP) concept (Díaz et al. 2018; 2015).

Usually defined as the "benefits humans obtain from ecosystems" (Millennium Ecosystem Assessment (Program) 2005, v), ES can refer to the production of wood, the purification of water or the pollination of crops that will give humanity fruits for instance. On the other side, the concept of NCP is defined as "all the positive or negative contributions of living nature (the diversity of organisms, ecosystems, and their associated ecological and evolutionary processes) to the quality of life of people" (Díaz et al. 2018). The great similarity between MA's ES definition and NCP definition given by IPBES did not escape other scientists that considered these very slight changes in the MA definition as minimal (Braat 2018; Kenter 2018).

During this presentation, I will analyse several aspects of the debate that may have opposed the concepts of ES and NCP. I will try to show how, despite the great similarities between the two concepts, real contributions have been (re)made.

Species, Essentialism, and Human Nature

Ingo Brigandt, University of Alberta

Essentialism about any issue is hardly endorsed in contemporary science studies and philosophy of science. This also holds for biological species, although two decades ago philosophers following Richard Boyd were willing to promote a revised notion of essence. Yet a handful of holdouts who nowadays even endorse intrinsic species essences exist. This talk will engage with Christopher Austin's recent essentialism about species, because it is both rooted in current issues in evolutionary developmental biology and adopts a neo-Aristotelian framework that resonates with discussions in contemporary analytic metaphysics. Apart from criticizing this intrinsic essentialism for species in general, I will reject such an essentialism as applied to humans as an unacceptable notion of human nature.

Consisting of developmental modules, Austin's intrinsic essences are species-wide dispositions to develop in a goal-directed fashion. Importantly, Austin avoids any claim that this would consist in developing a single, species-typical phenotype. Instead, he relies on the disposition to generate a restricted but whole range of phenotypic outcomes (e.g., depending on environmental circumstances). While Austin's strategy is to separate the question of what makes an organism a member of a species (answered in terms of an intrinsic essence) from the question of what makes a taxon a species, I object that this fails to incorporate those features about the nature of species that account for the generation of variation and evolutionary change. Moreover, Austin's teleological essentialism yields an objectionable account of human nature through a faulty vision of how human diversity should be explained and appraised.

Interactive Kinds and Norm Enforcement

Danielle Brown, University of Alberta

This paper investigates the mechanism that undergirds interactive kinds, a concept put forward by Ian Hacking (1995, 1999) and defends an account of the mechanism underlying human interactive kinds relating to their dual-status as epistemological and normative. Hacking argues that kinds in the social or human sciences--psychiatry, sociology, economics--are interactive in that those who are classified interact with their classification, generating feedback loops which may result in changes to the kind itself. This, according to Hacking, produces problems with the stability of the kind that can impede

our epistemic practices of empirical generalization and predictions. The two main questions raised with respect to interactive kinds are (1) whether interactivity is exclusive to human kinds, and (2) whether interactivity is a substantial problem for our epistemic practices. After a review of the literature (Khalidi 2013; Cooper 2004; Laimann 2020), I defend an affirmative answer to both questions. Though there exist other sorts of feedback mechanisms in nature, the phenomenon Hacking identifies is unique to human interactive kinds and stems from the fact that human beings are sensitive to norms and values and that kind assignment functions as a norm enforcing mechanism. I accept Laimann's (2020) view that challenge of human interactive kinds to our epistemic practices is not merely instability, but the way both stabilizing and destabilizing feedback obscure or interfere with other relevant causal processes. I push these ideas a step further, arguing that both stabilizing and destabilizing feedback in human interactive kinds are a byproduct of the much larger problem of the role that kinds play in the enforcement of norms.

Standpoint Epistemologies, the Early Years: Feminist Philosophers of Science

Alex Bryant, University of British Columbia

A common folk narrative regarding the development of standpoint epistemology begins with Hegel's influential account of the epistemic consequences of social positions, passes through the Marxist tradition, and into the political theorization of Marxist, Black, and (eventually) liberal feminists. So this story goes, the insights of these traditions congeal into what are now called standpoint epistemologies in the 1990's.

I press on this narrative by investigating the citational, conceptual, and social connections which presage a now famous intersection in the development of standpoint epistemology: the 1997 symposium regarding Susan Hekman's "Truth and Method" which occurred in SIGNS. In so doing, I attend specifically to the role of feminist thinking about scientific knowledge by sociologists (Patricia Hill Collins and Dorothy Smith) and philosophers of science (Sandra Harding, Donna Haraway, and Helen Longino) in the intellectual development of the more general (but nevertheless feminist) epistemologies which follow.

Looking Backward and Forward at the Lakatos-Kuhn debate: the Logic of Scientific Research as Historical-Hermeneutical Reconstruction

Marco Buzzoni, Università di Macerata (IT)

Thomas Kuhn is the individual philosopher usually credited with having played the most important role in the preading of the view that, even if they are distinct disciplines, history of science and philosophy of science must closely cooperate (see e.g. Nickles 1995; Galison 2008; Kuukkanen 2012: 346; Franssen et al. (eds.) 2016).

This historical reconstruction is, in an obvious sense, beyond controversy. However, in spite of its prima facie plausibility, it must be corrected on one important point. In a sense, Kuhn's strong influence did not represent a help, but rather an obstacle to the view of an intimate connection between the history of science and the philosophy of science. In fact, a convincing theoretical clarification of the relationship between philosophy of science and history of science was not provided by Kuhn, and it is at least in part still to be provided.

In order to argue in favour of this thesis, the initial part of this paper will briefly revisit the debate that took place in 1965 between Kuhn and Lakatos at Bedford College in London, in order to highlight a fundamental theoretical knot that still need to be solved. The proposed solution involves radically rethinking the relationship between the context of discovery and the context of justification, placing the genetic-historical reconstruction of scientific theories at the very heart of their logical-epistemological justification.

Francis Bacon as Friend of Aristotle's Natural Science

Christopher Byrne, Saint Francis Xavier University

Despite Bacon's opposition to the Aristotelianism of his time, there are three fundamental points of agreement between him and Aristotle:
1) Not all natural science is experimental. Nature is found in three states: free, forced, and constrained by human intervention. The third is the realm of experimental science. The study of nature in its free state, however, is primarily observational and not experimental. Two examples of the latter are biology and astronomy; the objects studied by these sciences have features that can be observed only in a natural context, or in an environment in which the natural context has been replicated.
2) The parts of nature that can be investigated experimentally are those that are indifferent to human intervention because they behave in the same way in both experimental and non-experimental contexts; they are immune to artificial constraints. Thus, we become masters of nature not by destroying it, but by harnessing it.
3) Natural science proceeds by way of induction, but not numerical induction. Instead, scientific claims are properly based on inference to what is naturally necessary; the latter is grounded in causal mechanisms that can operate in one way only, beginning with the operations of the material elements.
All three of these claims were denied by the late Scholastic doctrine of substantial forms; in freeing natural science from substantial forms, Bacon was acting as a friend of Aristotle's natural science.

"But I am not a barbarian": *Le Dernier Homme* and the Crisis of Evolutionary Time

Michael Cameron, Dalhousie University

This paper reads Cousin de Grainville's 1805 prose poem Le Dernier Homme [The Last Man] as symptomatic of an epistemic shift fundamental for the history of evolutionary biology. As has been acknowledged by many academics, Grainville's text is representative of many important transitions of the early nineteenth century, for despite ending on a Christian vision of apocalypse, it is nonetheless a work of proto-science fiction and an important step toward secularism. Following such readings, I argue that Le Dernier Homme dramatizes a crisis in Christian thinking and its concomitant faith in a meaningful end to Creation, a crisis necessary for the emergence of non-teleological evolutionary theory such as contemporary Darwinism. In the text, God tasks Adam – the First Man – with returning to Earth to convince Omegarius – the last fertile male – not to procreate. If Omegarius adheres to God's wishes, the Resurrection as depicted in the Book of Revelation will commence; if he chooses not to comply, he will become the progenitor of "the most accursed of all races." Considered within the contemporary intellectual milieu of the likes of Lamarck and Cuvier, Omegarius' choice should be interpreted as one between a religious and a secular understanding of humanity's relation to nature – if we have no transcendent end to which to look, then our future evolutionary path is conditioned instead by the caprice of natural laws. Ultimately, Omegarius decides to follow God's command, but the fact that such a choice must be made indicates nonetheless that a non-teleological rendering of evolutionary time has become imaginable.

Revolutionary Machines: Socialism and Empire in the English Mechanic

Johannes Chan, York University

The English Mechanic, published from 1865 to 1926, was one of the most widely circulated popular science periodicals in Victorian England, securing a loyal working-class readership by remaining both affordable and participatory in nature. The periodical's large sections of correspondence exchanges

allow for a type of historical approach proposed by Robert Young. What Young termed "social intellectual history" relies upon Victorian periodical literature to unearth the views of "lesser" scientific writers like Whewell and Sedgwick. While this task was taken up by historians like Adrian Desmond and James Secord – there is less existing literature focused on working-class voices such as those found in the pages of popular mechanics' magazines. The English Mechanic as this paper will show had an editorial line largely liberal-democratic in nature – both against class antagonisms and supportive of spreading the use of industrial machinery like the Arkwright mill to replace unruly labour threatening the reliable supply of commodities. However, the periodical's participatory correspondence sections still brought to its readers voices that were sometimes sympathetic to socialism or sometimes explicitly socialist. Though the socialism featured in its pages was more often less revolutionary and more inclined to reform or gradual change. Simultaneously, what we find in reader discussions over machinery and political economy are also frequent mentions of Britain's imperial possessions, revealing an intimate relation between working-class views of technology, socialism, and empire.

Metaphors in Darwin's Natural Selection and a general account of scientific models

Deivide Garcia da Silva Oliveira, Federal University of Reconcavo of Bahia (BR)

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

Science in African Philosophy of Culture

Zeyad El Nabolsy, Cornell University

In this paper I show that specific conceptions of science play an important role in the work of African philosophers such as Kwasi Wiredu, Kwame Gyekye, and Anthony Kwame Appiah. All three philosophers draw on some conception of science in order to differentiate between "modern" and "non-modern"/"traditional" societies. However, despite the significant role that is played by conceptions of modern science in the work of those philosophers, they do not really provide extensive accounts of what kind of science they are referring to. I thus aim to reconstruct the conception of science that is deployed by those three philosophers. In the process, I show that while they sometimes refer to "science" without qualification, what they really mean is "modern science", i.e., science as it emerged in early modern Europe in the aftermath of the Scientific Revolution. I argue that this conception of science, namely, science as it took form in the aftermath of the Scientific Revolution in early modern Europe serves as a common denominator that unifies the approaches of Wiredu, Gyekye, and Appiah. I

show that the demarcation problem which is really of concern for modern African philosophy is not the general demarcation problem: how do we distinguish between science (without qualifications) and other bodies of beliefs? Instead the demarcation problem which is of concern for modern African philosophy has to do with a more specific problem: how do we distinguish between modern science and other bodies of beliefs?

Varying Evidential Standards as a Matter of Justice: the Context of Climate Change

Ahmad Elabbar, Cambridge University

The Intergovernmental Panel on Climate Change (IPCC) is known for adopting high evidential standards in its assessments. Although in principle the IPCC can report on knowledge contained in non-peer reviewed or 'grey' literature, in practice, these additional sources are largely excluded from its evidence base. Assuming that the IPCC is right about the relative epistemic merits of different forms of evidence, is adopting fixed high evidential standards morally justifiable in science for policy, or rather does the balance of moral reasons favour varying evidential standards in assessment? This question has emerged as an important locus of debate in the values-in-science literature, with compelling arguments on both sides. My aim is to adjudicate this debate by introducing a novel consideration: In contexts marked by background evidential inequality, maintaining fixed high evidential standards results in an unequal distribution of epistemic goods among stakeholders, producing a powerful assessment for data-rich regions (a high rate of findings) vs. a weak assessment for data-poor regions (a low rate of findings). Where such inequalities of epistemic power translate into inequalities of political power, or where the background evidential inequality is itself the result of social injustice, we have reasons of egalitarian justice to reject fixed high evidential standards in favour of variable standards: in particular, to lower evidential standards for data-poor regions. This argument fills a gap in the literature, which has so far neglected cases involving background evidential inequality, implicitly assuming background homogeneity of evidence in debates over the setting of evidential standards in assessment.

An Archive for Who?: A Lesson in the Limits of Tempered Equality and Free Speech

Jennifer Jill Fellows, Douglas College

In 2019, Unesco released a report entitled I'd Blush If I Could: Closing Gender Divides in Digital Skills Through Education. The goal of the report was, as the subtitle indicates, to investigate gender disparity in the digital world. The report found that women are grossly underrepresented in computer science programs, in software engineering careers, and in silicon valley. (Unesco, 2019, 19) In many ways, this report confirmed what many of us already know: that digital spaces are largely designed by men, for men.

Though digital systems designed by women for women are rare, they do indeed exist. One example is Archive Of Our Own (also known as AO3) a fanfiction website. In this essay I argue that the values at the heart of AO3 largely map onto Helen Longino's framework of how to build feminist knowledge-making communities in science. However, I also critique AO3 as a site that still needs room to grow if it is to be truly intersectional, as it has largely failed to address legitimate concerns regarding racism on the site. I examine how AO3's current struggles can illustrate a long-standing problem in feminist empiricism regarding community building, freedom of speech and knowledge-sharing across communities. If I am correct, the values of tempered equality and uptake of criticism in Longino's framework can be harmful and can lead communities built upon her framework (as AO3 largely is) to be structurally unable to be fully inclusive.

'Minding the Gap': Sophie Germain and the relation between mathematics, philosophy of mind, and gender equality.

Melanie Frappier, University of King's College

Because of her major contributions to number theory and mathematical physics, Sophie Germain (1776-1831) was—even in her lifetime—used as an example of both the benefits of women's education and of its perils. Germain herself did not enter the debate, or so it may seem, dedicating herself to mathematics until the end of her life when, strangely enough, she made a foray into conjectural history. At first sight, her unfinished Considérations générales sur l'état des sciences et des lettres may seem to offer little more than a speculative analogy between the historical developments of the sciences and those of the humanities. However, read as a text drafted at the intersections of early 19th-century debates on women's rights, phrenology, and positivism, Germain's Considérations is, I argue, perhaps better understood as a sketch of a theory of the mind depicting thought as both fundamentally mathematical and malleable. If so, Germain's manuscript may be better conceived not as a naïve attempt at speculative history, but as a search for a metaphysical basis for gender equality and women's rights to education.

The Nature of Holobionts: The Agential Autonomy Perspective

Fermin Fulda, University of Toronto

One of the most important recent discoveries in biology is the ubiquity and importance of the symbiosis that holds between microbes and their plant and animal hosts (McFall-Ngai et al. 2013; Douglas and Werren 2016). The term 'holobiont' has been introduced to denote the unit formed by the host macroorganism and its associated microbiota (Margulis 1991; Rohwer et al. 2002). A central issue concerns the ontological status of this multi-species, polygenomic consortium: is the holobiont an ecological community of micro and macro biological individuals (e.g. Skillings 2016), or does it constitute a biological individual in its own right (e.g. Zilber-Rosenberg & Rosenberg 2008)? I address this issue using a new criterion of biological individuality according to which, biological individuals are autonomous agents. After clarifying the concept of biological 'agency' and 'autonomy' and showing the adequacy of this criterion with respect to intuitive non-symbiotic cases, I apply this criterion to three holobiont systems: the coral holobiont, the cow-rumen holobiont and a plant-holobiont. Although it is an empirical issue whether a given biological system meets a given criterion, I argue that this criterion has the important conceptual advantage of allowing for degrees of agential autonomy and hence individuality along a continuum. This implication challenges the assumption that the problem of the ontological status of holobionts takes the form of a dichotomy between full-blown individuality and full-blown non-individuality (ecological community). This criterion thus explains the intuitive possibility that most holobionts are located midway between these two extremes and why some cases are undecidable.

The New Modern Medicine: Scientific Medicine as an Unstable Model

Jonathan Fuller, University of Pittsburgh

Few would disagree that contemporary western medicine is scientific. However, while it is tempting to analyze scientific medicine within the traditional demarcation problem in philosophy of science by wondering what makes medicine a science, such an analysis misses out on the historical significance of scientific medicine. Rather, we should ask what makes contemporary western medicine 'scientific medicine'. Probing the latter question reveals that scientific medicine is an unstable model of medicine in recent history and today.

I argue that medicine became modern scientific medicine by the turn of the twentieth century by

aligning with and modeling itself after particular sciences: the laboratory or biomedical sciences (e.g. biochemistry and physiology). The resulting model of scientific practice is often called 'the biomedical model' or, simply, 'the medical model'. During the twentieth century, the influence of new medical sciences led to a shift in scientific medicine, resulting in a new medical model and a new modern medicine characterized by (1) multifactorial diseases and (2) noncommunicable disease epidemics, as well as an emphasis on (3) randomized trials and (4) medical risk. Noncommunicable disease epidemiology and clinical epidemiology had a profound influence on this new scientific medicine. In fact, all four characteristics mentioned above reflect the newfound importance of epidemiological concepts and methods in medicine. Likewise, we can see contemporary movements like 'precision medicine' and 'deep medicine' as part of an ongoing effort to remake modern medicine in the image of new sciences: molecular genetics and computer/data science, respectively.

Talking with Plants in the 1970s: The Sensation of 'The Secret Lives of Plants'

Della Gavrus, University of Winnipeg and Vivien Hamilton, Harvey Mudd College

A surprising 1973 runaway bestseller made its authors famous, enchanted the public, and forced the scientific establishment into an unplanned and very public confrontation. In 'The Secret Lives of Plants,' by Peter Tompkins and Christopher Bird, readers learned that plants "are living, breathing, communicating creatures, endowed with personality and the attributes of soul," able to read people's minds and sense their emotions, even across long distances. To support these radical claims, Tompkins and Bird drew on mysticism, spiritualism, philosophy, and the history of science, and compiled a large number of experiments from across the world – including from behind the Iron curtain. At a time of widespread environmental concern, the authors hoped that plants, "may be ready, willing, and able to cooperate with humanity in the Herculean job of turning this planet back into a garden from the squalor and corruption" of its current state. Surprisingly, the book continues to cast a shadow in the present, as a new generation of plant researchers making bold claims about plant intelligence find their work haunted by the memory of 'The Secret Lives of Plants.'

In this paper, we recover the neglected origin story of this book and examine its reception in scientific circles and wider culture. Drawing on oral history interviews with friends and family of Tompkins and Bird, and on media from the 1970s, we ask how both the book and the conversation surrounding it were shaped by the environmental movement, Cold War secrecy, and New Age entanglements with science.

Author Meets Critics: James Elwick, *Making A Grade: Victorian Examinations and the Rise of Standardized Testing* (Toronto 2021)

Ernst Hamm, York University, Tara Abraham, University of Guelph, and Robert Brain, University of British Columbia

Examinations and standardized testing are deeply integrated into schools, universities and whole systems of education in many different places and times. They play a key part in the preservation and transmission of knowledge across generations, as they do in gate-keeping. They are also controversial and as James Elwick's Making a Grade shows, they have been so for a very long time. Among other things, examinations are sometimes seen as the preserve of an old guard dedicated to upholding standards of one sort or another; sometimes as innovations that allow for fair treatment for all; sometimes as elaborate obstacle courses that might be worked around. This session brings together the author of an important new book on a subject of enduring relevance with critics whose work ranges across the physical, biomedical, human and social sciences, and their interactions.

TBD

Yousif Hassan, York University

What is a Beautiful Experiment?

Milena Ivanova, Cambridge University

There has recently been an influx of interest in the relationship between aesthetics and science. Philosophers have explored the role of beauty in scientific theorising, how it affects the generation of theories and the evaluation of their tenability, and the relationship between beauty and epistemic aims such as truth and understanding. The primary focus of these works, however, has been the relationship between theories and aesthetic values. My aim in this article is to engage with aesthetic aspects of scientific experimentation, specifically with how aesthetic features enter the construction, evaluation and reception of an experiment. I start with an analysis of the origins of scientific experimentation and illustrate the relation between experiments and artistic performances, arguing that from the early 17 century we can appreciate the aesthetic nature of experiments and their aim to generate not only knowledge of nature but also an aesthetic experience in the audience. I turn to analysing which aspects of experiments are appreciated aesthetically, identifying several contenders, from the ability of an experiment to uncover nature's beauty, to encapsulating original designs and human creativity. I focus specifically on the idea about design and the notion of beauty, asking what makes an experiment beautiful? I analyse commonly noted qualities, such as simplicity and economy and illustrate how they are understood by discussing a very famous experiment: the Meselson-Stahl experiment in biology that established how DNA replicates. Last, I look into claims made by scientists that an experiment is beautiful only when it leads to discoveries, and defend the idea that both design and result are constitutive of the aesthetic value of an experiment, and are both importantly correlated with epistemic aims of the experimenter.

Future Expectations, Transhumanism and AI

Dayna Jeffrey, York University

This paper explores narratives that transhumanists envision for the future. Transhumanism advocates for the transformation of the human condition through AI and other emerging technologies. Transhumanists desire a world where AI integrates with the human body, preventing aging and enhancing cognition (Diamandis 2012). To achieve this humankind will require highly advanced forms of AI, called "super-intelligence" (Shanahan 2015). Transhumanist visions of super-intelligent AI are influential in that they reflect popular imaginaries of progress through technological innovation; although transhumanist narratives may sound controversial, they draw heavily on tropes about the human benefits of technology that are familiar (Hurlbut & Tirosh-Samuelson 2016). Transhumanist imaginaries extend this logic of progress beyond near-term outcomes, advocating for the technological transformation of our very understanding of humanity itself, reflecting a particular ethics of new and emerging technologies like AI. My paper adopts a theoretical approach called the sociology of expectations (SE) (e.g. Brown & Michael 2003; Borup et al. 2006; Selin 2008). SE analyses the future-orientation of technological innovation, centering the 'future' as an important object of inquiry (Brown et al. 2000; Borup et al. 2006). SE enables me to explore how future expectations of technoscience influence its development and how they shape society (Borup et al. 2006). Future visions challenge fundamental values and concepts of our current historical and cultural assumptions about temporality and society (Jasanoff & Kim, 2015; Mali, 2016). It is necessary to examine them to understand changing forms of public engagement within science and technology policy, where the latter are configured by new and shifting future imaginaries.

Incompatible Models, Modality and Realism

Aditya Jha, University of Canterbury (NZ)

The Problem of Incompatible Models (PIM) refers to the existence of multiple contradictory models of a target system T, which poses a challenge to the realist reading of these models (Morrison 2011; Weisberg 2007). Perspectival Modelling (Massimi 2018; Rice 2019) aims to solve the PIM by rejecting the 'representation-as-mapping' notion that models must represent/capture the structural features of T accurately in order to explain the relevant features of T. The departure from representation-as-mapping is justified by appeal to the modal features of perspectival models which map "the space of what is objectively possible" (Massimi 2018, 350) by "capturing (modal) patterns of behaviour that are universal across classes of real, possible, and model systems" (Rice 2019, 96).

This paper shows that the appeal to modal features of T and universality class arguments fails to distinguish between degrees of modality offered by these perspectival models because the conditionals to these modal inferences fail to circumscribe the antecedents correctly and systematically. With the help of a case study of modal explanations of pendulum systems (spherical pendulums and n-tuple pendulums), the paper shows how some seemingly robust modal explanations break down under various perturbations spelling trouble for the perspectivalist. This is because (1) it is simply not the case that a system falling in a universality class with certain antecedents (related to perturbations) will fail to be a part of the same universality class if the antecedents change, and (2) nothing in the modal model alone or in the universality class allows us to ascertain the antecedents that make an explanation work, thereby affecting its degree of modality and applicability.

Systems Biology Study as an Interdisciplinary Object

Kevin Kaiser, Université de Montréal

Systems biology is a well known interdisciplinary field bringing together biologists, mathematicians, computer scientists, physicists and engineers to understanding organisms from a systemic perspective. While most of the work in philosophy of interdisciplinarity put the emphasis on systems biology as a case of interdisciplinarity, it can be put forward that it's study is an interdisciplinary object in itself. Indeed, the multiple disciplines studying it are only able to offer partial description of the field.

In this talk, I will aim at clarifying what is philosophical and bibliometrical analysis contribution in understanding systems biology. More precisely, I will explore the following questions: (a) what are the (dis)similarities between philosophical and bibliometrical description of systems biology, (b) what aspects is/are more adequately described by philosophical/bibliometrical analysis, and which aspect is/are contradictory/consistent.

To do so, a hybrid approach philosophical/computational will be adopted. First, the logical interaction between disciplines in systems biology will be reconstructed following analysis of the case by philosophers of biology. Second, the empirical interaction between disciplines in systems biology will be reconstructed thought bibliometrical tools. That will result in the production of two networks that will be used for the comparative analysis.

By clarifying what each type of analysis bring, it is expected to show both the relevance of each in studying systems biology, but also what there are lacking. This will help to identify the ground on which interdisciplinary work must be build.

Bias and Blind Analysis in High Energy Physics

Molly Kao, Michael Massussi and Jean-Philippe Thomas, Université de Montréal

Discussions in philosophy of science about cognitive biases in experiment often focus on domains such as clinical trials. It is less common to consider how cognitive biases can play a role in

investigations of fundamental physics. The necessity of collecting and interpreting massive amounts of data requires making choices at various points of the analysis of an experiment, but these choices are not uniquely dictated by the data. Physicists are aware of this issue, and utilize a variety of techniques collectively referred to as ``blind analysis'' to counteract possible biases. Yet the importance and applicability of these techniques remains contentious in some physics communities. We argue that in order to productively assess whether blind analysis should be applied in any given case, we first need to have a clear idea of the kinds of problems it is meant to respond to. To that end, we propose three different ways in which we might classify these practices. The first involves identifying the kind of cognitive bias being mitigated. The second is in terms of the degree of ``blinding'' being undertaken, or in other words, how much data is permitted in the construction of a data model. The third considers the various decision points in the design and implementation of a data analysis method. We suggest that thinking about these practices in such terms is useful for different purposes, and that these classificatory schemes can facilitate considerations about using such techniques in other disciplines.

More than Sympathy: (Mis)communication in Health Care and the Need for an Ontology of Pain

Rachel Katz, University of Toronto

Pain, while generally an easily recognizable sensation, can be difficult to explain or quantify to another person. Much of the ability to discuss the experience of pain is based on being able to compare the sensation to how one feels “normally”. Pain scales are of limited use, as it is difficult to understand what a number on a scale means to both a patient and a medical professional, but doctors’ offices and emergency departments often resort to this metric when points of comparison fail to translate between parties.

The development of a pain ontology has been suggested as a way to better understand and quantify pain. This project was first proposed by Barry Smith and colleagues in 2011. In this paper I review Smith et al’s call for a pain ontology, highlighting key applications where such an ontology could be useful both to patients and physicians, such as in the diagnosis process. I argue that the use of an ontology to partially automate a patient’s diagnosis could reduce instances of misdiagnosis and protect patients from racism and misogyny within the biomedical system. However, I then discuss the ethical issues that ought to be considered in the development of a pain ontology. What are the consequences of the partial automation of diagnosing the cause of pain? How effective would an ontology be against a physician’s unconscious biases? I conclude that a pain ontology is a necessary step in facilitating better communication about pain, but that ontology alone cannot resolve human intolerance.

The Climate Casino: Employing Betting Markets to Quantify Uncertainty within the IPCC Assessment Report Framework

Aaron Kenna, University of Toronto

Throughout the Fifth (AR5) and Sixth Assessment (AR6) Report cycles, the Intergovernmental Panel on Climate Change (IPCC) adopted a calibrated language framework uniformly across all working groups for the characterisation of uncertainties in key climate change findings. Within this framework AR5 and AR6 working groups communicate uncertainty through language terms calibrated according to two distinct metrics: a probabilistically quantified range of uncertainty expressed via a likelihood scale and a qualitative description of levels of confidence.

The IPCC’s calibrated language approach has engendered quite a bit of controversy. Herein I identify three of the most prominent criticisms found within the literature: the lack of transparency and traceability of expert judgements, the context-dependent interpretations of probability terms, and the

conceptually confusing distinction between probability and confidence. I argue that the IPCC's calibrated language approach lacks the resources to meet these criticisms, and I contend further that the methods of classical deliberation used by both AR5 and AR6 working groups to produce assessments of uncertainty inadequately account for the game theoretic dynamics that are unavoidably involved in eliciting expert judgements from large, heterogenous groups of variously endowed individuals with significant view-point diversity.

I then offer up a radical proposal: the IPCC framework would benefit considerably from quantifying and aggregating uncertainty via curated betting markets. Curated betting markets, I argue, better exploit the knowledge bases unevenly dispersed throughout a large and diverse community and thereby more effectively reduce asymmetries in knowledge and mitigate the deleterious effects of power dynamics which afflict classical deliberation methods. This is achieved, I argue, in large measure through the strategic maneuverings, reciprocal learning, hedging of risks, and exploitation of arbitrage opportunities by participants carrying out market interactions anonymously. Lastly, I sketch how betting market probabilities, which invariably are precise, model decision relevant features of evidence, such as balance, weight, and specificity, more effectively than alternative methods which aggregate uncertainty via imprecise probabilities. Thereby, I hope to shed some light on a few long-standing debates between precise and imprecise probabilists about how probability reflects evidence.

Revisiting the Work of William F. Ogburn: the Problems of Scientism, the Value-Free Ideal, and Engaged Inquiry in 20th-century Social Science

Emy Kim and Mark Solovey, University of Toronto

Historical scholarship on the well-known Chicago sociologist William F. Ogburn (1886-1959) has emphasized his commitment to a statistical, dispassionate, and "objectivist" approach to social science research, putting him in contrast to "purposivist" scholars whose work explicitly took up normative, moral, and social issues. This paper seeks to reinterpret Ogburn's work by showing how, in various types of writings, he actually did take a direct interest in understanding and finding solutions to personal suffering, social problems, and economic dislocations. Two of his well-known projects—his 1922 book, Social Change with Respect to Culture and Original Nature, and his contributions to the President's Research Committee on Social Trends (1933), as well as his lesser-known 1934 pamphlet, You and Machines—reveal Ogburn's concern for such matters. This paper focuses in particular on his views about unemployment. After the Great Crash of 1929, he examined this problem in You and Machines, which included alarmist statements about the deleterious consequences of technological change on worker welfare. Our analysis calls for a revised, richer, and more complex view of Ogburn's work and legacy as one of the nation's leading social scientists during the first half of the 20th century.

The Cold War Comes to Town: North Bay, the BOMARC Missile Site, and the SAGE Underground Complex

Bree Lohman, University of Toronto

Today, the nuclear defense infrastructure of North Bay, Ontario, has receded from the public imagination and passed out of historical view. However, during the 1960s and '70s, these military installations—a missile site and an underground base—formed the Canadian contingent of the SAGE-era early warning and air defense system, a continental nuclear defense infrastructure that scanned the Northern latitudes from 1957 to 1983 for nuclear attack, encompassing detection, surveillance, and interception technologies—notably, nuclear weapons formed part of the defensive arsenal. SAGE is too often misappraised as only an American project. However, it was in fact a joint undertaking between Canada and the United States.

Now that these sites are no longer in use, North Bay is no longer the harrowing place it once was. In fact, the BOMARC Missile Site is a self-storage facility these days. Silos that once held nuclear warheads now house snowbirds' RVs and summer speedboats for Lake Nippissing. Meanwhile, the SAGE Underground Complex, blasted 600 feet beneath the surface, has been decommissioned for decades. Proposals for this mausoleum of the Cold War have suggested retrofitting it as a data center. For this talk, I return to those harrowing days of North Bay's past. I will attempt to examine the negotiation of nuclear risk—and reward—through acts of nuclear maintenance during the Cold War. I define nuclear maintenance as the banalization and the exceptionalization of nuclear objects through localized, intimate, and ongoing work, which upholds a particular ideological arrangement. For North Bay, the risk of nuclear defense infrastructure was worth the reward—yet this disposition demanded continual maintenance and affirmation by local actors and institutions.

Epistemic Terms in the Practice of Science: A Computational Text-Mining Approach

Christophe Malaterre and Léonard Martin, Université du Québec à Montréal

Much attention has been devoted in the philosophy of science to explicating highly-prized concepts such as "explanation", "theory", "law" or "model" among many others, resulting in a plurality of nuanced philosophical accounts (such as the DN, causal, unification and mechanistic accounts of explanation). The rationale for this enterprise is to be found in the central epistemic roles that such concepts are taken to play in science. Yet, do these concepts actually play such significant roles? In this contribution, we propose to investigate the actual roles that major epistemic concepts play in the practice of science by analyzing terminological occurrence patterns in scientific publications. Narrowing down the study to six major epistemic concepts for feasibility reasons ("theory", "model", "mechanism", "explanation", "understanding" and "prediction"), we measure actual terminological usage and relationships in a corpus of over 75000 full-text scientific articles of the biological and medical sciences (BioMed database). Using text-mining methods, we identify the most frequently co-occurring epistemic concepts. The resulting terminological cartographies partly validate select philosophical intuitions but also suggest notable differences between philosophical reconstructions and the actual roles that concepts appear to be playing in the scientific discourse. We also investigate the incidence of disciplinary context.

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

Mousa Mohammadian, Ahmedabad University (IN)

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

The first question targets philosophers like Hempel and Sober who hold that some theoretical virtues are constituents of the aim of scientific theorizing and others (e.g., simplicity and internal consistency) are instruments (or means) of achieving the aim. I argue that an instrumentalist view of any theoretical virtue results in major problems and counterintuitive verdicts about scientific rationality and the progress of science. Regarding the second question, I show that my proposal unifies three important rival account for the aim of scientific theorizing in the literature: (i) Kuhn's and Laudan's accounts that the aim of scientific theorizing is finding theories with the greatest puzzle/problem-solving ability; (ii) the

realist proposal that the aim is to find true theories; and (iii) Bird's view that the aim of scientific theorizing is knowledge or justified truth. If successful, this unification is quite striking partly because (i) is proposed by two prominent anti-realists while (ii) and (iii) are offered within the realist camp.

Margaret Cavendish on Animal Generation

Kathryn Morris, University of King's College

Generation was central to Margaret Cavendish's philosophical project: Cavendish was concerned with explaining natural order and saw the emergence of complex creatures according to natural kind as one of the the most significant (and puzzling) forms of regularity in the natural world. Accordingly, the problem of generation was an ongoing preoccupation for Cavendish, one which she addressed in all her mature philosophical works. Her theory of generation did, however, change significantly over time, in ways that were intertwined with her shifting views on causation, individuation, and freedom. This paper will map out the key changes in Cavendish's theory of generation. I will argue that she begins by proposing an unconventional version of epigenesis, according to which self-moving matter forms complex structures out of inanimate building materials. There is a decisive move away from epigenesis in her later work, in which generation is explained in terms of the transfer of knowledge between social units. The paper will both elucidate Cavendish's changing positions and illustrate the connections between debates over generation and broader philosophical controversies in the seventeenth century.

Investigating the Interplay between Theory and Experiment in the Uptake of the Dynamic View of Proteins

Jacob P. Neal, Western University

Changes in scientific representations of proteins have recently undergone a dramatic shift from static to dynamic. For the first half of the twentieth century, the dominant view of protein structure held that proteins were rigid, compact, and largely static molecules. An alternative dynamic view of proteins arose in the 1970s and 1980s. It treated protein molecules as small thermodynamic systems and emphasized that proteins in solution would undergo constant structural fluctuations. The aim of this paper is to identify the causes of this shift by examining the interacting and often competing role of theory and experiment. The slow uptake of the dynamic view raises a historical puzzle: what explains the quarter-century time lag between the origin of the view and its eventual acceptance? One explanation offered by scientists and historians of science suggests that the dynamic view of proteins in the 1970s and 1980s was a theoretical view awaiting experimental confirmation (Cui and Karplus 2008, Hilser et al. 2012, Morange 2020). Protein dynamics, on this account, would only be taken seriously after advances in experimental techniques, such as protein NMR, enabled researchers to visualize protein dynamics at high resolution. I contend that this explanation is partial at best. Although technological advances played a part, I argue that theoretical understanding of protein dynamics was a crucial driver behind the emergence and uptake of the dynamic view.

Chemical Indicators, Colorimetry and the Standardization of Diabetic Sugar Analysis in the 20th century

Elizabeth Neswald, Brock University

While the discovery of insulin in 1921 has received much attention, the tests and techniques for measuring diabetic sugar levels, which were necessary for an insulin therapy to succeed, have received little research attention. This paper investigates the development of urine and blood sugar monitoring methods in the first half of the 20th century, focusing on the crucial role of colour as a means to

determine sugar levels. From the late 19th century onward, the presence of sugar in urine was determined through chemical indicators, with concentration indicated by the intensity or shade of colour. Colour was the means by which the chemical process of a reagent interacting with sugar could be made perceptible. Colour is, however, an elusive and subjective phenomenon. This paper approaches the history of diabetic sugar measurement as a process of attempting to fixate and standardize the process of colour interpretation. It traces this history from the early indicators, through the introduction of colorimeters into biochemistry, to the development, marketing and use of different kinds of chemical, material, and physical colour standards for different user groups. It shows how the ability to accurately interpret colours became one of the most important skills for researchers, physicians and patients in the treatment and monitoring of diabetes.

The Evolution of the Axiomatic Method in Reconstructions of Quantum Theory

Jessica Oddan, University of Waterloo

Reconstructions of quantum theory, including those by Hardy and Coecke, are a novel research programme in theoretical physics which aims to uncover the unique physical features of quantum theory via axiomatization. I will argue that reconstructions develop a novel species of axiomatization. I trace the evolution of the axiomatic method from Hilbert's axiomatization of geometry through to von Neumann's applications to quantum mechanics. I then show how Hardy and Coecke's reconstructions are successors to the method. A common thread throughout this evolution is the important role that intuitions and empirical input play in the postulation of axioms—however, I will argue that these two features are integrated differently in Hardy and Coecke's work than in von Neumann's. Von Neumann was contending with an immature quantum mechanics without an established formalism, whereas Hardy and Coecke use the axiomatic method to confirm key physical postulates where the established formalism of quantum mechanics acts as a constraint. This relates to the 'tightness' between mathematical formulation and physical postulate, and I will argue that the distinction between mathematical formulation and physical principle is blurred in reconstructions, particularly those that are operational such as Hardy's. An operational reading of quantum mechanics integrates physical intuitions and empirical input in the mathematical formalism, which is significant because the formalism with which we describe quantum mechanics is necessary for the expression of its physical concepts. Operationalism bears a similarity to von Neumann's use of intuition, although for von Neumann intuition was integrated in the postulation of physical axioms.

The 1972 Montréal IGC Semi-Centennial

David Orenstein, Danforth CTI

In 2022 we can celebrate many anniversaries in Canadian STEM&M History, including the semi-centennial of the August 1972 International Geological Congress / Congrès géologique international (IGC / CGI) in Montréal. Many Canadians had helped establish the first (and subsequent) International Geological Congress in Paris in 1873. Canada had previously hosted an International Geological Congress as early as 1913. It was held at the University of Toronto and Presided by McGill University's Frank Dawson Adams. The 24th/ème IGC/CIG, in Montréal fifty years ago, was hosted in part at McGill, though mostly in the downtown hotels and congress centres. Its President, Robert Folinsbee, came from the University of Alberta, and major logistical support from the Geological Survey of Canada.

The Montréal IGC was a major event, scientifically and socially, and similar in many ways to the Toronto IGC. Both had Canadians playing leading rôles, not only organisationally as hosts, but also very much so scientifically. There were extensive social programmes during the Congress period, and an extensive programme of field trips before, during, and after. The 1972 IGC was especially noteworthy for its establishment of Plate Tectonics, with the University of Toronto's J. Tuzo Wilson laying a key rôle.

There was also breakthrough work in both Precambrian Paleontolgy and Planetology. And, to highlight the importance of outreach and professional renewal, a Section on Geological Education.

When to Stop Building Trust: Perceived Epistemic Injustice and the Limited Obligation of Institutions to Cultivate Trust in Science

Tyler Paetkau, University of Alberta

The ongoing Covid-19 pandemic has brought the issue of trust in science to the fore. Despite the demonstrated safety and efficacy of vaccinations against Covid-19 and access to vaccines, a significant portion of those in Canada and the United States resist vaccination. While traditional approaches have sought to ameliorate vaccine hesitancy through public education, recent scholarship has argued that the root of vaccine hesitancy is a lack of trust in vaccine-promoting institutions. Specifically, vaccine-promoting institutions are seen as being motivated by financial gain or racist ideologies rather than the public good. However, while trust-focused approaches offer legitimate strategies for increasing vaccine uptake, these approaches often directly conflict with public health measures imposed during the pandemic. In particular, policies such as vaccine passports, vaccine mandates for employment, and special taxes for the unvaccinated have all come under fire for supposedly contributing to distrust in vaccines and vaccine-promoting institutions.

This tension between competing public health concerns reveals a topic largely overlooked by trust-based approaches. That is, how far should public institutions go in their efforts to develop trust in science among the general public. Drawing on theories of procedural justice and epistemic injustice, I argue that public institutions have a normative obligation to cultivate trust in policy-relevant science. In particular, institutions have an obligation to be trustworthy, appear trustworthy, and to build trust through developing respectful relationships with the public. However, these obligations have limits. One such limit is instances of distrust in science rooted in perceived epistemic injustice. While instances of epistemic injustice are generally composed of both substantive and perceived epistemic injustice, I argue that these two elements can occur independently. As such, when distrust is rooted in an instance of epistemic injustice that lacks the substantive element, the institution has no obligation to cultivate trust.

On the Philological Foundations of Modern Science in early nineteenth-century Germany

Kristine Palmieri, University of Chicago

The meteoric rise of nineteenth-century German science has been well documented. The crucial role that classical philology played in its development, however, has been overlooked. On one hand, this is because explanations highlighting the convergence of science, state, and industry tend to focus on the period after German unification in 1871. On the other hand, this is because analyses emphasizing the role that universities played in stimulating new research overwhelmingly focus on scientific triumphs while ignoring the humanities – the category to which philology is relegated today. Classical philology, however, was queen of the sciences in the nineteenth-century research university and the field's epistemic authority was undergirded by the development of a distinct ethos, which contributed to the emergence of a distinctive mode of German science as it permeated the German intellectual life and academic culture.

This paper excavates the philological foundations of modern science first by explaining how and why philology seminars gave rise to this ethos and establishing what made it scientific. I then trace the dissemination of this ethos through the German higher education system and conclude by revealing the impact it had on teaching and research in the natural and social sciences at universities.

Walking Backwards towards the Future: Trajectories of Latin American Futurisms

Martín Pérez Comisso, Arizona State University

For many indigenous peoples in the Americas, like the Quechua communities in Perú, the temporalities flow from the back to the front: We walk backward towards the future looking at our past. This paper dissects the role of images of the future in Latin America. Based on the documental analysis and the early analysis of interviews with professional future professionals, I argue that Latin American images of the future are suffering from a series of historical, epistemic, and cosmological constraints that restrain their value and impact on their local population, as well other peoples around the world to enrich with those visions of the future. Latin American images of the future are discussed from the role that speculative designers, science fiction writers, science and technology strategies and foresight practitioners understand and convey history and stories under different intellectual traditions, some of them with more than 60 years in the region (Medina, 2014). Contrasting with Afrofuturism (Nelson, 2002; Eshun, 2004); Chicanofuturism (Ramirez, 2004; 2007), or Sinofuturism (Conn & de la Seta, 2019), Latin America´s ways of futuring are deeply entangled with coloniality (Quijano, 2000; 2007) which limits the potential of local imaginations, producing a cultural void that undermines the narratives and capabilities of regional science and technology (Sagasti, 1973; Sabato, 1980; Sutz, 2002).

The consequences of hegemonic ways of futuring (Sardar, 1993) are the institutional and historical imposition of disowned futures (Inayatullah, 2008) that colonize Latin America with methods, styles, practices, and concepts that constantly require adaptation and gambirra (A Brazilian word that refers to precarious hacking). The re-evaluation of historical and present visions of the future in the region (like Rivera Cusiqanski, 2012; de la Cadena and Blaser, 2019) offer space to embrace the plurality of futurism that the region remixes, as well to find common historical trajectories that cross around different professions, countries, and identities. The challenges to understanding Latin American' futures visions reside in the limitations of imposed temporalities on the region, that have forced Latin America to look forward to a shiny future abroad that blind it from their traditional ways of future thinking, one that remains invisible despite being present in the intellectual past of all its nations.

Lived Model Psychosis: Intoxicated Psychology and the Kraepelinian Dichotomy

Matthew Perkins-Mcvey, Dalhousie University

The Kraepelinian dichotomy—the severance of acute, recurrent psychosis into dementia praecox and manic-depressive illness—continues to exhibit a profound influence on Western psychiatry, particularly through the enduring importance of the DSM and ICD. Despite this formative role in the history of modern psychiatry, the precise origins of Kraepelin's nosology remain the subject of considerable scholarly debate. The proposed origins of Kraepelin's dichotomy range from the suggestion that Kraepelin pioneered a uniquely insightful clinical approach to outright dismissals of Kraepelin's work as offering any innovation. But what unites these varied efforts to chronicle the history of the Krapelinian dichotomy is an underestimation of the profound significance of Kraepelin's earlier psychological experiments involving substances of intoxication. This paper establishes the Kraepelinian dichotomy as an artifact of Kraepelin's psychological experiments with intoxicants, at the root of which centred a conceptual equivocation between intoxication and psychosis. Tracing the development of Kraepelin's nosological system over the course of the first six editions of his textbook Psychiatrie, my analysis will examine the conceptual shifts underlying Kraepelin's classificatory approach relative to the content of his concurrent experimental studies on the psychometrics of intoxication. Most importantly, this narrative will identify Kraepelin's own experiences of intoxication as crucial to the formation of his understanding of the psychical structure of psychosis, as the foundation of the Kraepelinian dichotomy.

Such an analysis not only calls into question standard narratives in the history of psychiatry, it raises further questions about the nature of knowledge production in the bio-medical sciences.

Boundaries in Flux: The Legacy of Environmental Design Programs at the University of Waterloo, 1964-71

Eliza Pertigkiozoglou and Katrin Zavgorodny-Freedman, McGill University

Within the post-war research university, both emerging and established disciplines were in flux, defining their boundaries in relation to each other. This paper examines the transformations that took place at the University of Waterloo, a Canadian example of the spirit of the Cold War science- and technology-oriented research institution. In particular, our analysis focuses on the Department of Design, which emerged as a distinct institute within the Faculty of Engineering in the second half of the 1960s. Its creation compelled other academic fields, namely Architecture, Geography, and Planning, to also negotiate their placement and associations within the University. The desire of disciplines to find integration within the university structure conflicted with anxieties of claiming specialized expertise to legitimize distinct contributions.

This paper closely examines these disciplinary negotiations by looking closely at archival documents that discuss program structures and curricula, such as University course calendars from 1965-71. These documents are valuable historical artefacts due to their ability to mediate pedagogical visions in a concrete manner, situating them structurally within training programs, and complicating educators' rhetoric about professional expertise and disciplinarity. Our paper argues that the development of academic programs at the University of Waterloo reveals conflicting desires between integration and retention of disciplinary boundaries. The case of Waterloo demonstrates how interdisciplinarity was less about border crossings and more about institutionalizing disciplinary boundaries in relation to each other. Ultimately, this work can help elaborate on the unique position of the Canadian post-war research university against the larger backdrop of the Cold War.

How Theoretical Terms Effectively Refer

Sébastien Rivat, Max Planck Institute for the History of Science (DE)

The goal of this talk is to show that recent developments in theoretical physics offer a way to make some progress toward the traditional problem of referential failure across theory-change without making referential success too easy or too hard. Drawing on the framework of effective theories, I argue that referential success is most reliably assessed before theory-change by examining whether the putative referent of a term is specifiable within the limited domain delineated by the range of parameters over which the theory at stake is empirically reliable. I adjust the semantics of theoretical terms accordingly, building on Psillos's account, and show how the resulting theory of reference works with simple models of effective theories. Overall, their lesson is twofold: (i) referential failure arises when the putative referent of a term in a theory lies outside of its empirical reach; (ii) there are good reasons to take the reference of a term to be stable if the core causal-explanatory description of the referent does not depend significantly on a large variety of plausible and more comprehensive alternatives. If time allows, I will briefly conclude by explaining how the theory of reference handles the usual suspects, such as 'luminiferous ether' and 'phlogiston'.

Pregnancy Testing in Emergency Care Settings: a Case of Epistemic Injustice

Amanda Sears, McGill University

Havi Carel and Ian James Kidd propose that medical patients are uniquely vulnerable to epistemic and hermeneutical injustice, by means of both the physician approach and the fact that

healthcare institutions grant unequal authority to different methods of evidencing and reporting testimony (Carel and Kidd 529). Implicating historically persistent stereotypes of women as epistemically unreliable, I suggest that female patients may be especially susceptible to being undermined as bearers of first-person testimonial evidence. In this paper, I explore the hypothesis that pregnancy tests are overused in emergency care settings, owing to a loss of perceived epistemic credibility, thereby negatively impacting the quality of care for women. Relying on existing data and policy recommendations in medical literature, I demonstrate that self-reported pregnancy risk is capable of meeting the standards of evidential validity and that policies and actions by medical professionals which discredit this evidence are unnecessary and harmful. This paper calls into question the existing methods of knowledge attribution and acquisition which are routinely used to determine pregnancy status in emergency care settings, and suggests alternative methods intended to respect the epistemic credibility of female patients.

A Pluralistic Account of Autism: A Case for Strategic Conceptual Engineering

Mahmoud Shabani, University of Alberta

Autism is predominantly considered a psychiatric disorder whose symptoms manifest in an individual's social interactions and repetitive behavior. However, the concept of autism is heterogeneous, and its meaning has changed many times. Besides, the incidence prevalence of autism has increased in recent years. These conceptual changes and the rise in the incidence raise the question whether autism is a social identity or a psychiatric disorder. According to the identity conception, autism is a natural variation within human beings that should be respected. In contrast, advocates of the disorder view emphasize that people with autism are suffering greatly, and that it should be prevented or cured.

I attempt to show that these two camps favor a monistic view of autism and disorder and that identity concepts are employed to pursue different aims. Given that stakeholders have different needs and interests, I will go beyond this binary and argue that these different aims cannot be accommodated effectively by employing a single concept. Thus, the concept of autism needs to be revised. Using strategic conceptual engineering, I propose a pluralistic view of autism and argue that this approach is more effective than a monistic one given serving stakeholders' diverse interests

Legal Power and Medical Authority: The Global History of Lunacy Certificates (1850s-1910s)

Filippo Maria Sposini, University of Toronto

The confinement of people deemed as insane spanned the modern world. From the beginning of the nineteenth century, an increasing number of physicians, legislators, and intellectuals in Europe and North America accepted the idea that insanity was a disease, that it required a specific treatment, in a specific place, by a specific body of experts. Lunatic asylums emerged as the elective places for care and custody. Admission into such establishments was regulated by a specific legal provision called "certification".

Throughout the nineteenth century, medical certificates of insanity existed as a statutory requirement for institutional care in the British Empire. Using a standard formula, these certificates declared an individual to be of "unsound mind" and a "proper person to be taken charge of and detained". In 1853 England introduced a system which proved extremely influential for the development of health provisions around the world. It required one or two medical practitioners to "personally and separately" examine the patient. Doctors filled out a template which included "facts of insanity personally observed" and "facts communicated by others". This document authorized asylum

superintendents to detain patients without temporal limits. Numerous jurisdictions adopted this system in the late nineteenth century, including India, Ontario, Jamaica, Tasmania, Fiji, and many others.

In spite of its extension and longevity, we still know very little about the history of this procedure. My presentation will trace the circulation of certificates of insanity across the British Empire with particular emphasis on South Africa and the Pacific. By considering their global diffusion, I will describe lunacy certificates as critical devices that held together the power of law and the authority of medicine. Despite the want of uniformity, the spread of certificates of insanity was not a passive process in which colonies simply copied from the metropole. There were many "hybridizations" which raised concerns about the applicability and suitability of British laws and British liberty beyond the seas.

Scientists are Internalists about the Epistemology of Imagination: a Case Study from Space Science

Michael Stuart, National Yang Ming Chiao Tung University (TW)

The past 5 years have seen an influx of work on scientific imagination: what kinds are there, when is it permissible to use, who gets to use it, and how are uses of imagination evaluated and justified? This paper presents a case study from space instrumentation science. Scientists working in this field know that their instruments (optimistically) have launch windows that are several years to decades in the future. And every instrument they build (and many of the parts of those instruments) are often one-of-a-kind and the first-of-their-kind. Accordingly, many problems that arise in space instrumentation require a great deal of imagination. But that imagination is tightly constrained by time, budgets, political and public interest, and the limits of current technology. This paper looks at a specific episode of problem solving during the development of ProSPA, which is an instrument built to both search for water and perform in-situ resource utilization which will create water from lunar regolith. The question is, how do scientists recognize a use of imagination as a good one? Two options are borrowed from mainstream epistemology: internalism and externalism. Most writing on scientific epistemology portrays science as an externalist reliabilist project, and most writing in mainstream epistemology of imagination assumes an externalist viewpoint. Yet, in the case at hand, scientists prefer an internalist approach. Rather than justifying a use of imagination by finding out if the person who produced the idea has a reliable imagination, scientists simulate new ideas for themselves, to see if they are rational and responsible to hold, given their evidence and what they can imagine, and given how well the idea balances the need to satisfy as many epistemic constraints on good reasoning as possible. Some consequences are considered for how this should impact the growing literature on the epistemology of scientific imagination.

Newton was an Inductivist, but that doesn't mean what you think it means

Charle André Terrault, Université de Montréal

Le Scholium Generale (Newton 1713) contient sans doute un des passages les plus énigmatiques de l'œuvre de Newton. Je parle, bien sûr, du hypothesis non fingo, mais aussi des deux phrases suivant cette fameuse déclaration. À la lecture de ces phrases, le lectorat contemporain fait face à ce qui semble être une contradiction, car Newton tient un propos déductiviste dans les premières de ces phrases, puis continue en accordant une place à l'induction dans sa méthodologie dans la seconde. Pour comprendre ce passage, nous discuterons des différentes interprétations de la notion d'induction chez Newton, du contexte philosophique dans lequel Newton s'inscrit et, finalement, des interprétations de Newton précédant le paradigme inductiviste contemporain. Nous découvrirons à travers ce parcours que le problème trouve une solution toute simple : comme la plupart des philosophes de l'époque moderne, Newton emploie la notion d'induction de Francis Bacon (1620), laquelle est compatible avec une méthodologie déductiviste. Cette solution au problème susmentionnée n'est pas nouvelle, mais est

aujourd'hui méconnue. Je tâcherai, lors de cette conférence, de donner un portrait global des indices permettant de conclure avec une relative certitude que cette interprétation de Newton est la plus vraisemblable.

Toy Models, Dispositions, and the Power to Explain

Philippe Verreault-Julien, Eindhoven University of Technology (NL)

Reutlinger, Hangleiter, and Hartmann (2018) make a distinction between embedded and autonomous toy models. The former stem from a well-confirmed framework theory while the latter don't. They argue that some autonomous toy models don't provide how-actually explanations and understanding because they don't satisfy the veridicality condition. Examining overlapping cases, Nguyen (2020) contends that such toy models accurately represent their targets by identifying broadly construed dispositional properties in target systems. Moreover, he claims that they don't only provide how-possibly understanding.

Drawing on existing accounts of dispositions and of how-possibly explanations, I argue that neither of these positions is completely correct. Toy models may accurately represent, satisfy the veridicality condition, yet fail to be how-actually explations. This is because some dispositions remain unmanifested. Instead, the models provide how-possibly explanations; they possibly explain.

Two important upshots of this discussion are that 1) the veridicality condition doesn't demarcate how-possibly from how-actually explanations and 2) accurate representation is insufficient for how-actually explanation.

Daniel Lehrman: the Evolution of a Developmentalist

Marga Vicedo, University of Toronto

This paper examines the contributions of Daniel S. Lehrman (1919-1972), an early pioneer in behavioral endocrinology and developmental biology. Though widely cited as a critic of the early ethological program presented by Konrad Lorenz and Niko Tinbergen, other aspects of Lehrman's career and research have not received much historical attention. In this paper, I offer a fuller account of Lehrman's work and I situate his debate with ethologists within the larger context of Lehrman's early formation under G. K. Noble and T. C. Schneirla. I also examine his scientific research on the ring-dove and his general views about the best way to understand animal behaviour. I highlight Lehrman's impact on the evolution of ethological research, on the rapprochement of ethology and comparative psychology (Lorenz's opposition withstanding), and on institution and network building in the field of animal studies.

Lehrman's various scientific contributions have been overshadowed by his early reputation as a critic of ethology. In this sense, Lehrman's case is an example of how the framing of a scientific career through the lens of a highly visible event can lead to pay less attention to a scientist's positive contributions and impact beyond that event.

Contextualist Solutions to the Problem of Explanatory Asymmetry

Andrew Wayne, University of Guelph

The height of a flagpole is part of the explanation of the length of its shadow, but the length of the shadow normally plays no part in explaining the height of the pole. Accounting for this explanatory asymmetry, which is widespread in science, remains an unsolved problem for non-causal accounts of explanation. This talk has three parts. First, I describe how contemporary counterfactual theories of non-causal explanation are unable to solve this problem. I contend that these theories, following Woodward (2003), adopt a weak contextualism about explanation wherein the role of scientific context is limited to determining explanatory scope and interests. Second, I examine a solution proposed by

Marc Lange (2016), in which both scientific laws and particular matters of fact may be assessed with respect to their "explanatory priority." I show that Lange presupposes a much stronger role for context in scientific explanation than the current consensus around weak contextualism would allow. For Lange, the same argument may be explanatory in one theoretical context and not explanatory in another. Third, I argue that adopting this stronger contextualism may enable counterfactual theories of explanation to provide a successful account of explanatory asymmetry. I sketch an account of how theoretical context determines the truth values of explanatory counterfactuals, and I offer a "proof of concept" example to show how this would work in practice.

Lotto 1877: Boltzmann, Lakatos, and Model Engineering

Jennifer Whyte, University of Pittsburgh

In this paper, I will demonstrate the process of construction and proof in two toy examples of thought experiments in applied (and very applied) mathematics, and then move into a detailed tale of a real example from the history of physics – Boltzmann's lottery. I will argue that the process in both the toy and real examples is the same: building and testing representations using thought experiments. In all the cases, the choices made in building the models have nothing to do with the world of experience; but in all cases, the choices constrain the possible results the model can deliver. This constraint is what makes it possible for models to answer questions, but it also restricts the domain of the phenomena to which they can be applied. Model building is a process of give-and-take in which the twin demands of generality and power are traded off against each other until a satisfactory model is found. This dialectical process is very similar to the process of proof development described by Imre Lakatos in Proofs and Refutations.

I will contend that the role of thought experiments in science is typically misunderstood, and Boltzmann's Lottery is a case in which that misunderstanding makes a difference. Most accounts of thought experiments in the literature are factive: they present the function of thought experiments as establishing or debunking certain facts. I argue that thought experiments are non-factive, and that their only proper function in science is model engineering. Thought experiments allow scientists to work through the application of modeling techniques to particular systems.

Excavation in the Sky: Historical Inference in Astronomy and the Concept of Trace

Siyu Yao, Indiana University

Philosophers of historical sciences have pointed out that historical sciences, such as archaeology and palaeobiology, present different epistemic goals, challenges, and methodologies from experimental sciences. I borrow the philosophical framework developed by them to analyze some recent practices in astronomy. I highlight two contributions this synthesis offers: a more sufficient description of the epistemology and methodology of astronomy, and a reconsideration of the concept of "trace" in the general philosophy of historical sciences.

For the former, I suggest that despite its root in physics, modern astronomy shares many similarities with historical sciences: the aim of the reconstruction of token events, the epistemic challenges of lacking manipulation and relying on sparse traces, and consequentially shared methodologies. I further argue that such historical methodologies constitute a more accessible approach for astronomers to uncover both token events and regularities than other experiment-like methods championed by philosophers of astronomy.

For the latter, I point out that astronomy faces a peculiar difficulty in identifying traces and relating them to past events, which elicits a more careful definition of "trace" and more intricate processes to identify and make inferences from them than the existing approaches proposed by

philosophers. I argue that the identification of traces is only gradually achieved through iterations between the data-driven approach of clustering and the theory-driven approach of model construction, together with the synthesis of studies of multiple relevant historical events and the cross-validation between diverse datasets. I illustrate this with a case of the reconstruction of the Milky Way merger history.

The Nature of Values in Science: What They Are and How They Guide

Helen Zhao, Columbia University

Much philosophical talk of values in science has been underwritten by a picture of values as intrapsychic causative agents. On this view, values are psychological attributes of inquirers: they are what psychologists call 'personal values'. While empirical research shows that self-reported personal values are moderately predictive of attitudes and behaviors, their pathways of influence remain poorly understood. What is known suggests that the degree and character of a value's influence on action is finely sensitive to situational factors and other personal attributes such as social norms, personality traits, and an agent's value-laden characterization of their behavior (Rohan 2000, Jiga-Boy et al 2016, Sagiv et al 2017). Personal values guide inquiry only in complex interaction with other "decision vectors" (Solomon 2001).

This empirical work motivates the following conclusions about values in science, conceived as personal values. Philosophers may have overestimated the degree to which scientists can choose to act on their values, including to form beliefs that reflect them. It has been argued that where value-laden beliefs are formed unreflectively, they do not reflect scientists' personal values (Magnus 2022). Here I argue that, even where a belief reflects a scientist's personal values, we should not infer that she steered her belief to reflect her values. Personal values causally influence belief formation only in complex interaction with factors often not up to us. Philosophers may have also overestimated the degree to which a scientist can retrospectively know that a personal value influenced her action. She can't infer that her value was causally responsible for her choice just because that value and choice aligned, for experiments show that conflicting personal values are sometimes associated with the same behavior; the causative agent is underdetermined by the behavioral outcome.

In light of these conclusions, I argue for a transformation in our values talk. Philosophers of science have been confused, not helped, by imagining values as intrapsychic causative agents. Rather than conceive of values as personal values, we ought to conceive of them as pursuitworthy goals that range in contexts of pursuit (Kitcher 2011). Values 'guide' scientific practice, not in the sense that psychological features like traits and cognitive biases guide action: by causally influencing scientists to behave one way or another. They guide science in the sense that scientists' reflective or unreflective pursuit of certain goals best explains their pattern of attitudes and behaviors over time.

If we conceive of values as goals, certain research questions are precisified. 'Do feminist values belong in science?' concerns which goals scientists should pursue, as opposed to what psychological attributes scientists should have. Following Kitcher's (2011) taxonomy of value schemes, we might distinguish between probative, cognitive, and broad feminist values. Probative feminist values are what have been called feminist theoretical virtues, such as ontological heterogeneity and complexity of interaction (Longino 1996). Cognitive feminist values are kinds of knowledge feminists have enjoined science to produce, such as knowledge that reveals gender (Longino 1995), illuminates women's health (Rosser 1994), or is socially responsible (Kourany 2010). Broad feminist values are political goals of feminist movement, such as reducing global inequality and abolishing cisheterosexist oppression. 'Should feminist values influence science?' is reconfigured as the political question, 'should scientific inquiry have feminist goals?'