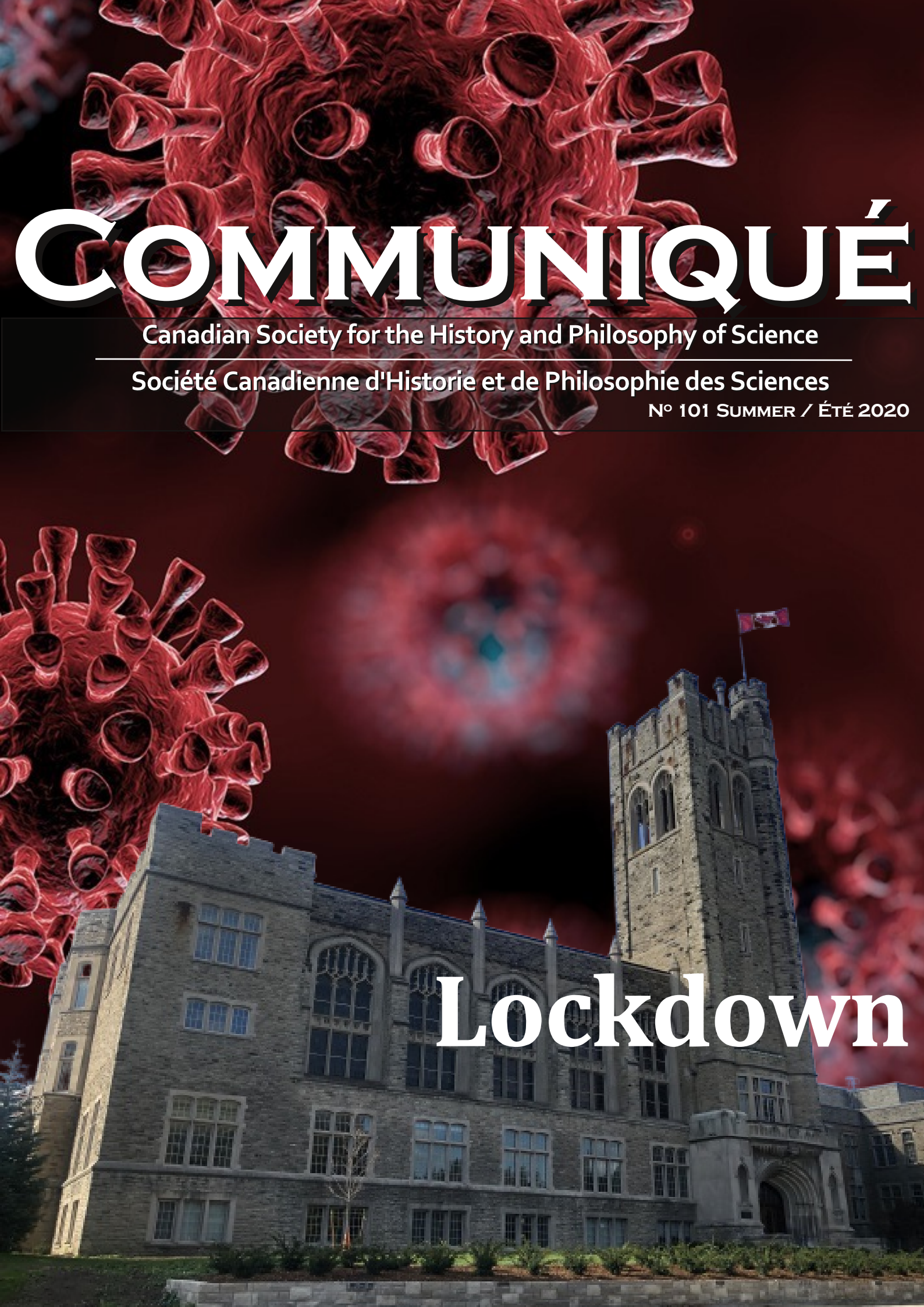


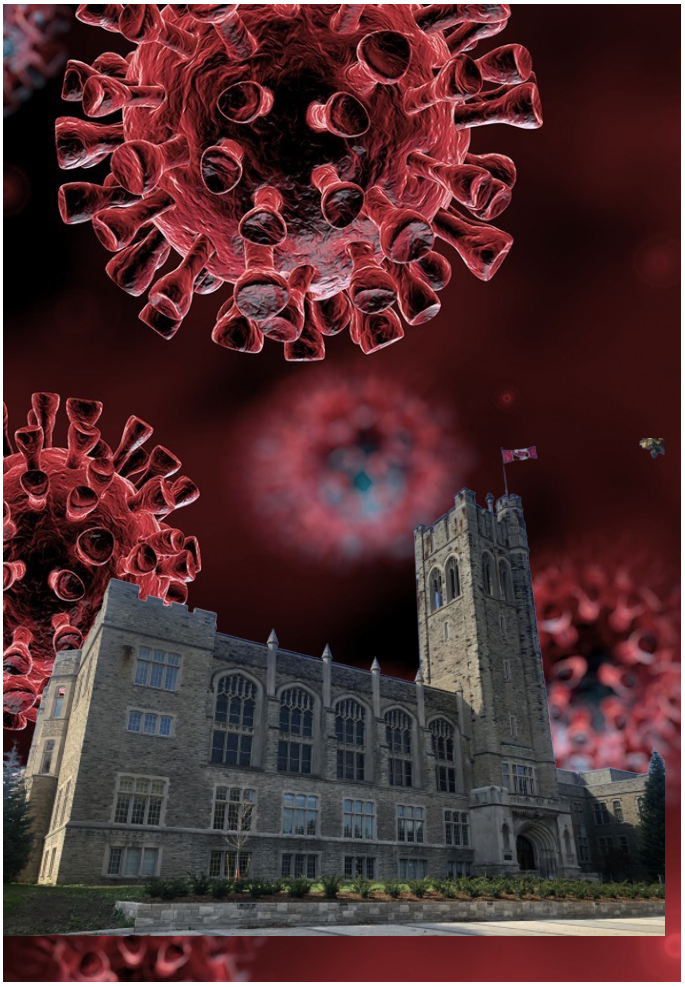
Communiqué

Canadian Society for the History and Philosophy of Science

Société Canadienne d'Historie et de Philosophie des Sciences

Nº 101 Summer / Été 2020

Lockdown



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Communiqué

Nº 101 Summer / Été 2020

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CSHPS SCHPS

Cancel Everything

Releasing official university statements on systematic racism and racial violence in solidary with Black and Indigenous peples isn't enough. We need to actively fight for justice.

Yascha Mounk's March essay in *The Atlantic* appeared right as I was surveying my classes for the best contingency plans to move online in case our university decided to close the campus in response to the novel coronavirus. We must start mitigation efforts immediately, he emphasized, and our behavior must radically change if there was any hope for flatting the curve. Academics, meanwhile, took to social media and op-eds to draw parallels to the histories and social consequences of past outbreaks, especially the early modern plague and the 1918 influenza. Pandemics, they emphasize, remind us that disease is always biological and cultural. Whatever fissures lay present in a society, an outbreak can wedge them open and expose humanity's encroaching relationship with the natural world.

Realizing that my students likely didn't understand why this outbreak was different—it is not the flu—I decided to begin my Health Activism class by opening the floor for questions. For an hour, I explained the buzzwords they'd been hearing: novel coronavirus, flatten the curve, COVID-19, mitigation. They were equally worried about contagion and the implication on their education. Would classes be suspended? Will they be sent home? What about Spring Break? "As soon as Delaware has one confirmed case," I predicted, "campus will be shut down." About twenty minutes later, a student interrupted my lecture to announce that a case had been confirmed.

That was the last time I was in a classroom. Over the following weeks, everything was cancelled. Classes, conferences, events. Stay-at-home orders passed. The US-Canada border closed. Hospitals began overflowing with coughing and feverish patients, many in respiratory distress. Unemployment numbers climbed rapidly as businesses shuttered. In response, governments passed economic relief packages to alleviate devasting financial hardships facing individuals and households. And as higher education shut down academic programs—some permanently—a profession already grappling with job uncertainty descended into further crisis. As CSHPS President Alan Richardson urges in his letter, we must condemn the firing of our vulnerable colleagues and support our precarious members.

After months of social distancing many people have reached their breaking point. As I write this letter, the news plays in the background covering stories of protestors taking to the streets to fight against police brutality. The deaths of Breonna Taylor, Ahmaud Arbery and George Floyd in the United States, of Eishia Hudson and Regis Korchinski-Paquet in Canada—not to mention countless of others whose deaths didn't receive widespread media attention—have provoked cries of *I*

can't breathe and *No justice, no peace* and calls to end racism and police violence. As tensions rise, activists around the world are taking to the streets in support of Black Lives Matter.

Though Congress has been cancelled this year, its theme of "Bridging Divides: Confronting Colonialism & Anti-Black Racism" is especially relevant. Releasing official university statements on systemic racism and racial violence in solidary with Black and Indigenous peoples isn't enough. In our fight for justice, we need to embrace inclusiveness in our communities and our scholarship. Decolonize HPS syllabi. Cite Black and Indigenous scholars. Acknowledge the harmful impact of settler colonialism. Donate funds to support precarious scholars and bail for protestors. Connect the past and the present. Cultivate relationships between the work that we do and the groups who have lost – and continue to lose – the most through the ideas, inventions and institutions we often criticize. Maybe this is asking for too much, but it is, at the very least, something for us to aspire to.

As editor, I intend for *Communiqué* to become a platform for addressing relevant social issues facing our CSHPS body. Future issues will include more substantial features, including themed essays and Francophone content. Since the work will significantly increase, the editorial team will be expanding as well; details will be shared in the next issue. In the meantime, though we all miss our annual meeting, the collection of abstracts in this issue the breadth and excellence of CSHPS. Finally, I would like to thank Catherine Rioux for her work and remind everyone that *Communiqué* is OUR newsletter. For it to succeed, members need to send in contributions, so please do so the next time you see a call for contributions in your inbox.

Jaipreet Virdi, Editor
jvirdi@udel.edu

Conditions of Uncertainty

It is hard not to lapse into the current clichés of "unprecedented times" regarding what we have all been dealing with. But especially among historians one needs to be careful with such phrases.

One way in which these times are indeed unprecedented for CHSPS is, however, that we did have to cancel our annual conference in light of the pandemic and the public health response. There was no way we could gather at Western and our program included scholars across more than a dozen time zones, making an online conference too daunting to plan in the less than 90 days we had. We owe a debt of gratitude to Molly Kao and the whole program team, who were putting together an excellent program; the research depth and breadth of our membership continues to be an inspiration. We owe our thanks also to Eric Desjardin, who was busy preparing a proper Western University welcome for us. We are happy that we are able to commemorate the 2020 CSHPS conference in *Communiqué*; we thank Jai Virdi for that.

I had hoped to be able to bring forward more ideas also on several initiatives during our conference. But the CSHPS officers and those we have been working with on behalf of the Society have, as we all have in our own lives and careers, mainly been working in crisis mode since early March. So, while we shall bring forward a few ideas on issues like membership, we have had to pause in some of our more ambitious thoughts.

I'd like to thank the Federation and particularly its Executive Director, Gabriel Miller, for their leadership through what for them was a genuine on-going crisis. They were exemplary in sharing information and seeking input. Losing Congress even for a year is real blow to them and ultimately to the profile of social science and humanities disciplines in Canada, but the cancelation was the only real way forward.

We are very much hoping that conditions will allow us to hold CSHPS 2021 at Congress and that we will see each other properly next year in Edmonton.

Of course, among the things we are now all worried about are the demands of our jobs through the continuing crisis and making sure that as we exit the crisis stage we do not find ourselves in a new, much worse "normal" in which our teaching is reduced to "online content delivery," our research is stalled by closures of facilities like libraries and archives and the cancellation of conferences and workshop, and in which we find our field much reduced. I and the whole CSHPS executive will, I pledge, be diligent in doing what we can to support our field and especially its more precarious members.

President's Message

The pandemic has, as we know, engendered many emergency measures at universities and other institutions of higher education around the world. Unfortunately, these measures have brought in their wake financial problems, often owing to insufficient government support, at many of these institutions—and these issues are beginning to arise in Canada as well as elsewhere where Canadians are employed. Some institutions are already planning or implementing plans that include the firing academic staff and the shuttering of academic programs.

I (and we all must) condemn the firing of academic staff in this situation—teaching and research are the core missions of these institutions. I am, of course, particularly concerned by reports that among those academics being considered for layoff are scholars in history and philosophy of science. If anything, the issues of how scientific knowledge is secured, how it is mobilized both in public discourse and in political action, how it sets frames for questions of value, and how it suggests technological solutions to human problems brought to the fore by this pandemic indicate to us that there should be not fewer, but rather many more scholars of and programs in history and philosophy of science at post-secondary institutions. While we are already overworked, we need to be as diligent as possible in making the case for the importance of what we do. The CSHPS executive will certainly be diligent.

We need to stand with our academic colleagues right across campus and call on our governments and our institutions to take stock of what is happening and to use the pandemic not to reduce but to augment the role of higher education in our societies. In particular, research and teaching in the humanities and social sciences are crucial for a citizenry to be able to understand complex issues that involve natural knowledge, individual rights, political decision-making, and social concerns, and for all of us to act rationally and compassionately in conditions of uncertainty.

Alan Richardson, CSHPS President
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ABSTRACTS
CSHPS/SCHPS 2020

Image: Wellcome Museum of Medical Science, Endsleigh Court, Endsleigh Gardens, LondonWellcome Collection (CC BY 4.0) .

ORGANIZED SESSION

Digital History of Economics, Psychology, & the Philosophy of Science

Christopher Green (York University)
Christophe Malaterre (Université du Québec à Montréal)
François Claveau (Université de Sherbrooke)
Alexander Klein (McMaster University)

The discipline of history is evolving. In addition to the traditional qualitative historiographical approaches, new digital methods are beginning to make their mark as well. These digital methods often start with vast databases of material that could never be read and absorbed in their entirety by a single researcher, which are then subjected to one of a variety of data-scientific types of analysis in order to reveal novel insights about disciplines from which the databases were drawn. This session will consist of four presentations showcasing the potential of various digital methods in different intellectual contexts: economics, psychology, the philosophy of science, and the "unmentioned correspondents" who influenced Bertrand Russell's philosophy.

Christopher Green

What Influential Parts of Science are not on the Radar of Philosophers? A Bibliometric Detection Method Applied to Philosophy of Economics

This paper proposes a general bibliometric method to determine the extent of the mismatch between what practitioners of a specific science judge to be important in their field and what philosophers of that specific science focus on. By overlaying citation maps from the two sets of scholars, this method detects both the time lag for philosophers to become interested in 'hot' topics and the types of topics that attract much philosophical scrutiny. We apply the method to (philosophy of) economics and discuss how the results can be compared to insider understanding of this field. We also argue that (1) this method could be applied to other fields of (philosophy of) science and that (2) its results can help philosophers of science better select their research projects. The last point does not presuppose that philosophers of science should distribute their attention over a specific field in ways similar to the practitioners of this field, but rather that our method can single out areas of research of philosophical interest that have so far escaped scrutiny.

Christophe Malaterre

Exploring the Landscape of Turn-of-the-20th Century Psychology Via Social Networks

The history of any science is conventionally studied qualitatively, by close reading and interpretation of published and unpublished documents related to the topic of interest. In the past few years, my colleagues and I have developed a novel approach to the history of psychology and related areas of philosophy which involves taking the complete text of long runs of articles in influential journals and transforming them into networks based on the vocabularies that appear in each. In such networks, each article appears as a "node" in the network, and the distance between any two nodes represents the similarity in the vocabularies of any two articles. The result is a kind of map of the "intellectual landscape" of the discipline: articles from distinct subdisciplines tend to cluster together, separated from other subdiscipline. As one compares networks corresponding to successive time blocks (e.g., decades), subdisciplines emerge, grow, shrink, and disappear as their popularity waxes and wanes. Using these networks, one can get a sense of the evolving "shape" of a whole discipline over time. I will present examples from 1880 to 1920, using journals such as *American Journal of Psychology*, *Psychological Review, The Monist, Philosophical Review*, and *Journal of Philosophy, Psychology, and Scientific Methods.*

François Claveau

Reconstructing the History of Philosophy of Science by Means of Topic-Modeling

Much of the history of philosophy is done via

careful scholarly examination of individual texts. Such an approach has the merit of generating a deep understanding of the theses defended in these texts, but it also runs into difficulty when faced with high volumes of textual data. This situation is true as well in the more specialized field of the history of philosophy of science. In this contribution, we show how data-driven text-mining tools can be used as a complement to usual historical analyses. We propose to approach the history of the philosophy of science throughout the 20th century with the assistance of statistical algorithms applied to the complete full-text corpus of eight major journals of the field from 1931 up until 2017. By running text-mining and topic-modeling algorithms, we identified over 150 key research topics that span across these 87 years. We also investigated the evolution of these topics over time and their fluctuating significance in the journal articles. Our results concur with known episodes or traits of the discipline—for instance, the rise and fall of logic and language-related topics or the more recent rise of research in the philosophy of biology—but also highlight a diversity of topics that is much richer than what is usually acknowledged.

Alexander Klein

Text Mining Bertrand Russell

One task of scholarship in the history of philosophy is to try to understand the influences that shaped a historical figure's thinking. But interlocuters in private conversations that may shape a historical figure's thinking are not always mentioned in published text, perhaps especially when the interlocutors are not from socially dominant groups. What is more, the literary remains of prolific historical figures may be voluminous, so that it can be easy to miss what I will call "behind-the-scenes influencers." This paper develops a data-mining technique for addressing this problem. I take Bertrand Russell as my historical subject, on whom I demonstrate the technique; and I focus on a particularly important decade for his philosophical development, 1912 – 1921. The technique has two arms that work like pincers. In arm one, I use meta-data from the over 100,000 letters in the Russell Archives (at McMaster University) to find frequent correspondents of Russell's whose names appear seldom or never in his published books (henceforth "unmentioned correspondents"). And in arm two, I hunt for unmentioned correspondents whose addresses match locations that are discussed in the same published corpus, with the hope of identifying behind-the-scenes influencers with respect to his thinking about politics and international relations. My methodology is as follows. Drawing from metadata associated with Russell's letters at McMaster (for the decade under study), I use Gephi (a standard networking software) to produce two networks (both networks are unimodal, undirected, and weighted). The first is a network of persons with whom Russell corresponded during this period. The second is a network of geographic locations of Russell's correspondents during the same period. I then use the Stanford Name Entity Recognizer (NER) to extract proper names from a corpus of 11 books he produced during this period. Person-names and place-names are extracted from this list. The person-network is compared with person-names that have been extracted, and frequent, unmentioned correspondents are identified. The geographic network is compared with place-names that have been extracted, and frequent, unmentioned correspondents from these locations are identified. Finally, I offer a traditional, close reading of some samples from the correspondence between Russell and the figures I have identified during data-mining, arguing that there is good reason to regard some of these as genuine, behind-the-scenes influencers of Russell.

ORGANIZED SESSION

Decentered Sciences: Beyond Centre / Periphery Stories

Maria Amuchastegui (York University)
Ernst Hamm (York University)
Gordon McOuat (University of King's College/Dalhousie University)
Arden Rogalsky (University of King's College)

This session will explore non-European encounters in science, replacing centre-periphery and circulation models with close studies of the types of science at the so-called periphery and the ways in which those sciences challenge the centre.

Maria Amuchastegui

The Discovery of Binary Numeration: Leibniz, Caramuel, and the New World

Leibniz claims, in his 1703 Explication de l'arithmétique binaire, that he invented binary numeration, a claim that has remained largely unchallenged. Most histories of mathematics and computer science credit Leibniz with the discovery of the numbering system that would later form the basis for modern computers. Although the priority dispute between Leibniz and Sir Isaac Newton over the invention of calculus has been extensively studied, the dispute over the discovery of binary numeration has received little attention. Juan Ares, María Aurora Martínez, Juan Alfonso Lara, and David Lizcano contend that Leibniz plagiarized the Spanish scholastic philosopher and mathematician Juan de Caramuel y Lobkowitz (1606-1682), who was in turn inspired by New World accounts of alternative numbering systems, in particular the counting practices of the Guaraní Indians of Paraguay. A more nuanced interpretation of Ares et al.'s allegation is needed, one that takes into account 17th and 18th century norms for attribution, the relationship between Spain and the northern Europe, and the role of institutions in legitimating Leibniz's priority claim. It was the Académie Royale des Sciences that first published Leibniz's Explication de l'arithmétique binaire, an act that instantly conferred legitimacy on his claim. In addition, the status of indigenous numbering systems as knowledge has not been sufficiently acknowledged. Ares et al.'s formulation assumes that it was Caramuel who "discovered" the numbering systems described in his 1670 Mathesis biceps, a formulation that denies the status of knowledge to the various numbering systems used in the New World.

Ernst Hamm

Science, Empire, Centre and Periphery: Considerations via the Caucasus, Tartu, Moscow and Paris

Science and empire is a booming industry and for good reasons. The long reach of nineteenth century imperialism was going strong through most of the twentieth century and, arguably, lingers into the present. And science has never been far from the centre of imperialism. But the empires in question for many historians, including historians of science, have been largely Atlantic, but even there the Iberian, Dutch and even the French empires are overshadowed by the focus on the Anglo-Atlantic world. But British and American, or French, empires were not the model for all others. This paper will consider the ways in which the expedition to and ascent of Mt Ararat in 1829, an expedition involving natural philosophers from the University of Dorpat (Tartu), Russian soldiers and diplomats, an Armenian cleric, and any number of go-betweens from the Caucasus and Transcaucasia, was a project of Russian imperial science. Despite this Russian language and institutions were not at the centre of the expedition. This paper argues, along with other recent work by historians of science and

empire, that too much of our thinking about science and empire is structured around rather dated ideas about British imperialism. Places like Tartu, Armenia, the Caucasus were part of an empire but not wholly defined by empire. Likewise, the natural philosophical questions that were addressed by the expedition were related to imperial concerns, but not entirely defined or limited by such concerns.

Gordon McOuat

Tracking Decolonisation: The case of the Journal of Genetics *going East*

In 1957, the *Journal of Genetics*, the oldest English journal in genetical science (founded by William Bateson and R. C. Punnett in 1910) ripped up its roots at University College London and followed its colourful editor, J.B.S. Haldane, to a new home in India. The move was a political one, tracking Haldane's anti-imperialist passage to India, and strongly resisted by its European former editors and contributors. Haldane's goal in moving the J.of G. was to diversify science and its flagship journal, de-colonising both the centre of authority of science and, most importantly, its contents. Using archival and extensive bibliometric data drawn from Haldane archives and the papers of the journal itself, we will examine the shifting ways in which the journal succeeded or failed in setting a standard of a decolonised science. Was this effort at decolonisation successful? What does it say about our perceptions of modern science being predominantly "Eurocentric"? Can science be decolonised?

Arden Rogalsky

J.B.S. Haldane: Charting a New Genetics Through Language and Place

In the early 1950s, eminent 20th century biologist, mathematician, and science popularizer John Burdon Sanderson (J.B.S.) Haldane began to trace the outlines of a new program in genetics around two axes of interests: the genetics of animal language, and the unique research possibilities promised by newly-independent India. This paper traces the convergence of those interests, and brings to light the common political, ethical, and methodological concerns that generated their mutual co-formation in Haldane's work. In a wide-ranging series of studies concerning animal communication, Haldane attempted to articulate an evolutionary mechanism that could explain the obscure process through which learned behaviours become inherited instincts. The kinds of research and genetic interpretation that he thought necessary were, much to his frustration, at odds with the prevailing tendencies of British genetics, then plagued by limited field study possibilities and stifling politicized demarcations in the wake of the Lysenko affair. Haldane's dissatisfaction with these limitations arose simultaneously with, and partly in response to, his encounters with a nexus of uniquely local possibilities for the study of animal behaviour in India. Among his principle concerns were India's long-standing ethical-religious practices of non-violent observation, an abundance of animal and plant life in large "unaffected" regions of the country, locally-relevant methods of population analysis, and India's political independence from the hardened binaries of genetic theory upheld by Cold War combatants. This harmonious interplay of research activity and place played an important role in motivating Haldane's move to India several years later in 1957, a transitional period which has recently received several detailed reassessments. More broadly, studying Haldane's early engagements with Indian science contributes a strong challenge to centre-periphery analyses of science in the last century, and is therefore relevant to decolonizing global histories of genetics, ethology, and knowledge transfer.

ORGANIZED SESSION

Embodied Methodological Integration: The Case of Network Analysis in Phylogenetics Studies

David Montminy (Université de Montréal)
François Papale (Université de Montréal)
Kevin Kaiser (Université de Montréal)

This session stands as a preliminary exploration of a collaborative project aiming to understand how methodological integration in science is done and what are the epistemic payoffs.The conceptual backbone of the project is set in what is called ‘‘embodied epistemology’’. The relevance of this framework will be explained by David Montminy through the presentation of how embodied epistemology as been developed in integrative data biology and how it is articulated with a pragmatic view of scientific theories. The case study of the project is a set of publications from a bioinformatics laboratory. François Papale will present the work carried out by the members of this laboratory, focusing on their use of network-based tools to challenge tree-based models for evolution. The work carried out in the studied papers uses tools from network analysis and could be characterized as a case of methodological integration. That type of practice, i.e. integrative, which is widespread in biological science, could be conceptualized in multiple ways. Kevin Kaiser will present the different families of conceptual model in philosophy of biology and discuss which is the most fit for analysing the practices of the case study. That ‘‘tour of horizon’’ will serve as the cornerstone of the project by bringing together the various preliminary considerations. The session is meant to foster exchange with other researchers in philosophy of science interested in more applied philosophical analysis as a means of understanding science.

David Montminy

From Distributed Knowledge to Integrated Methods: A Case of Embodied Epistemology in Phylogenetics

In her 2016 book on data and biology, Sabina Leonelli refers to Chang (2004) and says that “…underdetermination is the epistemological motor of data-centric research and grounds the contemporary emphasis on both ‘big’ and ‘open’ data.”. She also claims, following Dewey (1938) and Longino (2006), that in order to fully appreciate the evidential value of a given dataset, one must take into account the context in which these data are produced, shared and reused. This investigative strategy, called embodied epistemology, requires a tool to analyze what Goldman (2004) calls distributed knowledge. In order to test such claims about the production of knowledge we will use Winther’s (2015) conception of the pragmatic structure of scientific theories and Northcott’s (2019) account of the background knowledge in big data science and apply to a French phylogenetic laboratory. By using an actual laboratory as our main locus of research we are following Goldman advice to treat “institutions, organizations, and associations of individuals as proper subjects of intentional and epistemic states” (Goldman 2004, p. 12); and by focusing on the individuals themselves and the different methods they use in their scientific work, we are explicitly treating “knowledge as processual, purposive, pluralist, and context dependent, and on the social and cognitive structure of scientific inquiry” (Winther 2015). While doing so, we will show how, in the specific case of phylogenetics contextual elements, i.e. meta and non-scientific considerations, are used to frame scientific knowledge claims.

François Papale

From Trees to Networks – Methodological Transitions in Phylogenetics

Evolutionary biology and phylogenetics have always been intimately tied to tree-based models, as the notorious Tree of Life representation of biological evolution on Earth illustrates (Doolittle 1999; O'Hara 1997). Contemporary research, however, is challenging the central role of tree-based models for evolution by mobilizing more and more network-based models or graphs in various ways and for various purposes, thereby integrating methods from mathematics, biology and informatics to study biological phenomena (Morrison 2014; Watson et al. 2019). According to some, this methodological transition is important enough to challenge Darwinism itself (e.g. Koonin and Wolf 2009), while other researchers simply acknowledge a resulting need to update the terms and concepts of the theory of evolution by means of natural selection (e.g. Papale, Saget and Bapteste 2019). This outstanding epistemic situation is a great site for philosophical inquiry regarding the dynamics of sciences. As such, in this series of presentations, we use this case study to explore the role played by specific agents (scientists, laboratories, etc.) in the realization of integrative work that push science forward. In this presentation, I will elaborate the case study by presenting what standard tree thinking in phylogenetics imply, by making explicit the changes that are underscored by network-based methods and dissecting the input of various distinct fields of research on these methods. This description of the scientific context will allow my colleagues to extract the philosophically and historically relevant information needed to make an agent-centered and embodied analysis of the dynamics at play.

Kevin Kaiser

Methodological Integration: In Search of the most fit Conceptual Models

The success of integrative practices in biological sciences to solve multilevel problems has generated multiple conceptual models to accommodate it in philosophy of biology. Those can be separate roughly in three different families of models, i.e. the neomechanistic account (Bechtel, 1986; Darden, 2006; Craver and Darden, 2013), the coordinate unity account (Mitchell, 2002; Potochnik, 2011, 2017) and the interfield account (Darden and Maull, 1977; Kincaid, 1990; Grantham, 2004; O'Malley et Soyer, 2012). In the objective of tracking methodological integration in our case study, this presentation will explore each of those families in search of the fittest for the task. To do so, first of all, the three different families of model will be presented. An emphasis will be put on what is integrated and how following Grantham (2004) suggestion that philosophers studying the process of scientific [integration] need to be clear about (1) the entities which enter into the process of [integration], and (2) the precise relation(s) which constitute their ''[integration]''» (p.134). Secondly, a conceptual selective environment will be set based on the different desiderata associated with the task. Then environment will serve as a magnifier to expose the capacities of the different models in light of the needs of the task. Thirdly, the performance of the different models introduced will be tested. The best model for task been identified, some concluding remarks will be mentioned.

ORGANIZED SESSION

Teaching HPS Through Experiences

Marisa Brandt (Michigan State University)
Isaac Recird (Michigan State University)
Eleanor Louson (Michigan State University)

Marisa Brandt

Reimagining First-Year Writing for STEM Students as Inquiry-Based Learning in Science Studies

How can a first-year writing course help to create 21st century STEM students with foundations for interdisciplinary inquiry? Could such as curriculum engage STEM students in knowledge production in ways that help to acculturate them as collaborative, ethical, and empathetic learners? Bringing together insights from writing pedagogy, Critical Cultural Communication studies, and Science Studies, the author is leading an effort to rethink the first year writing course required of all students at a residential college for STEM students at a large midwestern university. A major goal of the curriculum redesign is to develop science studies-inspired writing assignments that foster reflective experiential learning that demonstrate the value of science studies inspired inquiry to STEM education. The talk describes how the curriculum team designed the first-year curriculum and shares data on lesson lessons learned by the both the instructors and our students.

Isaac Record

"Make the students do the work": Designing a new space for learning HPS

In early 2018, I gained access to a windowless room in the basement of my building and I received $40,000 to spend on equipment to support student learning. Over the course of the spring semester, 60 students in my HPS classes used these resources to design a new learning space for our college. I'll share the story and share some lessons from this experience that can apply to smaller experiential learning exercises. In class, students learned from guest speakers about ethnography, sociology, classroom design, makerspace culture, and many other topics. They immediately put these skills to use: they interviewed fellow students, faculty, and staff; completed site surveys of dozens of sites of learning ranging from coffee shops and lounges to makerspaces and classrooms; and read literature on experiential learning and classroom design, all in pursuit of the background they would need to create the new learning space. New interests emerged for them during this process, including the links between learning and failure and learning and games, and we had to work to incorporate these new ideas into the plans for the space and for the course. Having the college itself as an authentic "client" for the major project of the class worked well as a practical motivator: students took the project seriously and learned a lot. This was a life-changing experience for me and for my students. Managing a design project of this scale with 60 students was certainly a challenge for me, and there were some bumps along the way, but I am proud of the outcome: a student-driven learning space.

Eleanor Louson

Teach with "GORP" for Better Experiential Learning in HPS

Experiential learning opportunities can improve student engagement and reflection in HPS courses. As a learning experience designer at a large midwestern university, I facilitated prototype experiential, interdisciplinary, problem-based courses. We designed these courses based on Heinrich et al.'s GORP framework, which leverages Gravity, Ownership, Relationships/Roles, and Place as elements promoting transformative, student-driven learning and engagement. At the same time, as an instructor in the History, Philosophy, and Sociology of Science, my own students' engagement in classroom experiences was enhanced when I began applying the GORP framework at the assignment level. In this talk I describe a series of three team-based experiential HPS assignments from my 1st-year undergraduate course. I introduce the Black Box project, Lab Study site visit, and Scientific Controversy stakeholder analysis assignments, and show how each of them benefit from GORP. I also describe strategies for prompting students' written reflections on these experiences and for giving students the tools to manage their own teams.

Individual Abstracts

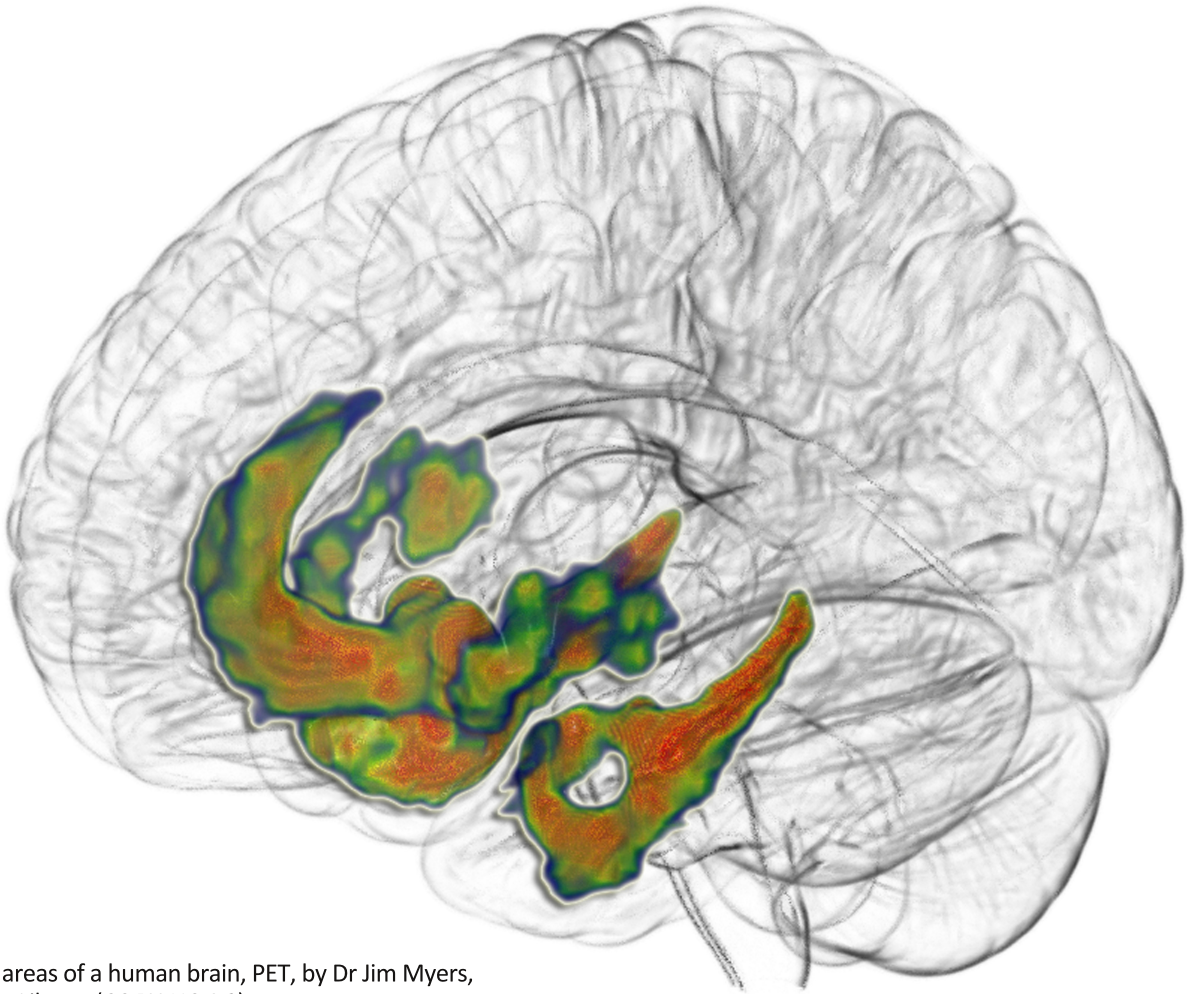

Image: Neurotransmitter in limbic areas of a human brain, PET, by Dr Jim Myers, Imperial College London. Wellcome Library (CC BY-NC 4.0).

Derek Andrews (Dalhousie University)
Too Complex to Predict?: What Complexity Theory Reveals About Natural Kind Analysis in Psychiatry

In his work on psychiatric classification and natural kind analysis, Jonathan Tsou argues that some mental disorders ought to be recognized as belonging to natural kinds, owing to the fact that they represent classes of abnormal behaviour underlain by stable causal mechanisms (Tsou, 2016). The presence of the stable causal mechanisms underlying the disorders Tsou identifies, such as schizophrenia (2016) and depression (2013), enable reliable projectionable inferences to be made about members of these kinds – that is, persons with these disorders (2013; 2016). Accordingly, this move, contends Tsou, would positively impact our ability to prognosticate about and treat persons with these mental disorders (2013; 2016).

However, I argue that approaching psychiatric conditions from the vantage point of complexity theory, as developed by Bechtel and Richardson (2010), reveals a significant problem for Tsou's position. Given the immense complexity of biological systems and diseases alike, it seems that any particular factor involved in the expression of a given mental illness, such as the stable causal mechanisms Tsou identifies, can be affected by the myriad other factors in play (Phillips, 2013). This results in a picture of immense complexity, wherein no two individuals with the same psychiatric disorder will have the same causal picture underlying its expression (2013). Accordingly, it seems that Tsou's analysis does not afford us the ability to make reliable inferences about members of mental disorder kinds, as it does not take into account the full causal story at work in the expression of individual cases of mental disorders.

Vincent Auffrey (IHPST, University of Toronto)
Hygiene and Eugenic Discourses in French Canada, 1902-1912

The Association des Médecins de langue française d'Amérique du Nord (AMLFAN) was founded in Québec at the turn of the twentieth century. The physicians who convened at the Association between 1902 and 1910 shared a concern for the degeneration of the French-Canadian "race" under the effects of alcoholism, tuberculosis, and syphilis. For hygienists such as Arthur Rousseau and Charles-Narcisse Valin, this state of degeneration called for hygienic measures that would help regenerate and improve the French-Canadian race. While their suggestion that marriages be matched scientifically in order to prevent the transmission of hereditary and acquired defects from parent to offspring may be reminiscent of eugenics, French-Canadian physicians had no knowledge of Sir Francis Galton – eugenics' "founding father" – and his work on the topic. In fact, it is only in 1912, following the First International Eugenics Congress in London, that the word "eugenics" was translated into French and imported into French Canada by zealous, yet marginal neo-Malthusians and Darwinists. While historiography dismisses Quebec as being a non-case in the history of eugenics, the discourses held by French-Canadian physicians at the turn of the century point towards a much more subtle and complex picture of French Canada's relationship with eugenics. This paper sheds light on the early encounters of French-Canadian society with eugenics and proposes that French-Canadian physicians, independently of Galton, were already engaged in a debate on the scientific management of human reproduction to ensure the future of the French-Canadian nation prior to 1912.

Cedric Blais, Adam Gemminck, Noah Kay, Megan Krempa, Antoine Mercier, Cameron Yetman, and Melanie Frappier (University of King's College)
Digging up the Past: Reflections on the Role of Provenance Studies in the History of Science

Provenance studies are especially helpful when it comes to unravel the problematic centre-periphery narratives because they naturally force us to "zoom in on the local" (Roberts 2009). Here, we trace back an undocumented, broken crate filled with paleolithic tools to the National Museum of Canada, the Royal Society of Canada, and the quixotic excavation Canadian geologist Henri-Marc Ami conducted in Dordogne in the 1920s and 30s. As we unearth the history of the collection, we explore how such unassuming artefacts raises issues with the traditional centres-of-accumulation model of science emphasizing large collection for the identification, classification, and standardization of their specimens (Radwick 2005), paying special attention to how these models fail to properly account for the changing values of scientific collections and how they end (Jardine et al. 2019).

M. Bryson Brown (University of Lethbridge)
On Laws of Nature

Recent philosophical accounts of laws of nature vary widely. Examples include Marc Lange, who builds on possible world semantics by imposing a special truth condition for "counternomic" counterfactuals. Others, including Fred Dretske, David Armstrong and Michael Tooley, have argued that true law statements express contingent, second-order relations between the universals involved; for example, if the laws of Newtonian mechanics were laws of our world, the universals force, mass and acceleration would be related to each other by the equation, F=ma. And John Bigelow, together with Brian Ellis and Caroline Lierse proposed that natural necessities at a given world w are grounded in what kind of world w is. More austere (i.e. less metaphysical) views have also been defended, for example, by David Lewis and F. P. Ramsey, both of whom held that the laws of a world w are the generalizations that do the best job of systematizing regularities that hold at w. But a different approach, due to Wilfrid Sellars, has been neglected in these debates. Sellars's view of laws derives from his treatment of predicates. In first order logic, the extensions of predicates are treated as independent of each other. But in (Sellars, 1948) and other work, Sellars argued for a richer treatment of predicates, grounding their identities in rules of "material reasoning." I present an account of material reasoning and its implications for predicates and laws of nature, connecting them to a general logical result showing how to generate representations of 'possible worlds,' in the form of maximal consistent sets of sentences, from a monotonic, reflexive and transitive consequence relation.

Alex Bryant (McMaster University)
Aristotle on the Generation of Sounds

Aristotle writes: "what is struck must be smooth, so the air is able to rebound (aphallesthai) and shake (seiesthai) as a mass" (DA420a25-26). This passage has played a significant role in shaping the literature on Aristotle's conception of hearing, as the use of "seiesthai" has encouraged the view that Aristotle has a proto-vibration theory of sound generation (Cf. Burnyeat (1992), Ganson (2002), Gottschalk (1968), Johnstone (2013), Marmodoro (2014), Pasnau (2000), Polanksy (2007), Shields (2016), Sorabji (1991), Towey (1991), even, arguably,

Averroes). In my paper, I develop an initial account of Aristotle's acoustic science that is lacking in the present Aristotelian literature on perception. By drawing on other areas of the corpus including Parts of Animals (PA), Movements of Animals (MA), Generation of Animals (GA), Physics, and Generation and Corruption (GC), I also contribute a more complete account of Aristotle on voice than is presently available. First, I outline Aristotle's comments regarding the basic physical parameters for the production of sounds. Then, I treat Aristotle's comments on reverberation, which will contribute to our understanding of the importance of smoothness for sound generation and fill in Aristotle's conception of echo. Finally, I treat Aristotle's account of voice, where we find the conclusions of the preceding sections cemented. In the section on voice, I highlight the relationship between sonic properties (like pitch and timbre) and the physical characteristics of both sound-producing objects and the environment surrounding these.

Jörg Matthias Determann (Virginia Commonwealth University)
Islam and the Extraterrestrial Life Debate

Historians of the extraterrestrial life debate, such as Michael Crowe and Steven Dick, have mostly focused on the West. Their narratives move from Democritus to Immanuel Kant, and to modern astronomers and science fiction authors, like Percival Lowell and H. G. Wells. In contrast, this paper contributes to a more global history of astrobiology by analyzing Muslim views of the universe. The idea of the plurality of worlds was consolidated by European astronomers, such as Nicolaus Copernicus, who were indebted to earlier Islamic learning. The Copernican Revolution turned Earth into a planet, and planets into possible earths. After slowly establishing itself against resistance by the Catholic Church, heliocentrism was eventually taken up by Christian missionaries themselves. These missionaries were important to the spread of modern astronomy in the Middle East as well as South Asia. Both Protestants and Catholics sought to convince natives of the truths of Christianity through the superiority of Western science. Many Muslims took up the new natural knowledge, but held on to their scripture. They pushed back against Western claims by arguing that their sacred text was in harmony with modern science. This was helped by Qur'anic verses that speak of God as "lord of the worlds" and of creatures across the heavens. Endorsed by religious scholars, the imagination of extraterrestrial life flourished among scientists and science fiction writers from across the Muslim world. Examples include Nozair Khawaja and Hosam Elzembely, who founded the Astrobiology Network of Pakistan and the Egyptian Society for Science Fiction respectively.

Zeyad El Nabolsy (Cornell University)
Paulin J. Hountondji on Science, Capitalism, and Imperialism: An African Philosopher's Quest for a Sociology of Scientific Knowledge in the Peripheries

In this paper I argue that one can identify a coherent theoretical view of the relationship between science, capitalism, and imperialism in the works of Paulin J. Hountondji. Hountondji claimed that colonialism by bringing about a class of dependent capitalists and by creating dependent economies hindered the development of an autonomous scientific discourse on the African continent. Thus rather than attempting to theorize the relationship between science, technology, and capitalism in general, it is necessary to develop a theoretical framework that allows one to study the relationship between science, technology, and capitalism in the peripheries, where capitalism itself had a distinctive structure that differed from the "classical

capitalism" of the metropolitan countries. I aim to provide a detailed reconstruction of Hountondji's claim that capitalism hindered scientific development in the formerly colonized world, and the manner in which he draws upon historical materialism as a theoretical framework in order to substantiate this claim. I also show how he deploys historical materialism in order to launch a critique of culturalism with the aim of showing that strictly speaking it is fallacious to equate “modern science” with “Western science” (or “European science”). I argue that the motivation for this attempt at making a conceptual distinction between “modern science” and “Western science” is the desire by Hountondji to articulate the possibility of an anti-colonial (and anti-neocolonial) modern science. Moreover, I argue that Hountondji's respect for modern science and his desire to develop an autonomous modern scientific discourse on the African continent is not incompatible with respect for indigenous (or, as Hountondji prefers, “endogenous”) knowledge. However, it is incompatible with respect for "endogenous knowledge" as it is understood within the framework of the ethnosciences (i.e., ethnobotany, ethnomathematics, etc.), which according to Hountondji present the former as a petrified system of knowledge that is isolated from modern science. Instead Hountondji argues that it is necessary to integrate endogenous knowledge with modern science in order to develop a scientific discourse that will contribute to the emancipation of African countries from neo-colonial tutelage.

Craig Fox (Rotman Institute of Philosophy)
Sciences That Tell Stories: Rethinking the Distinction Between Historical and Experimental Science

The consensus in the literature is that sciences that investigate the past—so-called historical sciences—are clearly different in kind from traditional kinds of experiment-based science, employing a distinctive methodology. In Sect.1, I briefly explicate the received view and describe its motivation. In Sect.2, I show that, contrary to the received view, the epistemic situation faced by scientists investigating the past is not distinctive, and so the category "historical science" is ill-conceived. In Sect.3, I argue that the proper distinction is between sciences that tell stories of the unfolding of events—I call these "story sciences"—and those that do not. Stories, in my sense, are not to be confused with narratives, though the two are related. Indeed, I argue that the term "narrative" is ambiguous and that several problems associated with narratives are due to this ambiguity. I show that the main problem is that events are individuated under a description, and participants and those looking back in time, tell very different, often incompatible narratives. This leads, then, to a kind of anti-realism about events or a rejection of narratives as truth-apt. I show that narratives, when problematic in this way, are so because they over-describe the target event. Narratives contain what I call a story, but also additional content that seems to be about the event but is tacitly about the particular observer or investigator. Narratives contain parochial content that fails to individuate the target event according to its invariant causal structure.

Doreen Fraser (University of Waterloo)
Taking the Long View on Quantum Field Theory

At the moment in theoretical physics there is a pervasive sentiment of frustration about the elusiveness of quantum gravity. I will argue that the history of classical physics contains lessons applicable to the present moment. Drawing on recent historical work on the development of

classical physics after Newton by Brading, Stan, Hepburn, and Caparrini, I point out parallels between the state of development of analytical mechanics at the time of Lagrange (late eighteenth century) and the state of development of quantum field theory today. Lagrange took physics as his starting point, but regarded his work as a contribution to mathematics rather than natural philosophy. It was not until the end of the nineteenth century that Lagrangian mechanics had developed to the point that it could be applied to physically interesting problems. One theme of the new historical work on this period is that the development of the mathematical formalism of analytical mechanics supported the development of new physical principles. Similarly, contemporary work by mathematicians on quantum field theory has not yet yielded models applicable to physically interesting systems, but could lead to deeper physical principles. The mature version of Lagrangian mechanics that had been formulated by the beginning of the twentieth century was an important ingredient for quantum mechanics and quantum field theory. By analogy, a future, further developed version of quantum field theory could be an important ingredient for quantum gravity. The history of physics counsels patience.

Patrick Fraser (University of Toronto) & **Jamie Shaw** (Institute for History and Philosophy of Science and Technology)
D. C. Miller's 'Disproof' of Special Relativity

During the 1920s, D.C. Miller claimed to produce a significant effect detecting an aether wind. Not only could this have undermined the primary motivation for adopting special relativity, but it gave experimental force to a theory that had largely been rejected by the physics community. This result should have shocked the community, but it didn't; the results were largely ignored. This was not because Miller was thought of as a crank; on the contrary, he was one of the most respected experimentalists of his day. Moreover, it was not because there was any obvious flaw with his experiment; the mistake was not detected until the 1950s. This fascinating state of affairs has been almost completely forgotten and has been left out by most historical accounts of the development of relativity. The goal of this paper is to recount Miller's experimental results and the reactions of his colleagues. In particular, we reconstruct Miller's understanding of the Michelson-Morely experiments and their implications for theories of the aether. Additionally, we contrast this with the popular conception, which we contend is founded upon illegitimate scientific grounds. The dissonance between these two narratives concerns differing understandings on whether or not the Michelson-Morely experiments were genuinely replicated. It is because of this difference that Miller's seemingly robust experimental results were rejected by the scientific community without justification. This interpretation stands in stark contrast to what few thinkers, such as Michael Polyani (Polyani, 1958), and Harry Collins and Trevor Pinch (Collins & Pinch, 1995), have previously argued.

Yousuf Hasan (University of Western Ontario)
Carnap's Pluralism: An Alternative to Naturalized Philosophy for Feminism

Carnap's philosophical program is not motivated by feminist considerations. However, his pluralist program may serve as a better alternative to naturalized philosophy in advancing feminist interests. In the early 1930's, for Carnap, important concepts in philosophy were restricted to purely syntactic explanations. By the late 1930's, however, Carnap broadened his program to engage in semantic endeavors as well. In his autobiography (1960), he refers to

this shift from syntax to semantics as important and uses it as an example for why for him philosophy ought to be loosely defined so as to not hinder conceptual progress. This move was possible for Carnap due to his principle of tolerance, which allowed him to adopt a broader philosophical program without worrying about correctness. Carnap's principle is central to my argument for preferring his pluralist program over a naturalized philosophy when it comes to advancing diverse methodological approaches in feminist philosophy. For my argument, I will focus on Audrey Yap's Feminism and Carnap's Principle of Tolerance (2010) paper in which she argues in favour of Carnap's principle against the stereotypical view of logical empiricism. My focus will be different in that I will begin by revisiting the main dispute between Quine and Carnap, and how Carnap's program already avoided "totalizing narratives" and instead resulted in a pluralism favourable to feminist philosophy. Unlike Yap, who focused on the role that tolerance played in logic and language, I will focus on the role it plays in epistemology.

Aleksandra Kaye (University College London)
Mapping the Polish Knowledge Networks in Nineteenth-Century Latin America, 1830-1890

In the nineteenth century when Poland was not on the map, as its territories were partitioned between the Habsburg Austria, the Kingdom of Prussia, and the Russian Empire, around 9,000 Poles, mainly members of the cultural, intellectual and political elites, emigrated to other parts of the world. Many went to France, but a significant number moved further afield to Latin America. Many of these people were scientifically skilled and contributed to the local communities. For example, Igancy Domeyko (1838-1889), a geologist and educator, who surveyed many of Chile's natural resources, and Ernest Malinowski (1859-1899), the engineer behind Peru's Ferrocarril Central Andino. While Domeyko and Malinowski are relatively well-known there were many more accomplished Polish émigrés to Latin America whose stories are being slowly forgotten. It is the scientific contributions of these people which I will address in this paper. In my transnational research I trace Polish émigrés to Latin America and their involvement in production and circulation of scientific knowledge. I question conventional assumptions about how knowledge travels and aim to highlight and challenge the centre-periphery model, which views people from 'peripheral nations' as dependent on the 'centres' for progress and knowledge. 'Peripheral nations' collaborate now and have done so for centuries. In my approach I take inspiration from Digital Humanities and Social Sciences and apply social networks analysis methodology to historical research aiming to develop a more dynamic model of the effects of migration on knowledge creation and circulation.

Megan Krempa (University of King's College)
Time after time: An Analysis of the Development of Radioactive Time

A shift in the scientific understanding of time as something objective to elements on earth rather than something subjective only began less than a century and a half ago, with the advent of the fields of nuclear physics and radioactivity. Yet, today it is difficult to conceptualize just how radically time has changed since before atoms and atomic decay was understood. Before, there was little to be shown for proof of an "absolute" time. But upon the discovery that radioactive elements not only decay to other elements and at constant rates depending on the element, this meant that time itself was able to be measured far more specifically than before. This paper will focus on the history of this shifting perception of time and radioactive

decay in nuclear physics. It will focus primarily on the work of Harriet Brooks, a Canadian nuclear physicist who did seminal work in the early days of the field. Her contributions, I will show, were influential to the understanding that radioactivity and radioactive decay produced other elements, and that elements decay at constant rates. This paper will also analyze other responses and comments on radioactivity from voices such as Ernest Rutherford, J.J. Thomson, and John Joly, to analyze how ideas and knowledge were shared. It will be shown that a far more complete and interesting history of nuclear physics can be created by looking to the exchanges and work done by scientists of lesser renown or who are marginalized (literally and metaphorically), like Harriet Brooks.

Sina Fazelpour & Zachary Lipton (Carnegie Mellon University)
Algorithmic Injustice from a Non-ideal Perspective

Inspired by recent breakthroughs in predictive modeling, practitioners in both industry and government have turned to machine learning with hopes of automating decisions. Unfortunately, many social desiderata concerning consequential decisions, such as justice or fairness, have no natural formulation within a purely predictive framework. In efforts to mitigate these problems, researchers have proposed a variety of metrics for quantifying deviations from various statistical parities that we might expect to observe in a fair world and offered a variety of algorithms in attempts to satisfy subsets of these parities or to trade off the degree to which they are satisfied against utility. In this paper, we connect this approach to fair machine learning to the literature on ideal and non-ideal methodological approaches in political philosophy. In the most straightforward application of ideal theory, one supports a proposed policy by arguing that it closes a discrepancy between the real and a posited ideal world. However, by failing to account for the mechanisms by which our non-ideal world arose, the responsibilities of various decision-makers, and the impacts of proposed policies, naive applications of ideal thinking can lead to misguided interventions. In this paper, we demonstrate a connection between the fair machine learning literature and the ideal approach in political philosophy, and argue that the increasingly apparent shortcomings of proposed fair machine learning algorithms reflect broader troubles faced by the ideal approach. We conclude with a critical discussion of the harms of misguided solutions, a reinterpretation of impossibility results, and directions for future research.

Daniel Lindquist (Indiana University, Bloomington)
Hegel as a Resource for the Philosophy of Biology

In this talk I suggest several ways in which Hegel's reflections on the philosophy of nature can be profitably taken up for contemporary thinking about the life sciences. Kant's philosophy has regularly been turned to by those seeking for a way to think about teleology in nature (such as Weber and Varela 2002), and Kant's reflections on this topic are powerful and enduring, but peculiarities of Kant's handling of natural purposiveness render his use problematic. Hegel, I argue, provides us with everything valuable in Kant's discussion, while avoiding the skepticism that lead Kant to treat the life sciences as second-rate sciences. Hegel is also useful for understanding the relationship between an organism and its environment, which (Levins and Lewontin 1985) had already spoken of as "dialectical" and can be seen as prefiguring recent work in "niche construction." Finally, I argue that Hegel's thesis of the "impotence of nature" provides a striking positive motivation for adopting a pluralistic, pragmatic view of taxonomy,

and for reflecting critically on questions of "scientific realism" as an understanding of the practice of scientific inquiry.

Amy MacKinnon & Muhammad Ali Khalidi (York University)
Reclassifying Body Dysmorphic Disorder: A Causal Model Informed by the Patient's Perspective

In psychiatric taxonomy, philosophy of science intersects with mental health. The well-being of psychiatric patients depends in crucial ways on how psychiatric disorders are classified. One such disorder, Body Dysmorphic Disorder (BDD), involves persistent and intrusive thoughts about a perceived bodily flaw, which is not observable or appears slight to others. People with BDD perform repetitive behaviors or mental acts in response to concerns about their appearance. In the standard psychiatric taxonomy, BDD is classified alongside Obsessive Compulsive Disorder (OCD) as one of the Obsessive-Compulsive Related Disorders (OCRDs). Although BDD and OCD are similar in terms of their associated impulsive and compulsive behaviors, we argue that this similarity is not sufficient to justify classifying them in the same category, at least if we are interested in understanding the etiology and causal profile of BDD. Attending to the patient's perspective can lead to a better appreciation of how BDD differs from OCD. We point out several differences in the way that BDD and OCD patients experience their condition, having to do with delusional thinking, referential thinking, the extent to which thoughts and behaviors are endorsed by patients, and the degree to which behaviors tend to reduce the anxiety of patients. This leads us to hypothesize a causal model of BDD, which sets it apart from OCD and other OCRDs. We conclude by suggesting that re-classifying the disorder may have consequences for intervention and treatment.

Alexandru Manafu (York University)
The Analyticity Objection to Special Science Laws

A number of authors, including Kim (1992), Millikan (1999), Boyd (1999), and Shapiro (2000, 2005) have expressed similar concerns about the possibility of a science whose kinds are functional. They have suggested that if there were laws in which functional kinds figured, these laws would be analytic, and thus uninformative. If one holds the requirement that natural sciences are by their very nature empirical investigations of the world, the worry that there can't be a science of multiply realized functional kinds becomes apparent. In this paper I offer a precise formulation and a label for this problem, by expressing the concerns that these authors have univocally, as similar instances of what I call "the analyticity objection to special science laws". Using a number of examples of multiply realized kinds appearing in various scientific domains such as chemistry and solid state physics, I argue that the analyticity objection doesn't hold for these domains, hence the credibility of the general point of the objection is much diminished.

Ashley Rose Mehlenbacher (University of Waterloo)
The Expert and her Virtues

"The expert" is an important historical and rhetorical construction. The expert has generated much attention with the purported death of expertise (see: Tom Nichols) and growing concern

that publics have lost trust in science, metonymic for the loss of trust in scientific experts. Aristotle provides insight into this problem through his articulation of phrónēsis as an intellectual virtue in Nicomachean Ethics. Often experts are characterized in terms of technical knowledge or skill. Missing in these formulations is the foundational deliberative and moral capacity marked by phrónēsis. The rhetorical perspective offered in this presentation establishes expertise as comprised of knowing-that (epistēmē and experience), knowing-how (skill or technê), and knowing-what (phrónēsis). The addition of phrónēsis inflects expertise with an important moral quality. In this presentation, phrónēsis is articulated through the rhetorical tradition, principally through the work of Aristotle and neo-Aristotelians (including Carolyn R. Miller and Steven Mailloux), and through the virtue ethics tradition in moral philosophy (including Rosalind Hursthouse, Philippa Foot, and Julia Annas). The argument I advance in this presentation is that expertise is the enactment of specialized knowledge, through practical judgement and practical wisdom founded on experience, most applicable to the situation or problem one faces. In addition to the arguments advanced in this presentation, the claims are supported by qualitative and rhetorical analysis of over 40 interviews with self-identified experts in Science, Technology, Engineering, and Mathematics disciplines. Interview data offer discussions of how participants define expertise, believe they became experts, and, crucially, how they assess expertise in prospective collaborators.

Parysa Mostajir (University of Chicago)
Values in Science: A Pragmatist-Feminist Perspective

Philosophers Heather Douglas, John McCumber, and Don Howard have observed that, from the 1960s, philosophers of science largely ignored socio-political factors, opting for a confirmation-theoretic approach that accepted the value-free ideal of science. In the 1990s, to undo this depoliticization and challenge the notion of science as a process that reveals pure, objective facts, feminist scholars such as Longino and Rooney demonstrated the implausibility and untenability of a clear-cut divide between the operation of epistemic/constitutive, truth-oriented values and the operation of contextual, socio-political values. Taking a broad look at 20th century philosophy of science, the growth of the value-free ideal coincided roughly with the recession of the pragmatist tradition in American philosophy. Bridging this gap, the insights of late-20th century value-conscious feminist philosophers of science can be read as consistent with and strongly implied by theories of science found in early-20th century value-conscious pragmatist philosophy; and potentially, there is a highly fruitful theoretical conversation to be had between them. In Dewey's Logic, he suggests that the methods of scientific inquiry we institutionalize are not absolute methods by which we reveal the objective nature of reality, but are historically developed and adapted to meet specific biological and socio-cultural needs. Dewey was reacting to logical positivists, but if we interpret his statements on institutionalized methods to correspond to Longino's "constitutive values," then pragmatism contains a finely-developed framework for engaging feminist theories on the social and cultural purposes for which science is undertaken, and social and cultural influences on our concepts of objectivity and rationality. Additionally, pragmatism's consideration of science's adaptation to relatively universal biological needs (as well as highly contingent social ones) may resolve some questions left by feminist epistemology about the existence of a degree of objectivity—albeit limited—in scientific methods as they stand.

Michel Nguessan (Governors State University, University Park, Illinois)
Refrigeration and the Cold Chain in the USA from 1900 to 1960: Lessons for Developing Countries in Africa and beyond

Refrigeration technology and the cold chain are critical in the economic, industrial and social life of every nation. This study paper provides some historical perspectives on the development of this technology in the USA from the beginning of the twentieth century to the 1960s. It is a brief history of the use of refrigeration technology for preservation, transportation and distribution of perishables goods. An important goal of this study to show the historical roles of different public and private organizations and actors in the process of creating a reliable cold chain. On the other hand, leveraging refrigeration technology for food preservation and food security is a big challenge today in developing countries. The ultimate goal of this paper is to show how to refer to the American experience in order to help plan and implement this technology in developing countries. After the methodology and research design sections, the paper discuses: 1) the importance of refrigeration technology and the cold chain in modern life; 2) the evolution of the refrigeration technology and the cold chain in the USA from 1900 to 1960; 3) lessons from the American experience that can help articulate policies and strategies for developing countries. The study concludes that, even though the geography, the history, the technological, economic and social contexts are different, valuable lessons from the American experience can help strategize and implement refrigeration technology and the cold chain in developing countries in Africa.

Alix Noël-Guéry (Université de Québec à Montréal)
Plants as Sentient Social Beings: Decolonization & Biosemiotics / Plantes organismes sensibles sociaux: décolonisation & biosémiotique

Plusieurs philosophies traditionnelles africaines et autochtones considèrent l'ensemble du vivant - autant le règne végétal qu'animal - comme étant composé d'êtres sensibles. Ces visions du monde s'opposent à celles d'origine occidentale basées sur l'objectivisme qui « exclut traditionnellement la nature (et donc les plantes) du domaine social » (Dev, 2016) et sensible. Le vivant objectiviste se retrouve donc divisé en deux : un vivant inerte mécanique et végétal puis un autre sensible et animal. Le vivant traditionnellement autochtone ou africain, quant à lui, est unifié, intégré et sensible. La plante y est même considérée comme un être social qui communique avec les humains. Les différents codes de la nature, autant sonores que chimiques, deviennent un langage de communication d'êtres vivants sensibles : une biosémiotique incorporant de « nouvelles découvertes en biologie, […] avec des notions Peirciennes de signification, d'interprétation et de signification » (Callicott, 2013). En quoi la division objectiviste occidentale possède un aspect colonialiste qui nuit à la recherche et favorise l'exploitation excessive et destructrice de la nature ? En quoi l'étude de la biosémiotique peut aider à comprendre la communication trans-espèce entre la plante et l'être humain et à ainsi briser les hiérarchies du vivant ?

Aaron Nowaczek (Institute of Cognitive Science, Carleton University)
Moving Through Quality Space: The Impact of Change Over Time for Clark's Thery of Phenomenality

Austen Clark defines phenomenality as the appearance of quality Q at region R. Translated, this definition states that the placement of sensory qualities to spatial locations forms the basis for the way the world appears in our conscious experience. One important feature of Clark's account is the use of quality spaces. Another is the placement of those qualities to a spatial location or region. Clark's account ignores how sensory qualities change over time by treating sensory qualities as regions or points on a quality space. In this paper, I will argue that regions or points in a quality space cannot represent the change over time critical for identifying different sensations (such as a throbbing pain) and will subsequently supply an account of how change over time fits into this picture. Acknowledging the smearing of phenomenality across time impacts how we think about both quality spaces and quality placement. The passage of time involved with sensory qualities and their placement is an important if ignored feature in not only Clark's theory of phenomenality but also in quality space theories in general.

James A. Overton (Knocean Inc.)
Transparency and Invisibility in Open Science

Openness has been a siren call for scientists, funding bodies, and the public in recent years. Philosophers of science including Sabina Leonelli have been involved in developing Open Science policies, but have also been critical of this trend. While there are many important benefits of openness, from epistemic questions of warrant and trust, to ethical questions of access and justice, these benefits are not distributed evenly, and neither are the costs and limitations of Open Science. In this paper I apply the work of Leonelli and others on Open Science to my first-hand experience with three projects: ten years contributing to the Ontology for Biomedical Investigations, eight years as a consultant for the Immune Epitope Database, and five years as a member of the Technical Working Group of the Operations Committee for the Open Biological and Biomedical Ontologies Consortium. I demonstrate the transparency of these projects by pointing to a wide range of publicly available artifacts and records, from public mailing lists to issue trackers, design documents to version control repositories. However there are gaps in these public records, and these projects all rely on a staggering breadth of scientific and technical expertise, so that important factors may be hidden in plain sight. I draw on these examples to argue (1) that openness in science is worth pursuing, in equilibrium with other goals, and (2) that philosophers and historians of science should take advantage of increasing openness and transparency, with an awareness of these limitations and invisible factors.

Lydia Patton (Virginia Tech)
On Doing Good Work in the Community: Kuhn and the Social Tradition

Thomas Kuhn argues that science should be seen as a practice deeply embedded in social norms involving how to recreate and extend scientific achievements. The 'practical' reading of Kuhn has been developed by, e.g., Joseph Rouse, Hanne Andersen, and Paul Hoyningen-Huene. I want to focus on the question: what allows for the recognition of a philosophical or scientific achievement, as such, in the first place? Karl Popper focuses on the conditions for

disagreement: for being able to criticize another scientists. I want to give priority to the conditions for recognition: for the community of inquiry, or a subset of it, to be able to recognize a scientific or philosophical result as a result. Popper (and Lakatos) argue that recognition can be rationally reconstructed so that each move of theory development becomes logically necessary. But retrospective analysis effaces a key aspect: communication. I will focus on how results are received and evaluated by the community. Recognition of an achievement involves Michael Polanyi's tacit knowledge: being able to perform cognitive tasks, to put results in a context of similar work, to compare complex relationships with other complex relationships. Recognition requires evaluation. My paper will focus on the development and context of tacit evaluative capacities within the scientific community, and how they should factor into our understanding of the history of the philosophy of science.

Kent Peacock (University of Lethbridge)
Quantum Realism for Einstein, Bohm, and Smolin: What the Mathematics Allows

Lee Smolin's *Einstein's Unfinished Revolution: The Search for What Lies Beyond the Quantum* (2019) argues that Bohm's version of quantum mechanics can go a long way toward satisfying Einstein's demand for a realistic underpinning for quantum mechanics. In 1933, Einstein had stated, "I hold it true that pure thought can grasp reality, as the ancients dreamed… I still believe in the possibility of a model of reality—that is to say, of a theory which represents things in themselves." As Smolin sees it, Einstein's vision of physical reality demands that we understand reality as "independent" of the human observer, and as a unity, a "one". Smolin also argues that we can satisfy this vision of an independent physical reality despite the well-demonstrated nonlocality of quantum mechanics. I will argue that the separable realism that Smolin defends cannot be supported in the face of quantum mechanics. The general impossibility of underpinning quantum statistics with a Boolean model shows that there can be no such things as things in themselves, and the nonlocality of quantum dynamics (demonstrated in part by the existence of Bohm's quantum potential) shows that the observer is never entirely separable from the observed. Despite this, it is possible to entertain a robust realism so long as we do not make the mistake of insisting that realism implies the existence of a complete and consistent description of what Bohm himself (1976) called the "unknown reality which can only be described as eternal flux or flow".

Nicholas Ray (University of Waterloo)
Logical Empiricism's Surprising Anti-Foundationalism

Quinean and post-Quinean characterisations of logical empiricism begin with the assumption that the main philosophical aims of logical empiricism are foundationalist in nature, bringing as close as possible to fruition the Cartesian-cum-Lockean project of accounting for the external world using (private) sensory elements of the lowest order. This much is made explicitly clear by Quine in his "Two Dogmas of Empiricism" (1951), and echoed in his "Carnap on Logical Truths" (1954) and "Epistemology Naturalized" (1969). More recent variations of the thesis have been explicated by Rorty (1979), Davidson (1983 and 1988), and BonJour (1985 and 1998), not to mention similar criticisms in the Sellarsian branch of post-positivist philosophy, including Sellars (1956 and 1963), Brandom (1994), and McDowell (1996 and 2008)—to name but a few of the most famous examples. Even recent forms of normative empiricism have agreed with

the basic Quinean/Sellarsian view that logical empiricism was wedded to a Cartesian-cum-Lockean model of experience and perceptual knowledge, and, for this reason, fated for failure. See especially Gupta (2006 and 2019). The present essay re-assesses this seemingly ubiquitous assumption. Indeed, a closer examination of even the early ideas of the principal logical empiricists unveils a decisive move away from foundationalist tenets regarding experience and perceptual knowledge. This paper examines the famed, though often misunderstood, "protocol sentence debate" through the final public phase of the Vienna Circle (up to 1935), with special attention paid to Carnap's and Schlick's understandings of the role of protocols and their relationship to experience and our propositional knowledge. Since Quine's critique of normative empiricism makes a great deal about the foundationalist roots of Carnap's Aufbau project (1928), a sustained examination of that project is offered as well. The results are surprising: not only do we see a turn away from Cartesian-cum-Lockean assumptions in the theory of knowledge and the role of experience in justifying our common sense and scientific knowledge, but also we see an explicit rejection of the kinds of foundationalism common to other forms of empiricist epistemology, including classical British empiricism, Russellian empiricism, and other forms of sense-datum empiricism. In place of this empiricist-foundationalism is a thorough-going logical project—one that shows the mutual constructability of the concepts of "auto-psychology" (experience) and the concepts of the sciences. Carnap's "Constitution Theory" (a novel discipline that can take the place of traditional epistemology) utilises a non-Cartesian conception of experience to answer vexing problems about the relationship between empirical cognition and our common sense and scientific conceptions of an external world. This move by Carnap betokens a radical break with the sense-datum theories of previous empiricist-foundationalists like Mach and Russell, but the history of the protocol sentence debate shows that Neurath and even Schlick had already begun to divorce themselves from empiricist-foundationalism as well. Contrary to the received view in the history of twentieth-century philosophy, logical empiricism can be regarded as a first attempt at anti-foundationalism, not a failed attempt to complete the external world project.

Andrew Reynolds (Cape Breton University)
Metaphor and Literalism in the Scientific Realism Debate

Scientific realism is commonly said to involve a commitment to a literal interpretation of statements about observable and unobservable entities and processes (e.g. van Fraassen 1980, Psillos 1999, Chakravartty 2017). Hence, a claim that "There are electrons" is to be interpreted literally, i.e. that unobservable entities called electrons exist, rather than being reinterpreted 'figuratively' or 'metaphorically' as a statement about observable phenomena (à la empiricism) or operations or procedures (à la instrumentalism). This literalist commitment is referred to as semantic realism (Psillos 1999, Chakravartty 2017) and comprises one of three dimensions of scientific realism, along with commitment to a mind-independent reality and that scientific theories provide knowledge of the real world. But this notion of literalism faces two difficulties: 1) it seems to invoke an impoverished conception of metaphor (i.e. the merely non-literal), and 2) it neglects the deep and widespread occurrence of metaphor in scientific language and thought. Because statements about the behaviour of entities and processes are frequently made in metaphorical language, to say as van Fraassen has, that according to realism the aim of science is to provide "a literally true story of what the world is like" neglects just how much scientific language resists a literal interpretation. I propose therefore that a more adequate account of scientific practice requires greater recognition of the roles of metaphor in the

construction of theory, explanation, and experimental reasoning, and that consequently an adequate account of scientific realism must also include a more adequate understanding of metaphor.

Adam Richter (University of Toronto)
Anti-Catholic Science in the Early Royal Society

Anti-Catholic sentiment was widespread among English Protestants in the seventeenth century, including those involved in natural philosophy. Although the Royal Society of London claimed to keep religion and politics out of its activities, many Fellows professed a strong anti-papist attitude. This most often took the form of condemning the Pope and the Jesuits, but the Fellows also denigrated particular Catholic doctrines such as transubstantiation. Moreover, the Society promoted an association between Protestantism and experimentation. For instance, in his History of the Royal Society (1667), Thomas Sprat describes the rise of experimental philosophy as a second Reformation, and he mocks those Catholic scholars who merely pretend to value experimentation so that "the Protestants might not carry away all the glory" of new discoveries. This paper discusses how anti-Catholicism shaped the work of early Royal Society members such as Sprat, John Wallis, Isaac Newton, and Robert Hooke. In many cases, the Fellows resisted ideas that came from Catholic sources or seemed compatible with Catholic doctrines. On the other hand, the Fellows knew that certain Catholic scholars—including Copernicus, Gassendi, and Descartes—were responsible for enormous contributions to natural philosophy, and they could hardly dismiss these achievements out of hand. Accordingly, this paper also considers cases when the Fellows modified the ideas of Catholic natural philosophers to suit a Protestant worldview, and the strategies they developed to do so.

Mark Solovey (University of Toronto)
Social Science for What? Wasting Taxpayer Dollars, Winning Golden Fleece Awards

In 1975, U.S. Senator William Proxmire began to issue a monthly Golden Fleece Award, given to a government-funded research project deemed to have little practical value, implying that the American taxpayer was being "fleeced." This paper examines Proxmire's campaign against wasteful spending, with special attention to the case of the U.S. National Science Foundation (NSF) and its social science program. One of the nation's premier science agencies, the NSF received a number of Proxmire's unflattering awards, including one for a grant to Sherry Ortner, a rising star in Anthropology, for her project "Himalayan Mountaineering, Social Change, and the Evolution of Religion among the Sherpas of Nepal." Proxmire asked: why was the U.S. government allocating scarce resources to send Ortner half-way around the world to carry out such an esoteric study? Ortner responded by suggesting Proxmire was an ignoramus whose misguided efforts had dangerous implications for American science and foreign policy. Drawing on my forthcoming book Social Science for What?, this paper examines the heated exchange between the politician Proxmire and the scholar Ortner. As I will explain, this episode embodied fundamental and long-standing science policy challenges, which became particularly acute during the 1970s, and especially for NSF social science.

Charlotte Waller-Cotterhill (The University of Sheffield)
The Art of Medicine: An Interdisciplinary Assessment of Military Artificial Limbs during the 19th Century

Largely under researched until more recent years, the history of disability offers us valuable information on not only how past societies provisioned for the disabled but also what past societies perceptions of these people were. At the turn of the nineteenth century, mortality rates for amputations were incredibly high, in part, due to the lack of anti-biotics and misunderstanding around cleanliness, as such very few survived such a trauma and therefore there was limited need for artificial limbs. However, throughout the nineteenth century, developing medical understanding meant more soldiers were likely to survive their injuries and go on to require artificial appliances which saw their production grow from what had been a small cottage based process, into a process more closely resembling a factory line by the turn of the twentieth century. However, what is clear from the study of manufacturing techniques is that not every soldier was treated equally regarding the limb that would be produced for them and the driving force behind this was social status. Even the original amputation was performed to a standard based on the class of the patient, with the surgeons knowing certain people would only be afforded a crude peg leg, they need only perform a crude amputation. As very few original artificial limbs survive archaeologically due to the materials used in construction, this research endeavours to ascertain the true efficiency of the more 'superior' legs by accurately reconstructing a peg leg and an Anglesey leg using historical material and tools, and then assess their efficiency through lab based gait analysis. It will -answer questions surrounding functionality and long-term effects on the wearer and whether skeletal markers may be identifiable on wearers archaeologically, if their artificial limb is not in-situ. This data will be combined with the historical assessment of popular culture from the time, including but not limited to: art, literature and photographs. It is hoped this multi-disciplinary approach will demonstrate the manufacturing skill level involved in these appliances and also identify societal perceptions of disability in a way that has never been done before.

Erin Ward (University of Windsor)
Excavating the Roots of Scientific Consensus Expectation in the Public

The public has come to expect consensus among experts where scientific research is concerned, and when there is disagreement, especially very public, media-fueled disagreement, it is taken as evidence that there is something wrong with the science. But where did this expectation come from and why does it persist? While it is well known amongst scientists and scholars that reaching consensus is always a process, and one attenuated by some degree of residual uncertainty, this expectation that expert consensus ought to arise inevitably from good science has deep roots in the public psyche—roots which I plan to excavate in this paper. I suggest that a plausible source lies in the establishment of what constitutes a scientific fact in the seventeenth century. Rooting this out, as well as what is errant about it, will serve to support my later arguments that the true process of reaching consensus as well as transparency about disagreement needs to be part of science communication. I will furthermore claim that such transparency has become crucial in order to avoid a critical vulnerability resulting from consensus-expectation in the public; that is, the susceptibility to so-called "doubt campaigns."

Aja Watkins (Boston University)
Accommodating Horizontal Inheritance in Phylogenetics

Phylogenetics is the study of evolutionary relationships between different populations. A phylogeny is a "tree" that shows how the populations are related, i.e., in what order the populations diverged from each other. Currently, all phylogenetic trees have a strictly branching structure: two lineages which have diverged can never merge back together (e.g., Sober 1988). Horizontal inheritance in general, and lateral gene transfer in particular, challenges this assumption of phylogenetics. Microbial organisms, at least, most likely have a phylogenetic history with a reticulate structure, one where the branches can reconnect. Even some macroorganisms, especially plants, have been known to hybridize, which would result in the merging of two distinct lineages (Velasco & Sober 2010). Algorithms used in other areas can provide guidance for revising phylogenetic algorithms to accommodate for horizontal inheritance. For example, recent research on human evolutionary history has shown that our ancestors often met and interbred (e.g., Reich 2019). This research on human population mixing events uses algorithms that allow for a reticulate tree structure, which I believe may be applicable to the much larger Tree of Life. In this paper, I use these other algorithms to propose that phylogenetic algorithms be adjusted to accommodate for lateral gene transfer, hybridization, and other forms of horizontal inheritance.

Joseph Wilson (University of Toronto)
The Ghost in the Machine: Structural Metaphors in the 'Golden Age' of Artificial Intelligence Research, 1956-1976

This presentation is based on an analysis of the language used in a corpus of academic papers from 1956-1976 that are generally considered to be the foundational documents of the field of artificial intelligence. Thirty-one papers were assembled and examined for evidence of the use of structural metaphors (Lakoff & Johnson, 1980), first manually with an adapted version of the Metaphor Identification Procedure (Pragglejaz, 2007), and then through key-word-in-context searches (Deignan, 2008) with online corpus analysis tool Sketch Engine. Concordance data shows that the scientists frequently used metaphors to make sense of their work, some of them eventually coming to define the entire field of study. Some structural metaphors used imagery from the same source domain, suggesting underlying root metaphors (Pepper, 1972), evidence of particular perspectives that comes to constitute the academic field. Root metaphors such as A MACHINE IS A BRAIN or RESEARCH IS A JOURNEY were extremely successful in communicating non-observable phenomena between scientists. Other structural metaphors appeared briefly in the literature but soon disappeared from discourse such as Oliver Selfridge's suggestion that COMPUTER PROCESSING OCCURS IN HELL (specifically, the version of Milton's hell from Paradise Lost he called Pandemonium). There is a current renaissance of the spirit of AI's Golden Age that employs different metaphors: today we speak of record-high investment in 'deep learning' and 'neural nets'. The choice of metaphor when communicating science is important as it affects how scientists think about their work and how the public comes to understand what is going in R&D Departments and computer labs around the world.

Aaron Wright (Dalhousie University)
Narrative and Affect Across Sidney Coleman's Physics and Science Fiction

Harvard physicist Sidney Coleman (1937-2007) cared deeply about reading and writing stories, both in his physics and in science fiction (SF). Among physicists he is renowned for his research and pedagogy contributions to theoretical High Energy Physics (HEP); during his lifetime he was well known at SF conventions as a fan, cofounder of Advent:Publishers, and critic. This paper builds on work which argued for the continuity of modes of _visual analysis_ between the arts, psychology, and modern general relativity. In this paper, I argue for a continuity of _affect_ between SF and the practice of HEP---at least for Coleman. In an 1973 interview with _Vertex_ magazine, Coleman explained that ``one of the reasons for doing science, especially the kind of science I do (elementary particle physics, high energy theory) is that it makes your head feel funny, Goddamned strange. That's also the feeling I get out of SF.'' I bring Coleman's work in SF and HEP into conversation with recent work on Science and SF by Colin Milburn and recent work on the aesthetics of Cold War physics by Jessica Wang. In both cases, Coleman's ``funny'' feeling suggests possibilities new to the literature.

Cameron Yetman (University of King's College)
A Glowing Threat: Radium Luminous Instruments in Canada

In 1966, Jerome Halperin and John Heslep of the California State Department of Public Health conducted a survey of thirty-seven retail surplus stores in four major cities, wherein they found a substantial number of radioactive Second World War era aircraft dials, gauges, and switches. In their article on topic, "Radium in Military Surplus Commodities", Halperin and Heslep trace the origin of these instruments, explain the regulations regarding their use and ownership, and offer recommendations for improved government policy thereof. From my research, no comparable study has been performed in Canada. Since I lack the means to pursue such a study, I will take a more scholastic route by examining the post-war federal government's regulations regarding the distribution of surplus radioactive instruments, explaining the current regulations, and exploring the life which these objects have had in the intervening decades in the hopes of gaining a broader understanding of the public's relationship with radioactivity. I am particularly interested in looking at how museums have dealt with their radioactive collections, in the hopes of gaining a better understanding of proper curatorial practices thereof. These practices can serve as a litmus test against which current government regulation can be judged. While this is by no means a comprehensive study, it serves as a tentative first step towards understanding the way radioactive objects have, and continue to, affect our lives.

Submissions

All submissions and inquiries should be emailed to **cshps.communique@gmail.com**

Issues are published three times a year: in Winter, Summer, and Autumn. Submissions are welcome and can be sent in both official languages. We welcome submissions in the following categories:

Announcements: details about conferences, worshops, job openings, departmental or program news, and call for papers.

Research & Pedagogy: launches of any new and innovative research or techniques used to teach HPS or original topics addresed in their classes and seminars. We are especially interested in digital humanities projects and student engagement pedagogies. Descriptions should be no more than 800 words (with e-links, if available).

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Our aim is to keep the HPS community abreast of what is going on in the field, here and abroad, intellectually and institutionally. But we need your contributions if we are to share your news with the CSHPS community; the newsletter is only as robust and effective as we make it. We thank you for your contributions. The editors are grateful to York University for assistance with archival printing costs.

The newsletter layout was designed and created by Jaipreet Virdi using Scribus, an open source desktop publishing program.

REMINDER TO RENEW/RAPPEL DE COTISATION

This is a good time to remind members that your 2020 memberships have expired, so it is time to renew for 2021. In order to attend and/or participate in annual meetings, you do need to be a member in good standing: http://www.yorku.ca/cshps1/join.htm

lLe moment est venu de rappeler à nos membres que leur affiliation pour 2020 vient d'arriver à son terme et qu'il est donc temps de renouveler leur adhésion pour 2021. Pour assister et/ou participer au congrès de, vous devez être à jour de votre cotisation: http://www.yorku.ca/cshps1/join_fr.html