CSHPS 2019
SCHPS 2019

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Museo Galileo - Florence

PROGRAMME

Canadian Society for the History and Philosophy of Science Annual Conference

Congrès annuel de la Société canadienne d'histoire et de philosophie des sciences

1-3 June/juin 2019

University of British Columbia
Vancouver, B.C.
Canada

Part of the Congress of the Humanities and Social Sciences

Dans le cadre du Congrès des sciences humaines

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Programme at a Glance / Programme sommaire

SATURDAY JUNE 1 / SAMEDI 1 JUIN

ROOM	Buch-D218	Buch-D316	Buch-D322
8:30 – 10:00	Philosophy of Biology I: Evolution	New Conversations in the Field of Science and Religion	Measuring the Mind
10:30 – 12:00	Causation and Causal Inference	Sociology of Scientific Knowledge	[Cancelled session]
13:30 – 15:00	Methods in the Philosophy of Science	Machine Learning and Artificial Intelligence	Mines, Mountains, Caves: Sites of Knowledge Making
15:30 – 17:00	Probability and Evidential Reasoning	Values and Theory Choice	Science in Asia in the 19th and 20th Centuries
17:00 – 18:30	**International Keynote Speaker**: *Two Approaches to Social Epistemology* by Helen Longino (**Location: Buchanan-A102**)		

SUNDAY JUNE 2 / DIMANCHE 2 JUIN

ROOM	Buch-D218	Buch-D316	Buch-D322
8:30 – 10:00	Non-causal and Mathematical Explanations	Science and Public Policy	Natural History and Collections
10:30 – 12:00	Philosophy of Biology II: Ontology and Taxonomy	Science, Science Policy and the Federal State in Canada	Science in the Soviet Union
13:30 – 15:00	Methodology of Research and Experiments	Climate Science	Women, Transnational Mobilities, and Medico-Scientific Innovation (joint session with CSHM) **Location: SWNG 222**
15:30 – 17:00	**Stillman Drake Lecture**: *Data Madness and Quantified Heredity* by Theodore Porter (**Location: Buchanan A-102**)		
17:00 – 18:00	President's Reception (**Location: Robert H. Lee Alumni Centre**)		

MONDAY JUNE 3 / LUNDI 3 JUIN

ROOM	Buch-D323	Buch-D312	Buch-D218
8:30 – 10:00	Philosophy of Time (starts at 9:00)	Scientific Explanation	Scientific Lives and Correspondence
10:30 – 12:00	Logic and Structure of Scientific Theories	Scientific Approaches to Health Care	Book Panel on Christopher Byrne: *Matter and Teleology in Aristotle's Natural Philosophy*
12:00 – 13:30	**Annual General Meeting & Hadden Prize Ceremony (Lunch Served; Buchanan A-102)**		
13:30 – 15:00*	Scientific Realism	Models and Mathematical Foundations of Science	Ancient and Early Modern Science
15:30 – 17:00	Inquiry and Scientific Progress	Computation: Philosophical and Social Perspectives	History and Philosophy of Psychiatry

***Additional session June 3, 13:30 – 15:00:** New Research in the History of Soviet Science (joint session with CAS). **Location: Lasserre 102**.

Programme

FRIDAY MAY 31

18:00 - 20:00 Executive Meeting / Réunion du Comité exécutif
Henry Angus 332

SATURDAY JUNE 1

8:30 - 10:00
Buch-D218

PHILOSOPHY OF BIOLOGY I: EVOLUTION

Chair: **Tiernan Armstrong-Ingram**

Against a Force Theory of Evolution
Todd Nagel University of Western Ontario and
Aleta Quinn University of Idaho

Emergence and Novelty in Evolutionary Biology
Yasmin Haddad McGill University

The Evolution of Moral Belief: Support for the Debunker's Causal Premise
Michael Dale University of Texas at Austin

8:30 - 10:00
Buch-D316

SESSION: NEW CONVERSATIONS IN THE FIELD OF SCIENCE AND RELIGION

Chair: **Anthony Nairn**

Moving Beyond Complexity: Re-thinking Historiographical Approaches to Science and Religion
Sarah Qidwai University of Toronto

Psychedelic Testimony and Neurobiological Explanation
Andrew Jones University of Toronto

Perspectives of the Earth: The Distributed Affect of Three Photographs of the Earth and How the Transformation Perspective Exposes an Intersection Between Science and Religion
Anthony Nairn University of Toronto

8:30 - 10:00
Buch-D322

MEASURING THE MIND

Chair: **Julien Prud'homme**

Mediation in Measuring the Pure Experience of Pain
Celia Edell McGill University

Measuring Minds: Boring, Skinner, McGregor, and Stevens, and the Origins of Operationism
Sander Verhaegh Tilburg University

10:00 - 10:30 COFFEE BREAK

10:30 - 12:00
Buch-D218

CAUSATION AND CAUSAL INFERENCE

Chair: **Jacob Neal**

Formalizing Causal Inference: Sewall Wright's Path Analysis in the Early Twentieth Century
Zili Dong Simon Fraser University

Process, not just Product: the Case of Network Motifs Analysis
Shimin Zhao Simon Fraser University

10:30 - 12:00
Buch-D316

SOCIOLOGY OF SCIENTIFIC KNOWLEDGE

Chair: **Alison Wylie**

The Emergence of Peer Reviewed Books: University Press Publishing Editorial Practice in the United States
Joshua Silver University of Chicago

The Symmetry Principle and Post-Truth Politics: Taking the Strong Programme's Naturalism Further
Kinley Gillette University of British Columbia

Anti-Psychologism, Distributed Cognition, and the Cognitive/Social Divide
Gui Sanches de Oliveira University of Cincinnati

10:30 - 12:00
Buch-D322

SESSION: THE 'SCIENTIFIC OCCUPATION': PHOTOGRAPHY IN THE CONSTRUCTION OF THE PORTUGUESE AFRICAN EMPIRE

Session cancelled; Mendes Flores talk moved to June 2, 8:30.

12:00 - 13:30

LUNCH BREAK

13:30 - 15:00
Buch-D218

METHODS IN THE PHILOSOPHY OF SCIENCE

Chair: **Nicolas Fillion**

Negotiating History: Contingency, Canonicity, and Case Studies
Agnes Bolinska University of Cambridge
Joseph Martin University of Cambridge

What Counts as Scientific Practice?
Ananya Chattoraj University of Calgary

Duhem's Warning
Melanie Frappier University of King's College

13:30 - 15:00
Buch-D316

MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

Chair: **Yasmin Haddad**

The Return of Mind Design: Cognitive Science and the Turing/Ashby Debate
Darren Abramson Dalhousie University
Erik Nelson Dalhousie University

Analysis of the Rise of Deep Learning from a Philosophy of Science Perspective
Smitha Milli University of California, Berkeley
Ravit Dotan University of California, Berkeley

Representationalism in Affordance-Based Robotics
Zachariah A. Neemeh University of Memphis

13:30 - 15:00
Buch-D322

SESSION: MINES, MOUNTAINS, CAVES: SCIENTIFIC, TECHNOLOGICAL AND POLITICAL SITES OF KNOWLEDGE MAKING

Chair: **Elspeth Gow**

The Mine as Adversary: Leibniz versus the Harz Mountains
Andre Wakefield Pitzer College

A Mountain, Romantics and a Nation: Science and the First Ascent of Mt. Ararat
Ernie Hamm York University

National Spaces and Deepest Places: Politics and Practices of Verticality in the Scientific Research of Caves
Johannes Mattes Austrian Academy of Sciences

15:00 - 15:30

COFFEE BREAK

15:30 - 17:00
Buch-D218

PROBABILITY AND EVIDENTIAL REASONING

Chair: **Paul Bartha**

Conditionally Independent Evidential Sources
Robert Hudson University of Saskatchewan

There is More to Probabilities than Meets the Eye: How Private Information can be Inferred from Announced Credences
Somayeh Tohidi Simon Fraser University

Inductive Risk, Expected Utility, and the Consequences of P-Hacking
Adrian Erasmus University of Cambridge

15:30 - 17:00
Buch-D316

VALUES AND THEORY CHOICE

Chair: **Kinley Gillette**

Science, Values, and Epistemic Standards: A Question of Sufficiency
Brandon Holter East Tennessee State University

A New Value-free Ideal: Disrupting the Hegemony of 'Values' in Social Philosophy of Science
Alan Richardson University of British Columbia

Machine Learning, Theory Choice, and Non-epistemic Values
Ravit Dotan University of California, Berkeley

15:30 - 17:00
Buch-D322

SCIENCE IN ASIA IN THE 19TH AND 20TH CENTURIES

Chair: **Ernie Hamm**

Popular Science in India, c. 1830
Jason Grier Independent

Troubled Translations: Science and Ethnoscience in Twentieth-century Philippines
Geoff Bil New York Botanical Garden

Writing the Histories of Japanese Science: The Case of the Neutral Theory of Molecular Evolution
Cédric Blais University of King's College

17:00 - 18:30
Buch-A102

INTERNATIONAL KEYNOTE SPEAKER (OPEN SESSION)

TWO APPROACHES TO SOCIAL EPISTEMOLOGY

Helen Longino Stanford University

This talk is made possible in part thanks to the International Keynote Speaker Support Fund of the Canadian Federation for the Humanities and Social Sciences (CFHSS) / Cette session est rendue possible grâce au support financier du Fonds de soutien des conférenciers internationaux de marque de la FCSH.

SUNDAY JUNE 2

8:30 - 10:00
Buch-D218

SESSION: NON-CAUSAL AND MATHEMATICAL EXPLANATIONS

Chair: **Nicolas Fillion**

I Can't Get No Satisfaction, but I Can Explain It
Nicolas Fillion Simon Fraser University

Levels and a New Role for Mathematics in Empirical Sciences
Atoosa Kasirzadeh University of Toronto

Mathematical Explanation and the Problem of Counterpossibles
Erlantz Exteberria University of Western Ontario

8:30 - 10:00
Buch-D316

SCIENCE AND PUBLIC POLICY / PHOTOGRAPHY IN PORTUGUESE EMPIRE

Chair: **James Hull**

Breaking Barriers to Ethical Research: An Analysis of the Effectiveness of Nonhuman Animal Research Approval in Canada
Letitia Meynell Dalhousie University
Macgregor Malloy Dalhousie University
Caroline Vardigans Dalhousie University

On the Mistaken Image of the Behavioral Sciences Prevalent in Policy Contexts: Insights from the Feminist Philosophy of Science
Magdalena Malecka Stanford University/University of Helsinki

Framing Territories, Making Borders: Photography in the Context of the Portuguese Missions of Border Delimitation (1890-1931)
Teresa Mendes Flores Instituto de Comunicação da Nova

8:30 - 10:00
Buch-D322

NATURAL HISTORY AND COLLECTIONS

Chair: **Geoff Bil**

The Epistemological Motivations Underlying the Narrative Ordering of American Ornithology
Caroline von Klemperer Simon Fraser University

The Materiality of Data: Collecting Scientific Information at a University
Erich Weidenhammer University of Toronto

Genetic Fantasy and Colonial Nostalgia: Backbreeding the "Native Breed" at Old Sturbridge Village
Elspeth Gow University of British Columbia

10:00 - 10:30 — COFFEE BREAK

10:30 - 12:00
Buch-D218

PHILOSOPHY OF BIOLOGY II: ONTOLOGY AND TAXONOMY

Chair: **Ingo Brigandt**

Evidence for Ontological Weak Emergence
Hamed Tabatabaei Ghomi University of Cambridge

Genetics and Evolution: Is There More to Life than This?
Tiernan Armstrong-Ingram University of California, Davis

Taxonomic Responsibility
Aleta Quinn University of Idaho

10:30 - 12:00
Buch-D316

SESSION: SCIENCE, SCIENCE POLICY AND THE FEDERAL STATE IN CANADA

Chair: **James Hull**

Science, Industry and Policy in Early 20th-century Canada
James Hull University of British Columbia

You Can! Stop Waste So Others May Eat: Wastefulness, the Cold War, and Canada's National Food Conservation Campaign, 1947-1948
Eric Striikwerda Athabasca University

Nuclear Anxieties: Fallout Research and the Northern Radiation Study, 1963-70
Matthew Wiseman University of Toronto

10:30 - 12:00
Buch-D322

SCIENCE IN THE SOVIET UNION

Chair: **Alexei Kojevnikov**

Schools for the Mathematically Gifted Students of the Former Soviet Union. Students' Selection and Admissions. Creating Diversity within Gifted Education.
Inna Tokar City College NYC, FIT, Calhoun School

The Soviet Scientist as Inspector: the Communal Hygienists' Struggle to Regulate Industrial Pollution
Christopher Burton University of Lethbridge

12:00 - 13:30

LUNCH BREAK

13:30 - 15:00
Buch-D218

METHODOLOGY OF RESEARCH AND EXPERIMENTS

Chair: **Sina Fazelpour**

Sending Knowns into the Unknown: Towards an Account of Positive Controls in Experimentation
Rebecca Jackson Indiana University

Archaeological Interpretation as Iterative Process
Kristin Kokkov University of Tartu

From Metaphysics to Methods? Pluralism in Cancer Research
Katherine Valde Boston University

13:30 - 15:00
Buch-D316

CLIMATE SCIENCE

Chair: **Alan Richardson**

Taking Values Seriously: Climate Services and Inductive Risk
Greg Lusk Michigan State University
Wendy Parker Durham University

"The Oceans are our Great Laboratory": Marine Science and Ocean Governance in the Anthropocene
Antony Adler Carleton College

Climate Change: a Consequentialist Perspective
Carling Bergquist Dalhousie University

13:30 - 15:00
SWNG 222 (West Mall Swing Space)

SESSION: WOMEN, TRANSNATIONAL MOBILITIES, AND MEDICO-SCIENTIFIC INNOVATION (OPEN SESSION)

Chair: **Catherine Carstairs**

Margaret Sanger in China: The Eugenic Debates on Birth Control and Overpopulation in 1922
Mirela David University of Saskatchewan

Hunting Armadillos and Whales: Frances Oldham [Kelsey] at the University of Chicago in the 1930s
Cheryl Krasnick Warsh Vancouver Island University

"This was a Drug that Healed — it was Love": the Life and Career of Florence Nichols, Medical Missionary and Psychiatrist
Jill Campbell-Miller Carleton University

Joint session with the Canadian Society for the History of Medicine / Session conjointe avec la Société canadienne d'histoire de la médecine.

This panel is made possible thanks to the Aid for Interdisciplinary Sessions Fund of the Canadian Federation for the Humanities and Social Sciences (CFHSS) / Cette session est rendue possible grâce au support financier du fonds de soutien pour les séances interdisciplinaires de la FCSH.

15:30 - 17:00
Buch-A102

DRAKE LECTURE (OPEN SESSION)

DATA MADNESS AND QUANTIFIED HEREDITY

Theodore Porter University of California at Los Angeles

17:00 – 18:00
Robert H. Lee Alumni Centre

PRESIDENT'S RECEPTION

MONDAY JUNE 3

8:30 - 10:00
Buch-D323

PHILOSOPHY OF PHYSICS

Chair: **Bryson Brown**

Can Quantum Mechanics Unfreeze Time?
Kent Peacock University of Lethbridge

Explanation and Effective Field Theories
Martin King Rheinische Friedrich-Wilhelms-Universität Bonn

NOTE: this session will begin at 9:00 a.m.

8:30 - 10:00
Buch-D312

SCIENTIFIC EXPLANATION

Chair: **Adrian Erasmus**

The Role of Structural Explanation in the Study of Health Inequality
Daniel Saunders York University

Changing Explanatory Strategies in Structural Biology: an Example from Protein Allostery
Jacob Neal University of Pittsburgh, HPS

Analogy, Unity, and Scientific Understanding
Shuguo Tang University of British Columbia

8:30 - 10:00
Buch-D218

SCIENTIFIC LIVES AND CORRESPONDENCE

Chair: **Jason Grier**

A Social Network and Text Analysis of Charles Darwin's Correspondence 1835-42
Caroline Floyd University of Guelph

The Limits of Imperial Influence: John James Audubon in British North America
Debra Lindsay University of New Brunswick

A Woman's Place: Mary Warnock and the Public Face of Assisted Reproductive Technology
Angela Yu University of Oxford

10:00 - 10:30

COFFEE BREAK

10:30 - 12:00
Buch-D323

LOGIC AND STRUCTURE OF SCIENTIFIC THEORIES

Chair: **Shuguo Tang**

Empirical Adequacy Debugged
Michael Miller University of Toronto

Reasoning with Incompatible Theories
M Bryson Brown University of Lethbridge

Carnap on Formal Languages: Conversations with Russell and Gödel
Yousuf Hasan University of Western Ontario

10:30 - 12:00
Buch-D312

SCIENTIFIC APPROACHES TO HEALTH CARE

Chair: **Becca Jackson**

Space Allocation and the Mathematization of Hospital Work
Theodora Vardouli McGill University
David Theodore McGill University

Medicine's Transparency Problem: What We Can Learn by Paying Attention to Attention Deficit Disorder
Vivian Feldblyum University of Pittsburgh

Bioethics' Project of Interdisciplinarity: Towards an "Argumentative Epistemology"
Catherine Dussault Laval University

10:30 - 12:00
Buch-D218

SESSION: BOOK PANEL WITH CHRISTOPHER BYRNE MATTER AND TELEOLOGY IN ARISTOTLE'S NATURAL PHILOSOPHY

Organizer and Chair: **Louis Groarke** St. Francis Xavier University

Author: **Christopher Byrne** St. Francis Xavier University

Participants:

Mechanics in Hellenistic Philosophy
Sylvia Berryman University of British Columbia

The Relation Between Aristotle's Physics and Biology
Byron Stoyles Trent University

Aristotle's Physics and Late Scholastic Philosophy
Daniel Novotny University of South Bohemia

Thomistic and Aristotelian Hylomorphism
Steven Balder St. Francis Xavier University

Joint session with the Canadian Philosophical Association / Session conjointe avec l'Association canadienne de philosophie.

12:00 - 13:30
Buch-A102

LUNCH SERVED AT:
ANNUAL GENERAL MEETING & HADDEN PRIZE CEREMONY
DÎNER SERVI À:
ASSEMBLEE GENÉRALE ANNUELLE & REMISE DU PRIX HADDEN

13:30 - 15:00
Buch-D323

SCIENTIFIC REALISM

Chair: **Brandon Holter**

Realism about Molecular Structures
Amanda Nichols Oklahoma Christian University
Myron Penner Trinity Western University

Realist Intuitions: Theoretical Virtues of Scientific Theories
Corey Mulvihill University of Ottawa

Human Inquiry, Presupposition, and Natural Structure
Josh Mozersky Queen's University

13:30 - 15:00
Buch-D312

MODELS AND MATHEMATICAL FOUNDATIONS OF SCIENCE

Chair: **Daniel Saunders**

Moving Between Models: How Our Ontic Commitments Allow Incompatible Models to Inform One Another
Eric Hochstein University of Victoria

Anti-formalism in Philosophy of Economics: Mathematical Foundations or Mathematical Style?
Patricia Marino University of Waterloo

19th Century Geometry and Physical Theory Testing
Lydia Patton Virginia Tech

13:30 - 15:00
Buch-D218

ANCIENT AND EARLY MODERN SCIENCE

Chair: **Sylvia Berryman**

Successions and Classics in the Thought and Discourse of Ancient Science, or, Why Were There 'Schools' Anyway?
Paul Keyser The Climate Corp. (Chicago)

A Complementary Scientific Approach to Eratosthenes' Calculation of the Earth's Circumference
Cem Erkli Simon Fraser University

The Roots of the Silver Tree: Alchemy and Final Causes in Boyle
Jennifer Whyte University of Pittsburgh HPS

13:30 - 15:00
Lasserre 102

OPEN SESSION: NEW RESEARCH IN THE HISTORY OF SOVIET SCIENCE

Chair: Eric M. Johnson (UBC)

A Science for Aerial Hygiene: Vladimir Riazanov and the Soviet Understanding of Clean Air
Christopher Burton University of Lethbridge

Warming Trend: Soviet Climate Science and State Policy
Connor Stewart Hunter University of British Columbia

Biosocial Boundaries, Abortions and Eugenics in Soviet Russia, 1920-1936
Alexei Kojevnikov University of British Columbia
Kirill Rossiianov Russian Academy of Sciences

Stranger Facts: Mass Scientific Literacy Campaign and Alternative Forms of Knowledge in the Post-World War II USSR
Alexey Golubev University of Houston

Joint session with the Canadian Association of Slavists / Session conjointe avec l'Association canadienne des slavistes.

15:00 - 15:30

COFFEE BREAK

15:30 - 17:00
Buch-D323

INQUIRY AND SCIENTIFIC PROGRESS

Chair: **Shuguo Tang**

The Dynamics of Reason, Conceptual Analysis, and Scientific Progress
Nicholas Ray University of Waterloo

Induction and Deduction in the Context of Pursuit
Molly Kao University of Montreal

Inductive and Deductive Reasoning in Discovering the Cause of Brownian Movement
Klodian Coko University of Western Ontario

15:30 - 17:00
Buch-D312

COMPUTATION: PHILOSOPHICAL AND SOCIAL PERSPECTIVES

Chair: **Zachariah Neemeh**

Cyborg Landscapes: Intersections of Technology and the Environment in the Late 20th and (Early) 21st centuries
Sophie LeBlanc University of Toronto

Algorithmic Egalitarianism: Alphabet is Building a City of the Future
Anna Artyushina York University

Agency, Action, and ACTION-IS
Zoe Ashton The Ohio State University

15:30 - 17:00
Buch-D218

HISTORY AND PHILOSOPHY OF PSYCHIATRY

Chair: **Sander Verhaegh**

Kraepelin's Psychiatry in the Pragmatic Age: Transitions from Germany to the United States
David Rattray Simon Fraser University

Revolutionizing Psychiatric Classification: Prospects and Problems
Nicholas Slothouber University of Western Ontario

Towards a More Fine-Grained Methodological Landscape of the Study of Human Behaviour
Ingo Brigandt University of Alberta

PLENARY LECTURES / CONFÉRENCES PLÉNIÈRES

INTERNATIONAL KEYNOTE SPEAKER (OPEN SESSION)
SATURDAY, JUNE 1, 17:00 – 18:30, BUCHANAN A-102

TWO APPROACHES TO SOCIAL EPISTEMOLOGY

Helen Longino Stanford University

Recently epistemologists have turned their attention to social dimensions of knowledge. Philosophers of science have been exploring the social dimensions of scientific knowledge for far longer. This talk explores the difference in degree of sociality that emerges from mainstream epistemology and that emerging from philosophy (and history) of science.

STILLMAN DRAKE LECTURE (OPEN SESSION)
SUNDAY, JUNE 2, 15:30 – 17:00, BUCHANAN A-102

DATA MADNESS AND QUANTIFIED HEREDITY

Theodore Porter University of California at Los Angeles

The inheritance of mental illness surfaced as a quantitative problem beginning as early as 1789. It was made possible as a focus of investigation in consequence of the subsequent internment of so many persons in large public institutions under the watch of doctors and psychologists. This talk documents some basic continuities between nineteenth-century statistical records of what was presumed to be inherited mental illness and the programs of data work on human heredity that took off about 1900. The new mathematical statistics did not eclipse these institutional statistical traditions, but perpetuated them. The sudden celebrity of Gregor Mendel's pea hybrids encouraged the false impression of a basic science of genetics that might then be applied, legitimately or not, to humans. Eugenics had been going on all along, though without the name. It was the stimulant and in many ways the source rather than a consequence or byproduct of emerging genetic science. Right up to the 1930s and beyond, in Britain and the United States as well as in German lands, institutional data on inheritance of mental illness and "feeblemindedness" provided the principal basis for genetic investigation on humans.

Abstracts for individual papers / Résumés pour les contributions individuelles

alphabetical by first listed author

The Return of Mind Design: Cognitive Science and the Turing/Ashby Debate

Darren Abramson and Erik Nelson Dalhousie University

While embodied understandings of the mind partly grew out of Dreyfus' critique of computational approaches, contemporary advocates of either side often seem to talk past each other. Differing metaphysical assumptions about the nature of the mind on both sides of the debate have led to conflicting standards for assessing theoretical merit. With proponents on either side claiming that their theories cannot be empirically evaluated (e.g. Di Paolo and Thompson claim that enactivist theories cannot be fully captured by mathematical or scientific models, while both Friston and Howhy claim that the free energy principle/predictive coding is tautologously true), a commensurable assessment of the competing theories is beginning to look impossible. In light of this, we examine a rarely discussed debate between Turing and Ashby that lies at the roots of both computational and embodied approaches to the mind. Like contemporary theorists, Turing and Ashby held contrary metaphysical views. But, both believed that empirical testing through mind design was an ineliminable part of understanding the human mind. It is therefore likely that, despite their differences, both Turing and Ashby would have been deeply interested in contemporary results emerging from machine learning. Based on this conclusion, we argue that procedures for evaluating the success or failure of contemporary machine learning (such as the Winograd Schema) provide an important ground for bringing the competing claims of embodied and computational theorists back into a productive conflict.

"The Oceans are Our Great Laboratory": Marine Science and Ocean Governance in the Anthropocene

Anthony Adler Carleton College

In this paper I examine debates surrounding the use of marine spaces in the 20th and early 21st centuries. Specifically, I describe a period of transition when oceans were reconceived from an environment that could be conquered and controlled, to something fragile, broken, and dying. To trace this shift I follow the work of two twentieth-century figures whose work falls on either side of this divide. The first is the American engineer Carroll Livingston Riker (1854 – 1931), the other is Elisabeth Mann Borgese (1918 – 2002), daughter of the Nobel prize-winning author Thomas Mann. Riker regarded the ocean as a simple system that could be harnessed and made to serve humanity, while Borgese depicted the oceans as complex, fragile, and under threat by humans. Although of the two, Borgese was by far the more successful in bringing her plans to fruition, each imagined oceans as terrain demanding a new international political regime. In the present, the ocean has become emblematic both of a natural world victimized by humanity and of nature's possible vengeance. I conclude with a discussion of the environmental cost of marine pessimism. When pseudo-scientific claims gain traction, it is because they appeal to emotions and longstanding narratives already associated with particular environmental spaces. And, as I show, "dying seas" narratives and imagery may actually hamper communication between scientists and the public.

Genetics and Evolution: Is There More to Life than This?

Tiernan Armstrong-Ingram University of California, Davis

Philosophers of biology often consider the ontological commitments implied by biological theories, models, and practices. Given the diversity and complexity of the biological sciences, a thorough examination of all the implied ontologies within biology would be impractical. Philosophers quite reasonably limit their examination to a sample of the biological sciences. Unfortunately, this sample has been unrepresentative of that diversity and complexity. Much philosophy of biology has been dominated by a focus on biological 'fundamentals': genetics and evolution. Only relatively recently have philosophers begun to consider ecology, for example. I argue that the 'fundamental' biological ontologies drawn from the prevailing narrow focus do not provide an adequate foundation for philosophical understanding of much of biology. The position I develop is partly informed by a year spent as an embedded philosopher among biologists specializing in animal behavior sciences. This diverse collection of biological fields includes behavioral ecology, traditional ethology, behavioral genomics, comparative cognition, animal welfare, behavioral endocrinology, animal communication, and so on. The implied (and applied) ontologies found in these active research programs are often unlike the ontologies described by philosophers, and the entities within their theories, models, and practices are not plausibly reducible to more 'fundamental' ones. The animal behavior sciences draw upon and inform theories, models, and practices within anthropology, conservation biology, ecology, neurobiology, psychology, physiology, veterinary science, wildlife biology, and zoology. The interconnected reliance on common theories, models, and practices among these sciences suggests that all of these fields need to be considered more thoroughly by philosophers, else our understanding of biology will remain woefully incomplete.

Algorithmic Egalitarianism: Alphabet is Building a City of the Future

Anna Artyushina York University

In this conference paper, I discuss Alphabet's first urban development project, which is planned to be built in Toronto, Canada. Conveniently located along the city's Eastern Waterfront, Sidewalk Toronto is going to be the first neighborhood powered by Google's technologies, and the biggest urban data repository ever known. The project authors have gone so far as to say that they want to use technology to fix the social and infrastructural problems of the city, such as social inequality, income segregation, and traffic. I explore the social imaginaries invoked by Alphabet in the City Hall, citizen engagement events, and the media. Drawing on science and technology studies (STS) and studies of digital inequality, I reflect on the possibility of addressing social challenges by means of technology.

Agency, Action, and ACTION-IS

Zoe Ashton The Ohio State University

A central question in the philosophy of computation is to provide a sufficient account of what it is for a system to compute. Intuitively, a system computes a function when it implements some program. Identifying extensionally adequate conditions is difficult in the face of triviality arguments. There are many responses to the triviality arguments; one of which is Copeland (1996) which relies on a notion of action. This notion of action identifies interpretations of a program that are honest. Only honest interpretations can be said to show that an entity computes. So triviality arguments are, at root, nonstandard and non-honest interpretations of the original program specification.

Copeland is not alone in invoking action when describing computation; stit logic does this as well. But the two notions of action need clarification since it seems unlikely that they are in line with a traditional, intentional sort of action. I will argue that, while Copeland's arguments fail to explain whether his notion of action is tenable, the entities he discusses do satisfy an account of minimal agency, and so an action based response to the triviality arguments can be given. While the focus of this paper is one type of response to the triviality argument, it also paves some way toward developing a notion of agency that can be employed in a number of areas, including stit logic.

Climate Change: a Consequentialist Perspective

Carling Bergquist Dalhousie University

This essay adopts a consequentialist perspective on the issue of anthropogenic climate change. I argue that consequentialism provides coherent action guidance for both individuals and collectives. Moreover, I argue that western society's popular conception of morality, what philosopher Shelly Kagan refers to as "ordinary morality," is largely responsible for individual and collective rationalization for continuing to act in ways that contribute to anthropogenic climate change by allowing self-interest to take precedence over the greater good of the international community. Consequentialism denies the prominence of self-interest by repudiating the existence of options – that is, by refusing to accept those rationalizations for acting in ways that fail to benefit the greater good in exchange for satisfying self-interest. In order to understand how collectives – in particular nations – should approach the issue of climate change, I propose nations adhere to Peter Singer's per capita approach. Finally, in order not to eschew the importance of individual actions that contribute to climate change, I close by engaging with Kagan and his consequentialist understanding of how individual actions do indeed make a difference in collective action cases, in particular the collective action cases of "triggering" and "imperceptible difference."

Troubled Translations: Science and Ethnoscience in Twentieth-Century Philippines

Geoff Bil New York Botanical Garden

Ethnoscientists play an invaluable role as exponents of biological and cultural diversity. This role has frequently been compromised, however, by the discipline's close association with powerful imperial and colonial interests. This paper examines this tension in twentieth-century Philippines, with emphasis on the researches of two individuals: Elmer Drew Merrill (1876-1956), the most prominent botanist of the early years of American colonization; and Harold Conklin (1926-2016), the preeminent ethnoscientist after Philippine independence. The two represent vastly different ethnoscientific paradigms. Merrill's primarily economic interest in indigenous botany, which took shape under the auspices of an aggressively expanding colonial bureaucracy, is epitomized in his encyclopaedic effort to catalogue the vernacular names for useful Philippine plants from Spanish-language sources. Conklin's research on Hanunó'o and Ifugao botanical classification, and on the connections between indigenous cultures and environmental knowledge, bolstered by facility in numerous indigenous languages, took shape in a vigorously nationalist postcolonial context. Yet the areas of overlap between the two men are equally intriguing: Conklin's work drew upon military aerial surveillance photography, for instance, and he promoted his Ifugao study as broadly relevant to projects of tropical "development"; while Merrill insisted on the ontologically stable character of indigenous plant classifications, and even patronized Conklin's early ethnoecological research. In probing these connections and contrasts, this paper attempts a finely

grained understanding of the spectrum of translational practices spanning apparently inconsonant frameworks for understanding differences between indigenous and Western patterns of environmental thought.

Writing the Histories of Japanese Science: The Case of the Neutral Theory of Molecular Evolution

Cédric Blais University of King's College

This paper will explore new ways of writing post-colonial science by examining the work of Japanese geneticist Kimura Motoo (1924-1994). Kimura shocked the scientific community in 1968 when he proposed his neutral theory of molecular evolution, which asserted that the evolution of DNA is mostly random and non-adaptive. This contribution to the nascent field of molecular biology helped re-define disciplinary boundaries and challenged Darwinism, opening the doors for pluralism in biology as its un-settled pan-adaptationism. In this paper I argue that although one can interpret the neutral theory as an extension of Western scientific progress, it is in fact evidence of complex inter-cultural transmission. Early twentieth century Japan was a rich site for un-conventional thinking about evolution, as biologists such as Hyata Bunzo, Imanishi Kinji, Shinoto Yoshito and Kihara Hitoshi explored various anti-reductionist and non-Darwinian approaches to evolutionary biology. As this paper will show, there is a direct historical link between these aspects of science in Japan and Kimura's focus on stochastic processes at the DNA level. These aspects of Japanese scientific research were integrated into mainstream science when Kimura's theory gained acceptance, thereby inoculating "universal" Western science with "peripheral" Japanese approaches to biology. This history of the neutral theory of molecular evolution is thus a powerful example of the limits of Euro-centrism in the history of science, suggesting that modern genetics is not simply Western but the product of cosmopolitan exchange and dialogue.

Negotiating History: Contingency, Canonicity, and Case Studies

Agnes Bolinska and Joseph Martin University of Cambridge

Objections to the use of historical case studies for philosophical ends fall into two categories. Methodological objections claim that historical accounts and their uses by philosophers are subject to various biases. We argue that these challenges are not special; they also apply to other forms of philosophical reasoning. Metaphysical objections, on the other hand, claim that historical case studies are intrinsically unsuited to serve as evidence for philosophical claims, even when carefully constructed and used, and so constitute a distinct class of challenge. We show that attention to what makes for a *canonical* case can address these problems. A case study is canonical with respect to a particular philosophical aim when the features relevant to that aim provide a reasonably complete causal account of the results of the historical process under investigation. We show how to establish canonicity by evaluating relevant contingencies using two prominent examples from the history of science: Eddington's confirmation of Einstein's theory of general relativity using his data from the 1919 eclipse and Watson and Crick's determination of the structure of DNA.

Towards a More Fine-Grained Methodological Landscape of the Study of Human Behaviour

Ingo Brigandt University of Alberta

Helen Longino has prominently argued that different approaches to the study of human behaviour cannot be integrated. She even maintains that these approaches are incommensurable, among other things because they parse the overall space of causal factors in a disparate fashion. While this addresses the importance of methodological differences, I argue that Longino neglects overlap among and potential integration between approaches. Articulating the study of human behaviour in terms of incommensurable, monolithic 'approaches' also neglects the methodological diversity within a research field. By considering for instance molecular behavioural genetics as one 'approach', Longino assumes that across a whole field one overarching approach is being adopted. This talk works towards a more fine-grained landscape of the study of human behaviour, by investigating research in terms of individual methodological and explanatory commitments, where a research group typically adopts several such commitments. This permits understanding methodological diversity within a field, and partial overlap between fields, which may enable coordination across fields. I illustrate this by a look at behavioural epigenetics, especially epigenetic approaches to psychiatric conditions. Epigenetics research can take the impact of the environment seriously. When investigating neuroplasticity and the role of the human social environment, this yields the potential for integration with social psychiatry. At the same time, the epigenetics community is heterogeneous, where one can also find researchers adopting deterministic perspectives (early established epigenetic marks determining later psychiatric symptom formation) or a focus on pharmacological means of modifying epigenetic marks, as opposed to behavioural-psychotherapeutic treatments. A brief look at epigenetic studies on the role of gender in psychiatric conditions likewise reveals different methodological stances.

Reasoning with Incompatible Theories

M Bryson Brown University of Lethbridge

Over time, scientists have established reliable principles for reasoning about a wide range of phenomena. This success is the principal motive for scientific realism, but a closer look at how these principles are applied points to a more pragmatic and pluralistic perspective. Scientific reasoning deploys concepts and principles strategically, applying them confidently to many

kinds of systems and circumstances where their reliability is supported by past success. But this practice raises logical worries when the results of reasoning in one context are used as input for reasoning in another even though the premises relied on in the two contexts are mutually inconsistent. *Chunk and permeate* models of such reasoning have been proposed for the old calculus, Dirac's delta function, Bohr's hydrogen atom and other examples.
Here we extend local chunk and permeate models to a *patchwork quilt* model of the pro-tem scientific world view, by combining chunk and permeate with a careful examination of how conclusions drawn in one patch are transformed when they 'permeate' into and are applied in another. Such transformations underwrite an acknowledgment of Kuhnian *incommensurability*, while showing how a pragmatic approach using *contextually constrained* translations can bridge the conceptual gap between distinct patches, leading to conclusions about systems and situations we lack fully consistent accounts of.

The Soviet Scientist as Inspector: the Communal Hygienists' Struggle to Regulate Industrial Pollution

Christopher Burton University of Lethbridge

The Soviet Union is widely understood to have been a health and environmental disaster but it also had one of the most advanced sciences in the world of environmental health, known as communal hygiene. To apply their sophisticated science, the communal hygienists created a framework to regulate anthropogenic threats to human health, most of all, the State Sanitary Inspectorate. This paper will analyze mainly the key period of the 1940s and 1950s, formative for both the science and its application in practice.
Often, the scientists and the inspectors were the same people and therefore had direct experience of the regulation of industrial polluters. The failure of environmental regulation became widely known in the glasnost' period of the 1980s and played a major role in delegitimizing the Soviet Union. With access to archival sources we now know that signs of this failure were clear decades earlier. The paper will explore the reactions of the hygienists as the application of their science started to go wrong in practice. At this early stage, they were more likely to blame individual polluters or shortcomings within the Inspectorate itself than to identify a structural problem with Soviet industrialism.

What Counts as Scientific Practice?

Ananya Chattoraj University of Calgary

The practice turn in the philosophy of science is the increase of philosophers of science analyzing entire practice of scientists rather than only analyzing scientific theories. Hacking's (1992, 44-50) list of elements in experimental practice, Chang's (2011, 206) list of mental and physical activities, and Waters' (2014 6 -7; 2018 CSHPS lecture) investigative matrix all allude to the tools that scientists have at their disposal. Roughly, these tools include theories, procedural know how, and investigative and modeling strategies. Given the practice turn, we should consider the entire matrix of scientific practice for metaphysical analysis. The practice turn has led philosophers of science to favour research in non-theory based scientific methods.
Reasoning or investigative methods and aims of scientists, however, change over time and across disciplines in many ways. In this presentation, I begin to outline how what counts as practice can change over time and across disciplines. For instance, technological development like computer simulations can highlight the importance of theories (Winsberg 2010) where previously, scientists may not have focused on theories. It is also the case that phenomena treated as theory in one discipline are regarded as solely a tool in another. Physicists and chemists may consider the quantum computer as a tool to model and simulate complex structures (Lanyon 2012), but for computer scientists, quantum computing is a paradigm theory that demands its own tools like new programming languages and hardware architecture. Examples like the above show that practice-oriented philosophers of science ought to account for the changing face of practice.

Inductive and Deductive Reasoning in Discovering the Cause of Brownian Motion

Klodian Coko University of Western Ontario

Brownian movement is the irregular movement of microscopic particles (of diameter around 10-3 mm) of solid matter when suspended in liquids. Although it was known throughout the 19th century, it was only in the end of the 19th century that the importance of this phenomenon for the molecular-kinetic hypothesis was recognized. Historians of science often express surprise and lament over the fact that Brownian movement did not play any role in the development and justification of the kinetic theory of gases. Related to this historiographical position is the claim that most of the 19th century experimental investigations on the cause of Brownian movement were of a somewhat lower scientific status than the later experiments which successfully established molecular motion as the unique cause of the phenomenon (Brush 1968, p. 1, Nye 1972, p. 9, Maiocchi 1990).
I present the historical complexities of the 19th century experimental investigations on the cause of Brownian movement and make sense of its late connection with the molecular-kinetic explanation. I claim that there was actually an extensive and sophisticated experimental work done on the phenomenon. Most investigators were fully aware of the methodological standards of their time and put much effort to make their work adhere to them. I distinguish two different kind of investigations. The first

used the Bacon-Herschel-Mill inductive strategy of varying the circumstances to identify causal factors. The second made use of the *Method of Hypothesis* and of the criterion of *Consilience of Inductions* as formulated by William Whewell.

The Evolution of Moral Belief: Support for the Debunker's Causal Premise

Michael Dale University of Texas at Austin

The causal premise of the evolutionary debunking argument contends that human moral beliefs are explained by the process of natural selection. While it is universally acknowledged that such a premise is fundamental to the debunker's case, the vast majority of philosophers focus instead on the epistemic premise that natural selection does not track moral truth and the resulting skeptical conclusion. Recently, however, philosophers have begun to concentrate on the causal premise. So far, the upshot of this small but growing literature has been that the causal premise is likely false due to the seemingly persuasive evidence that our moral beliefs are in fact *not* the result of natural selection. In this paper, I argue that this view is mistaken. Specifically, I advocate the Innate Biases Model (IBM), which contends that there is not only compelling evidence for an evolved cognitive capacity for acquiring and implementing norms but also for the existence of an evolutionarily instilled set of cognitive biases that make it either more or less likely that we adopt certain moral beliefs. I go about arguing for this in the following way. In the first section, I explain the evolutionary debunking argument and introduce my thesis. In the second section, I explicate the IBM, which consists of explaining what it would mean to have innate biases and a cognitive capacity that enables and encourages us to acquire and implement certain norms. In the third section, I show why previous arguments attempting to show that our moral beliefs are *not* the result of natural selection are unconvincing and in so doing present evidence and argument in support of the IBM. In the fourth section, I discuss how the differences between the IBM and Street's evolutionary account might affect her version of the evolutionary debunking argument.

Formalizing Causal Inference: Sewall Wright's Path Analysis in the Early Twentieth Century

Zili Dong Simon Fraser University

"Path analysis" developed by Wright in the 1920s had been ignored for decades before it was rediscovered. With a philosophical interest, I am curious why path analysis (more generally, causal inference) was so unwelcome in the early twentieth century biology. Hopefully, this discussion will shed new light on the philosophy of causality.

To make causal inference (from observations) possible, we should have both adequate *conceptions* and *formalisms* of causality. On the surface, the major obstacle in taking causality as a legitimate scientific topic in the early twentieth century was the prevalence of misunderstandings of the concept of causality: Wright's path analysis was rejected mostly based on Pearson's wrong positivist claim that causation was just correlation.

However, further investigations reveal a more complex story. First of all, path analysis is a model-based statistical method whose validity relies on the reliability of prior knowledge about biological mechanisms, but such reliability was not guaranteed in the early twentieth century. Secondly, causation in special sciences (biology) needs to be understood in a novel way differing from traditional views, but this idea was unavailable at that time. Thirdly, Pearson's "correlation-only" approach was not totally devoid of merit; in fact, it made statistics a normal science and greatly promoted the progress of statistics. In view of this, I argue that Pearsonians were at least partially justified in being overly skeptical to the practice of causal inference. I draw a further implication that conceptions of causality, the formalization of causal inference, and the accumulation of knowledge in sciences are interdependent and have to proceed simultaneously.

Machine Learning, Theory Choice, and Non-epistemic Values

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The aim of this paper is to support the claim that non-epistemic values are essential to assessment of hypotheses. Much of the current discussion of the influence of political, religious, and other non-epistemic values on empirical reasoning relies either on (i) illustrating how it happens in concrete cases, or (ii) discussing practical or politically loaded subject matters such as social science or biology. Such arguments are vulnerable to two objections. First, if non-epistemic values happen to influence reasoning only in specific cases, perhaps this only shows that people are sometimes imperfect; it doesn't seem to show that non-epistemic values are essential to reasoning itself. Second, if the specific cases involve subject matters with obvious practical or political implications, then one might object that non-epistemic values are irrelevant for subject matters that are theoretical and not politically loaded. This paper supports the view that non-epistemic values are essential to assessment of hypotheses, using a theorem from machine learning theory called the No Free Lunch theorem (NFL). If my argument holds, it supports the view that the influence of non-epistemic values on assessment of hypotheses is: (i) not (solely) due to psychological inclinations of human reasoners; and (ii) not special to practical or politically loaded areas of research, but rather is a general and essential characteristic for all empirical disciplines and all areas of inductive reasoning.

Bioethics' Project of Interdisciplinarity: Towards an "Argumentative Epistemology"

Catherine Dussault Laval University

Bioethics is a discipline of a scientific nature aiming to produce systematically norms about the intervention on the living. It could also be described as an "ethics" engaged in the finding of the "good" intervention to be made in a context of care, health or research. Despite its acknowledged heterogeneous nature, bioethics tends to its institutionalization as an "*interdisciplinary discipline*" and a "*specialization of non-specialists*" following a pedagogical and scientific organization of its own. Presenting the analysis of fifteen interviews conducted with professors, researchers or ethicists having or having had activities in the field of bioethics, this paper presents an empirical study of "interdisciplinarity", the genealogy of the concept – and the history of the difficulty – as experienced in bioethics. We then glance through the discipline's process of institutionalization, going with a certain critique of the "disciplinary" and a valorization of new "circles of conversations" transcending disciplinary, scientific and institutional boundaries. In order to thrive in the academic world whilst staying "pertinent" to ethical problem solving, bioethics and bioethicists try to innovate through rational and interdisciplinary discussion between (non)experts. Their "interdisciplinary" practices at the interface of ethics, politics, epistemology and medicine modify what could be considered as "ethics" or "science" and create, we argue, an epistemology of a new kind that we will name an "argumentative" epistemology. This will lead us in conclusion to a discussion about contemporary sciences and epistemologies, and the social and moral implications of ethics performed "empirically".

Mediation in Measuring the Pure Experience of Pain

Celia Edell McGill University

In this paper I argue that a pure subjective experience of pain exists prior to language and interpretation in order to investigate the possibility of accessing this experience. First I outline what I take to be the pure experience of pain. Second I consider two different approaches to measuring pain, one based on self-reporting and the other on fMRI scans, as well as the mediation involved in each to examine which factors affect our access to the patient's pure experience. Third I argue that *until* fMRI scans can detect and account for the emotional and subjective factors of pain, their access to pure experience will remain incomplete compared to self-reported measures. Fourth I complicate this by arguing that the limitations of mediating language and the possibility of misinterpretation by health care professionals may mean that future access to pure experience is better accessed and measured by objective means. In conclusion, both approaches to measurement currently offer imperfect access to pure experience; and based on their respective advantages and shortcomings, neither method should preclude the other.

Inductive Risk, Expected Utility, and the Consequences of P-Hacking

Adrian Erasmus University of Cambridge

P-hacking is the manipulation of research methods and data to acquire statistically significant results. The prevalent position on p-hacking is that it is epistemically questionable, and thus could have negative practical consequences. Such criticisms typically stress that because p-hacking increases false-positive report rates, its regular practice, particularly in psychology and medicine, could lead to policies and recommendations based on false findings. In this paper I articulate this position using two philosophical tools: expected utility theory and the concept of inductive risk. Despite the prevalent position, some claim that experimental methods associated with p-hacking play a legitimate role in scientific discovery. I argue that although it is usually the case that refraining from p-hacking entails more desirable practical consequences, there are conditions under which p-hacking is not as practically perilous as we might think. I use formal resources from expected utility theory and elements from the arguments surrounding inductive risk to articulate the precise conditions under which this is the case. One way to mitigate the purported harms of p-hacking is by requiring that researchers follow pre-registered study protocols. Using the tools from the first part of the paper, I suggest that there are conditions under which following pre-registered protocols can have more negative consequences than if researchers were less constrained. Finally, I argue for requiring transparency over constraint when it comes to the pre-registration of trials.

A Complementary Scientific Approach to Eratosthenes' Calculation of the Earth's Circumference

Cem Erkli Simon Fraser University

Eratosthenes (276 - 194 BC) is the Hellenistic scientist known for calculating the circumference of the earth by using the shadow of a sundial's gnomon. Today, he is commended for getting admirably close to the currently accepted circumference of the earth. In this paper, I examine Eratosthenes' experiment through the lens of integrated history and philosophy of science. By using a complementary scientific approach, I point out the conceptual difficulties involved in the instruments and measurements available to him at the time, and argue that his calculation is problematic on those grounds, even if the numerical result he obtained is close to the modern one. I emphasize the role of instrumentation in science, and argue for amending the historiography of geodesy in such a way that Eratosthenes' apparent accuracy is interpreted as the result of experimental error rather than pure scientific feat. Instead, we should be willing to interpret Eratosthenes' successors as improving on his calculations, even if their results seem to stray farther from the currently accepted value of the earth's circumference.

Medicine's Transparency Problem: What We Can Learn By Paying Attention to Attention Deficit Disorder

Vivian Feldblyum University of Pittsburgh

This paper argues that if medicine is committed to its status as a normative enterprise – deriving its norm of positive "health" from functionalism about parts and wholes – then it must be transparent and explicit about the role that social norms and values play in determining the overall "health" of an organism.

First, I will give an overview of what the terms 'norm', 'normal', and 'normativity' mean in the context of this paper. Second, I will explain the relationship between contemporary conceptions of health and function, arguing that medical normative judgments about the functions of parts of the body are always made in either explicit *or* implicit reference to medical normative judgments about the function of the whole organism. Third, I will consider the two camps in the contemporary debate on the definition of health: negative and positive accounts. I will argue that implicit in negative conceptions of health is a norm about 'living', whereas implicit in positive conceptions of health is a norm of 'living *well*', and that both of these norms commonly show up in medical practice. Fourth, I will argue that in some medical cases the norm of 'living well' is set not by physiology but by social norms, and that given medicine's commitment to normativity it is negligent and potentially dangerous to leave these social norms critically unexamined. I will make this argument by considering a case study where this potential for harm seems apparent: the diagnosis and treatment of attention deficit disorder.

Framing Territories, Making Borders: Photography in the Context of the Portuguese Missions of Border Delimitation (1890-1931)

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Photogrammetry enabled the emergence of precision cartography and a considerable number of the photographs produced by the Missions for Border Delimitation make part of photogrammetry's history. Photographic cameras and images were used as metric devices of territories. We are referring to eight missions of border delimitation in Angola and Mozambique, between 1890 and 1931, commanded by the Cartography Commission, an institution of the Ministry of the Foreign Affairs and Overseas. All documentation, including photographic albums, negatives and some prints, are now at the Overseas Historical Archive. Besides the photogrammetric uses, all missions have photographic albums portraying the succession of border signs with their geographical coordinates, certifying through photography their indisputable reality. Complementing the maps, these photos should not be simply viewed as documents of the border and an easier way to get immediate information about border coordinates. They are symbolically making the border. In the context of the so called Pacification Wars — wars led by the Portuguese authorities against the Angolan and Mozambican local tribes to occupy the interior areas of the colonies, after the 1885 Berlin Conference that divided Africa between the European colonial countries — these photographs are political gestures, property certificates. Each side of the border produced their own photographic albums. We also found among these, some group photos portraying the mission's chief personnel in each side of the border. They portray a certain kind of conversation circle without which borders were not built, and that also show conviviality among both factions. The Africans, however, are not in these official photos, nor are they included in these scientific and political conversation circles.

A Social Network and Text Analysis of Charles Darwin's Correspondence, 1835-42

Caroline Floyd University of Guelph

Popular and historical conceptions of Charles Darwin portray him as a lone scientific genius. My paper challenges this picture by using digital tools from the digital humanities to analyze the collaborative process and extensive production timeline of his theory of evolution. Drawing on material generously provided by the Darwin Correspondence Project at Cambridge University, my work characterizes him as a project manager figure identified through trends in his professional and personal communities. While traditional historical analysis has offered insight into Darwin's collaborative networks, my work adds to this by digitally re-creating the academic network surrounding Darwin's theory. I examined Darwin's correspondences from 1835-42, a period identified by historian Martin Rudwick (1982) as significant in the formulation of his theory. Using the visualization tool Gephi, I generated social network visualizations separately for hidden figure's, academic colleagues and family members for each year, and I used text-based analysis software (Voyant) to identify and compare key terms allowing identification of content within given letters representative of an individual's original idea.

My research suggests Darwin increasingly relied upon his London-Cambridge professional correspondence network for scientific communication between 1835-42, and used members of his family as sounding boards to test controversial elements of his theory. A shift in Darwin's internal perspective as a geologist to a naturalist is evident through the transition in terminology of his letters. Ultimately, my larger project will determine what social network and text analysis can tell us about the individual contributions of Darwin's correspondents to the development of his theory of evolution.

Duhem's Warning

Melanie Frappier University of King's College

As Buzzoni recently argued, the claim that Pierre Duhem opposed any appeal to scientific thought experiments must be qualified. Duhem conceded that thought experiments could play a legitimate role in science, but only if they remained under the authority of observation (Buzzoni 2018). For Duhem, it naturally followed that thought experiments that failed to meet this requirement had to be banished from physics as misleading fictitious experiments. His strict adherence to this principle fueled his criticism of the work of his contemporaries, notably Henri Poincaré's use of thought experiments to motivate the postulates of mechanics.
Duhem and Poincaré's disagreement was not merely academic. To modernize its scientific institutions, the French government had unveiled in 1902 a long-planned reform of its education system. Physics held an important place in the new curriculum as a paradigmatic inductive science, i.e., an experimental science whose postulates are abstracted by induction from experiments and, by extension, thought experiments (Hulin 2000). Duhem attacked the new curriculum as a poor imitation of Poincaré's methodology, especially given its reliance on fictious experiments that clouded students' minds with "a monstrous confusion of fallacies […]" (1991, 205). But it is not clear that Poincaré would have disagreed with Duhem on that last point. The simplified discussion of the nature of science the new curriculum offered could simply not avoid the use of fictitious experiments. Given our own reliance on propaedeutic thought experiments in introductory science courses, it will prove useful to reflect upon Duhem's warning against them.

Popular Science in India, c. 1830

Jason Grier Independent Scholar

Popular science in nineteenth-century Britain can be seen as a project of social improvement. The communication of scientific knowledge to the mass public, it was argued, would result not only result in greater economic output due to technological advancements, but would also lead to the moral betterment of the British people—especially the working classes. Imperialism in the nineteenth century was also framed in terms of the moral improvement of those who were being colonised. It is unsurprising, then, that there were efforts to use popular science as part of the imperial project. One particularly interesting example of this was the short-lived periodical *Gleanings in Science* (1829-1831), which was produced by the Asiatic Society of Bengal in order to cultivate the sciences in India. In this paper I will discuss the three volumes of *Gleanings of Science* in order to understand better how such projects fit in both the history of science popularization and the history of imperialism.

The Symmetry Principle and Post-Truth Politics: Taking the Strong Programme's Naturalism Further

Kinley Gillette University of British Columbia

A number of Science and Technology Studies (STS) scholars (e.g., Steve Fuller, Sergio Sismondo, Harry Collins, etc.) have recently debated whether STS can in any way be held responsible for the current "post-truth era." As it stands, Michael Lynch is likely right that there is insufficient historical evidence to establish a causal connection. Nevertheless, some research in STS—and, in particular, research that follows the Strong Program's symmetry principle—is compatible with, even if not causally responsible for, post-truth politics. The reason for the compatibility is that the symmetry principle, as proponents of the Strong Program use it, requires explanations of scientific belief formation to be social. Non-social causal factors are, accordingly, treated as explanatorily irrelevant even if causally present. Symmetrical explanations, so understood, while not necessarily intended to undermine scientific authority, nevertheless parallel many attempts to discredit science, insofar as they each try to explain the content of science exclusively by appeal to social factors, such as political ideology or the pursuit of further funding, thereby leaving no role for non-social "nature" in explanations of scientific stability. This is a problem, at the very least for non-epistemic reasons. I therefore propose a naturalistic alternative to the symmetry principle that is incompatible with post-truth politics but nonetheless in keeping with many of the Strong Program's naturalistic aspirations. According to this alternative, the question of symmetry is to be treated as an empirical question, and the findings of the sciences (which often concern non-social "nature") are sometimes to be used as explanatory resources in meta-scientific explanations. The alternative is thus an embrace of both the division of epistemic labour in science and selective interdisciplinary exchange between the sciences and meta-science.

Genetic Fantasy and Colonial Nostalgia: Backbreeding the "Native Breed" at Old Sturbridge Village

Elspeth Gow University of British Columbia

Beginning in the late 1960s and early 1970s, Old Sturbridge Village (OSV)—a Massachusetts living history museum that recreates a generic 1830s rural New England town—began a selective breeding program to recover what were historically referred to and revered as the New England "native breeds" of livestock. The program was intended to improve the historical authenticity of OSV's Pliny Freeman Farm program, as well as to preserve America's lost agrarian past as insurance against an uncertain future. In association with the United States Department of Agriculture and the Smithsonian, researchers at OSV travelled to various pockets of New Zealand, Australia, and Britain in search of genetic remnants of preindustrial English livestock; their hope was that they might reproduce, or "backbreed," these animals for their historical display.

This paper brings together critical animal studies, science and technology studies, and critical museology in order to trace the development of genetic science and biological experimentation within Old Sturbridge Village. In doing so, this paper will ask what kinds of fantasies, desires, and anxieties were invested in the body of the historical animal, and specifically in the "native" breed? By reading the correspondence, working papers, and interpretive manuals housed at the OSV archives, I suggest that more than an exercise in historical accuracy, the backbreeding program demonstrates how the animal body functioned as a surrogate for the physical and moral health of both the individual and the nation.

Emergence and Novelty in Evolutionary Biology

Yasmin Haddad McGill University

Standard evolutionary theory is successful in explaining how existing structures, such as the bone structure of mammals, change over time. It is significantly more challenging to explain how new structures, like eyes and turtle shells, emerge in the first place. Such changes are called morphological evolutionary novelties. They involve the emergence of a new morphological feature that cannot be traced back to its expected phylogenetic origins. In this paper, my aim is to understand if a general conceptualization of novelty is possible. To do so I will use the narrower case of how novelty can be explained in biology, more specifically regarding evolution. This challenge has been taken up in a growing body of literature in biology that focuses on the concept of evolutionary novelty (Brigandt and Love 2012; Erwin 2015; Gayon 2004; Moczek 2011; Pigliucci 2008). The motivation of this paper is point towards an initial definition of novelty, in the context of a more fundamental problem: the tension between continuity and discontinuity, qualitative and quantitative change in evolution.

My view is that a historical philosophical approach combined with an interdisciplinary analysis in light of recent work in the field of biology and evolution will synthesize a contemporary understanding of novelty. There is a fundamentally unique aspect in biology that contrasts it to other sciences: its object of study is living beings, as opposed to inanimate matter. This points to the fact that traditionally causal explanations that apply in physics and chemistry might have to be modified or understood differently in biology.

I argue that the concept of novelty seems to be a corner case where this is more evident. It is the forward-looking nature of evolution that makes the question of novelty especially challenging and worth investigating, and in this paper I propose a conceptualization of this notion through a historical perspective in the first part, and a contemporary analysis in the second part. I will also propose objections to my claims and respond to such objections in light of a specific example, that of the development of winglike structures in treehoppers.

Carnap on Formal Languages: Conversations with Russell and Gödel

Yousuf Hasan University of Western Ontario

In *Empiricism, Semantics, and Ontology* (1950), Carnap distinguishes between "internal" and "external" questions. Internal questions, for Carnap, arise within a language and are amenable to the ordinary methods of evidence relative to that language. In contrast, external questions should be understood as practical questions about adopting a language. While Carnap originally made this distinction to sanction talk of abstract entities as an empiricist (1950), he later extended his distinction to mitigate realist/instrumentalist disputes with respect to theoretical entities (1958, 1966/1974). For my talk, I consider Carnap's informal discussions with Russell and Gödel in the 1940's on using a theological language to speak about God. For Russell, Carnap seems to come very near a position that allows too much independence to language. According to Russell, such a view on formal languages may lead Carnap to mistakenly treat questions of fact, for example, "Does God exist?" as questions of adopting a language: "Shall we adopt a theological language that contains the word 'God'". In contrast, for Gödel, while Carnap may accept a theological language in principle in a way that is not merely a calculus, the main problem arises when Carnap dismisses such a language on grounds of being non-productive from the outset within a scientific community. I will relate both of their worries to a more recent criticism by Penelope Maddy, which is based on the reality of theoretical objects such as atoms. I suggest ways to circumvent these worries.

Moving Between Models: How Our Ontic Commitments Allow Incompatible Models to Inform One Another

Eric Hochstein University of Victoria

In this paper, I argue that the ontic commitments of working scientists play an essential role in guiding and regulating the construction and application of scientific models. These ontic commitments are either explicitly represented within the models themselves, or implicitly presupposed in the boundary conditions of the model, the background conditions of their application, and the inferences we draw from them. Moreover, identifying and keeping track of such commitments is key to addressing the current problem of a lack of integration and unity within scientific domains. In other words, when models make contradictory claims about the same system, we can still draw inferences across those models by identifying shared ontic commitments that are implicit in their creation and application. This allows us to find points of contact between incompatible representations that we can use as a bridge to move between models. We draw inferences across incompatible models by moving through the shared implicit ontic commitments that the models take on board. This explains how scientists use collections of disparate and

contradictory representations to generate a coherent understanding of a phenomenon without directly integrating the models themselves.

Science, Values, and Epistemic Standards: A Question of Sufficiency

Brandon Holter East Tennessee State University

Arguments against an epistemic role for values in science often rely on distinctions between epistemic contexts and non-epistemic contexts of discovery, application, or research that conceptually isolate values from judgments of epistemic justification. I argue that these distinctions do not secure a value-free epistemology for science because they lack a non-arbitrary method for determining conditions of justification.

Revealing the direct influence of values in historical episodes of scientific theory choice fails to undermine the value-free ideal because it is always possible that value-free standards of theory choice prevail in the context of justification. When theory choice presents inductive risks, as is often the case in medical and social sciences, value judgments indirectly influence theory choices by raising or lowering evidential standards. Because merely accepting or rejecting a theory poses no risk of harm without grounding some further action, however, some distinguish purely epistemic standards from evidential standards in contexts of application, where theories are accepted as justified for some practical purpose. Finally, in the context of particular research or experiments, evidential standards are often employed as provisional heuristics sensitive to pragmatic constraints on inquiry, rather than purely epistemic standards.

I argue that in each case, epistemic justification is conceptually isolated from the value-laden standards scientists actually employ, but only at the expense of established normative standards of justification, whether judged by sufficient evidence, consensus, reliability, or explanatory power. Even an inference to the best explanation requires the explanation be sufficiently justified, rather than merely the best of a bad lot.

Conditionally Independent Evidential Sources

Robert Hudson University of Saskatchewan

Is evidence for a hypothesis better if evidence is drawn from independent sources? An affirmative answer to this question seems obvious. But then this depends on how the question is understood. I examine here one way of answering this question occurring in Elliott Sober's *Evidence and Evolution*, but that also finds expression in justifications of the much-discussed Condorcet Jury Theorem. What I show here is that this approach to defending the value of independent evidence leads to a counter-intuitive result that exposes an inherent flaw in this approach. To begin the paper, I explain the difference between conditional and unconditional probabilistic independence. With this distinction in mind, I recount Sober's argument showing that diverse, conditionally independent (though unconditionally dependent) evidential sources provide better support for a hypothesis than using the same evidence repeatedly. What I show, in response, is that Sober's form of argument can equivalently be used to demonstrate that the same evidential source, used again and again at different times, can also produce conditionally independent evidence, and so can generate a similar form of evidential boost. Intuitively such an evidential boost should not occur, and so we have a *reductio* of Sober's argument. A similar problem, I argue, attends the standard proof of the Condorcet Jury Theorem, a theorem that aspires to prove the special epistemic advantage of democratic decision making by probabilistically independent voters. My conclusion is that the benefit of independent evidential sources needs to be justified differently.

Sending Knowns into the Unknown: Towards an Account of Positive Controls in Experimentation

Rebecca Jackson Indiana University

Although experimental inquiry has received due attention in the last 30 years or so, surprisingly little has been written specifically about the history and philosophy of experimental controls. This paper offers a preliminary analysis of how positive controls function in experimental practice, using historical and contemporary examples from medical and life sciences. My aim is to generate a typology from a philosophy of measurement perspective, differentiating types of controls according to the epistemic role played by controls in the measuring process within the experiment or assay. This perspective provides a meaningful distinction between two types of positive controls, *extrinsic controls* and *intrinsic controls*.

Extrinsic positive controls are used to create a scale of comparison for interpreting results from an unknown intervention; a trial with a known intervention is conducted in order to compare results with that of the unknown intervention, which is performed in a separate experimental environment. Intrinsic positive controls play a very different role: ensuring that the experiment itself is operating as expected. They can be used for calibration of the experimental conditions, validation of instruments or indicators, and debugging during the design of the experiment or assay. As such, intrinsic controls share an experimental environment (or some aspects of the experimental environment) with the independent variable under study. The typology developed in this paper is general enough to apply to cases outside of life sciences, and has the potential to inform discussions on how to improve both internal and external validity for studies in social sciences.

Induction and Deduction in the Context of Pursuit

Molly Kao University of Montreal

John Norton's fundamental insight into the justification of inductive inferences is that all existing frameworks that purport to account for the structure of such inferences rely essentially on local, material facts. He thus argues that such frameworks, while perhaps useful in particular contexts, are the wrong way to approach the justification of induction more generally. In this talk, I will argue that Norton overstates the differences between the roles of deductive and inductive systems of logic, and that paying closer attention to the notion of theory pursuit can help us better understand their parallel roles. I will thus begin by presenting some examples of our evaluation of deductive and inductive inferences in the context of scientific inquiry, with a particular emphasis on their similarities. While recognizing the fact that there are certainly valid forms of deductive inference, I argue that the legitimacy of an empirical deductive inference is no more based solely on its structure than an empirical inductive one. Based on this comparison, I will suggest that we should characterize the role of these patterns of inference as indispensable guides to the determination of the pertinent local facts for a given inference.

Successions and Classics in the Thought and Discourse of Ancient Science, or, Why Were There 'Schools' Anyway?

Paul Keyser The Climate Corp. (Chicago)

Fellowships of belief and practice were the circles within which ancient scholars studied and preserved texts, student succeeding teacher. Fellowships nurtured conversations and produced concepts and theories that ensured the survival and relevance of their core texts. Those texts were the "classics" of their successions, and inspired successive teachers to produce adapted interpretations as the conceptual context of the lineage evolved. Students swore to uphold the lineage and practice of the teacher, then memorized their core texts and produced commentaries upon them.

That structure is found in China from the early Han dynasty, and also in the Sanskrit Vedic intellectual tradition. The same "classicizing" approach pervades the Greco-Roman intellectual tradition, where the successions of Plato, Hippocrates, and Aristotle, as well as Pythagoras and Epicurus, revered their founders as inspired. Lineages often regarded their founder as the true author of their received tradition, however altered it had become. However, privileging the founder of a lineage portrays history as a process of decay, which produces cognitive tension when the core text concerns science.

Ancient successions, dedicated to preserving a "classic" and its attendant re-interpretations, eschewed dissent and development, and valorized continuity. That outlook limits how greatly successions could conceptualize or instantiate innovation: indeed, Chinese and Sanskrit lineages were strongly preservative. Nevertheless, interpretive communities can and do innovate. Greek successions whose core texts were scientific confronted the preservative pattern: they transgressed their boundaries, and transformed their traditions. It was before their corpora became "classic" that Greek sciences were most creative and innovative.

Explanation and Effective Field Theories

Martin King Rheinische Friedrich-Wilhelms-Universität Bonn

Since the Higgs boson discovery in 2012, there have been no indications of physics beyond the standard model (BSM). Concrete BSM models have been pushed to the edges of their parameter spaces and as a result model-independent approaches, such as effective field theories (EFTs), have become increasingly popular in particle physics. The EFTs employed in new physics searches at the Large Hadron Collider (LHC) are what are known as bottom-up EFTs and are quite distinct from the top-down EFTs that have been more thoroughly treated in the philosophical literature. The aim of the paper is to examine the role of bottom-up EFTs, in particular the Standard Model EFT (SMEFT), in potentially explaining new physics. The paper argues that, in distinction from top-down EFTs, the SMEFT has the following three features that harm or prevent its ability to explain new physics. First, the higher-energy theory of which it is an approximation is not known and so it cannot be understood as an abstract or idealised model. Second, it has a large number of operators that obscure any explanatorily relevant information and can be reduced only by external considerations. Third, even if it successfully captures deviations from the SM, the SMEFT will primarily be used by physicists to guide the construction of further BSM models that may explain the physics behind the deviation. Thus, top-down and bottom-up EFTs are sufficiently distinct that they should be considered separately for questions of explanation.

The Epistemological Motivations Underlying the Narrative Ordering of American Ornithology

Caroline von Klemperer Simon Fraser University

Widely recognized as one of the greatest American ornithologists, Alexander Wilson (1766-1813) wrote and illustrated *American Ornithology*: a nine-volume collection containing illustrations and descriptions of birds found in the United States. The collection was pioneering and precedent-setting: it was both the first comprehensive work on birds of the US as well as the first comprehensive work of American natural history. When the collection was originally published, Wilson chose to organize it in an unconventional manner. Rather than place the chapters in a taxonomic arrangement, he ordered them in a narrative sequencing: the books followed the trajectory of his travels. Many subsequent publications of *American Ornithology* reorganized the chapters to adhere to a taxonomical sequencing.

In this paper, I uncover and analyze Wilson's motives behind the choice to place the chapters of *American Ornithology* in a narrative ordering. First, I unpack how the narrative ordering was fueled by two of Wilson's convictions, both of which expressed a scientific conscientiousness around epistemological concerns. I then demonstrate that Wilson had epistemological worries about taxonomies in general, which may have motivated his wanting to avoid a taxonomic sequencing. Next, I evidence the idea that Wilson thought science should be accessible to a diverse audience: he employed a narrative ordering to broaden the accessibility and appeal of his scientific work beyond specialists. I also point to the ways in which these considerations are epistemological in nature. Finally, I lay the groundwork for future research by unpacking reasons underlying some of the reorderings of Wilson's work.

Archaeological Interpretation as Iterative Process

Kristin Kokkov University of Tartu

The process of archaeological research consists of three different layers of interpretation, which proceed from the present material remains towards understanding and explaining the past events:

1. the layer that interprets material remains as elements of archaeological record;

2. the layer that interprets the archaeological data into evidence about the past events;

3. the layer that interprets the claims about the past and offers explanations about the past historical-cultural context.

These three layers of interpretation describe different stages how archaeologists build up theories about the past cultural context. Different features of traces of the past are interpreted repeatedly, building different layers of interpretation upon each other.
Interpretation of the past is an 'iterative bootstrapping: building on empirical and conceptual foundations that are known to be tenuous, and rebuilding them as inquiry proceeds' (Chapman and Wylie 2016, p. 134). Thus, all the aspects of interpretation are interrelated so that the results of the interpretation of one aspect influence the understanding and viewpoints of other aspects of interpretation.
The aim of this paper is to distinguish and explain the structure of each interpretational layer in detail and explain why it is important to ascertain the iterative structure of archaeological research.

Cyborg Landscapes: Intersections of Technology and the Environment in the Late 20th, and 21st, Centuries

Sophie LeBlanc University of Toronto

In this presentation, I'll consider the notion of the cyborg, extended to the study of landscape in the history of technology. The term "cyborg", as a human (or animal)-machine organism, emerged from cybernetics and human-machine discourses in the 1950s and 1960s. Donna Harraway adopted this term in the 1980s and 1990s, presenting the cyborg as a boundary transgressor; a figure which may "suggest a way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves" (Harraway, 1985, 1991). In recent decades, scholars of landscape architecture, urbanism and geography have spoken of the city as a cyborg (Swyngedouw, 1996), of cyborg urbanization (Gandy, 2005), or of cyborg landscapes understood through the interactions between infrastructure, ecology and society (Lokman, 2017). These works all suggest the cyborg as a powerful figure, opening the door to a hybrid understanding of nature and technology. Drawing from these discussions, I develop a framework for thinking of cyborg landscapes which contextualizes sites of interest within urban infrastructural processes and broader ecological systems, establishing their roles as interfaces for land use and technology. A specific case-study is examined: the re-development and greening of the Ile Séguin, Trapèze and Pont des Sèvres industrial lands in Boulogne-Billancourt, France.

The Limits of Imperial Influence: John James Audubon in British North America

Debra Lindsay University of New Brunswick

John James Audubon devoted the last half of his life to natural history, often travelling in search of both specimens and subscribers for *Birds of America* (1827–1838) and *Quadrupeds of North America* (1845; 1846–1854). Because British support during the 1820s and 1830s proved critical to the financial success of *Birds*, it was not unreasonable to assume that similar support might be found in British North America, and Audubon went to the British colonies on three occasions: In 1832 he went to New Brunswick, a year later he went to Labrador/Newfoundland, and in 1842 he went to Canada (now Quebec and Ontario). Each expedition combined the search for specimens and information with efforts to acquire the subscribers necessary to underwrite his projects, and this paper examines (1) how Audubon attempted to advance his agenda by leveraging connections established previously among the British elite, and (2) why a strategy of entrepreneurialism buttressed by patronage did not work in the colonies. Never passing on an opportunity to promote his work to potential subscribers, Audubon realized very modest returns in BNA, and this paper examines why the strategy that had worked so well in Britain, failed spectacularly in the colonies.

Taking Values Seriously: Climate Services and Inductive Risk

Greg Lusk Michigan State University **and Wendy Parker** Durham University

With the effects of climate change already manifesting, there is a growing interest among stakeholders to incorporate the foreseeable impacts of climate change into decision-making. Doing so is often not easy: climate-related information rarely comes in a form that allows stakeholders to anticipate and address impacts, especially on local scales. The job of an emerging area of climate science, dubbed climate services, is to make climate data useful by providing "scientifically-based information and products that enhance users' knowledge and understanding about the impacts of climate on their decisions and actions" (AMS Policy Statement 2015). Scientists recognize that to be most effective, climate services should be responsive not only to the basic information needs of users, but *also to users' value systems and decision frameworks.* How this responsiveness should be addressed in practice however, has not been articulated.

We argue that one way user values can be incorporated into climate services is in the management of inductive risk. This involves understanding which errors in climate service products would have particularly negative consequences from the users' perspective (e.g. underestimating rather than overestimating the change in an impact variable) and then prioritizing the avoidance of those errors. This essay shows how inductive risk could be managed in a way that serves user values at various points in the provision of climate services and identifies some of the potential benefits and risks of doing so.

On the Mistaken Image of the Behavioral Sciences Prevalent in Policy Contexts: Insights from the Feminist Philosophy of Science

Magdalena Malecka Stanford University / University of Helsinki

Insights from the behavioral sciences are reshaping public policy (Jones, Pykett & Whitehead 2013) and are used in diverse policy fields such as health and environmental policy, consumer protection. The behavioral policy units have been established worldwide, e.g. in the UK, US, France, Singapore, at the OECD, at the European Commission.

Proponents of the application of the behavioral sciences to policy believe that behavioral research provides the scientific evidence needed to design effective policies (Thaler & Sunstein 2008; Shafir 2012). In particular, they claim that a subset of the behavioral sciences (cognitive psychology and behavioral economics) they rely on offers an 'adequate', 'accurate', or 'realistic' account of behavior and therefore it should be a basis of policy design. However, this image of the behavioral sciences is mistaken.

My analysis builds upon Longino's most recent book (2013). The type of incommensurability that Longino demonstrates (and that characterizes most behavioral research, as I argue) calls into question the idea that there are epistemic reasons for treating some of the approaches within the behavioral sciences as the 'adequate', or 'accurate' ones. Hence, the justification for using some findings from the behavioral sciences in policymaking is questioned. I also bring insights from the feminist philosophy of science and of economics (Anderson 2002; Nelson 1996; Becchio forthcoming) in order to challenge the widespread view that behavioral science (especially behavioral economics) offers a more 'realistic' view on human agency. I then show what the implications of my analysis are for policy relevance of behavioral science.

Anti-formalism in Philosophy of Economics: Mathematical Foundations or Mathematical Style?

Patricia Marino University of Waterloo

This paper draws on work in philosophy of logic and mathematics to consider debates over the use of mathematics in economics. In a series of recent publications, Vela Velupillai and co-authors Thomas Boylan and Paschal O'Gorman argue that classical mathematics is inappropriate for use in economics and that constructive methods, such as numerical ones, should be adopted instead. Velupillai says that using non-constructible fixed-point theorems to prove equilibrium results where a equilibria cannot be directly computed is an "unnatural" and "ineffective" use of mathematics; Boylan and O'Gorman characterize non-computable results as rendering explanations "economically vacuous." I consider 1) whether, and how, their arguments apply to economics in virtue of its status as a social science, 2) how work in foundations of logic and mathematics bear on these claims and 3) what lessons we might apply from the history of proposals for non-classical "quantum" logics. I use Roy Weintraub's (2002) distinction between formalism in foundations and formalism as axiomatization and Penelope Maddy's (2002 and 2007) view of classical logic as an idealization to argue that the relevant anti-formalism is best understood not as arising from issues in foundations of mathematics, but rather in terms of the appropriateness of different mathematical methods, with particular attention to empirical adequacy. This contributes not only to our understanding of the application of mathematics in social science, but also to our evaluation of recurring claims, such as those of Stephen Pattern (2004), of economics as being too formalistic.

Breaking Barriers to Ethical Research: An Analysis of the Effectiveness of Nonhuman Animal Research Approval in Canada

Letitia Meynell, Macgregor Malloy and Caroline Vardigans Dalhousie University

While philosophers of science are now well-versed in the ways that values inform and constrain the sciences, analyses of ethical and epistemic failures in specific scientific institutions remain relatively under-explored. Our paper examines a particular site--research using nonhuman animals in Canada--where, we argue, the body that regulates scientific activity has procedures that cannot be expected to meet their avowed ethical commitments.

The Canadian Council on Animal Care (CCAC) is the national regulating body for publicly funded research using nonhuman animals in Canada. For an institution to be considered CCAC compliant they must have an internal committee charged with evaluating all research proposals for their scientific merit and compliance with 3R principles of replacement, reduction, and refinement (an internationally accepted standard for ethical research using animals). The most important tool employed by committees to fulfill this task is the "Animal Use Protocol" (AUP) form.

We have evaluated fourteen AUP forms released by the U15 universities to identify the extent to which they advance or even conform to the 3R framework. Our results find both isolated and widespread deficiencies that not only increase the likelihood of unnecessary harm to animals in research but also needlessly impair scientific progress. In our presentation we will explain the internal logic of the 3R framework and show how many of the AUP forms as currently written cannot forward the ethical mandate of the CCAC. This stands as a case study of how a lack of ethics literacy in science can impede effective and efficient regulation.

Empirical Adequacy Debugged

Michael Miller University of Toronto

Empirical adequacy is a well-cherished theoretical virtue. In this talk I will argue that despite this, we do not yet have an adequate account of when a theory properly counts as being empirical adequate. I will show that the presently accepted account is global in that it treats all of the observables of a theory uniformly, and timeless in that it considers hypothetical comparisons between theory and experiment at the end of inquiry. I will argue that instead, our notion of empirical adequacy should be local and dynamic. That is, it should consider individual observables, and it should reflect the types of changes that occur in comparisons between theory and experiment over time in actual scientific practice. I will illustrate the superiority of this conception of empirical adequacy by considering the history of a precision test of quantum electrodynamics.

Analysis of the Rise of Deep Learning from a Philosophy of Science Perspective

Smitha Milli and Ravit Dotan University of California, Berkeley

In recent years, there has been a boom in *deep learning*, a term coined in 2006 for a family of machine learning models known as neural networks. The goal of this paper is to analyze the growing popularity of deep learning from a philosophy of science perspective. Our project is both descriptive and prescriptive. We show how the rise of deep learning can be described using traditional philosophy of science terminology, mainly drawing from Kuhn and Lakatos, but also evaluate the extent to which it was justified. In particular, we identify a pivotal event in the process of the acceptance of deep learning – the 2012 Imagenet challenge. Imagenet is a well-known computer vision competition. In 2012, a deep learning model did better than all the rest in the competition. After that point, deep learning quickly became the predominant framework for learning algorithms as more and more researchers adopted it. We argue that the 2012 Imagenet competition can be conceived as a "crucial experiment" and catalyzed a process reminiscent of a Kuhnian paradigm shift. We discuss what terms such as paradigm, auxiliary hypotheses, and experiment mean in the context of context of machine learning and the extent to which the transition into deep learning was justified.

Human Inquiry, Presupposition, and Natural Structure

Josh Mozersky Queen's University

An essential component of external, or metaphysical, realism is the thesis that the world is, largely, independent of human thought and inquiry. A certain sort of antirealism argues that, on the contrary, what there is depends on, or is relative to, human investigation: there is no way the world is independent of our ways of describing it. In this presentation I argue that the very fact that we engage in some kinds of inquiry entails that at least some structure exists independently of all inquiry. In short, the existence of inquiry supports the independence portion of realism; the assumption that what there is depends upon human inquiry is, in the end, self-undermining. I end with an examination of the significance of this conclusion by comparing it to the views of some of the most prominent philosophers of science of the past half century.

Realist Intuitions: Theoretical Virtues of Scientific Theories

Corey Mulvihill University of Ottawa

Kuhn asserted that the “criteria or values deployed in theory-choice are fixed" and are “unaffected by their transition from one theory to another" (Kuhn 1977). The discussion of what these values are and how they should be categorized continues to the present day (see Kuhn 1977, McMullin 1983, 1987, 2012, 2014, Laudan 1984, 2004, Lacey 1999, Douglas 2009, 2013, and Keas 2017). Some have argued fixed criteria implies scientific realism (see e.g. McMullin 1996) others anti-realism (see e.g. Laudan 2004). This paper will argue that the fixed nature of these values implies at least some realist intuitions.

This paper's argument is an extension of Michael Dummett's that the realism debate in any area of philosophy can best be understood as a debate over philosophical logic (Dummett 1991) — that realism is assumed when classical logic is accepted, and intuitionistic logic is correct for anti-realist domains (Dummett 1992 & 1993). We extend this by arguing that we can determine whether a domain is realist to a great or lesser degree by asking if we accept certain superintuitionistic axioms in that domain. Comparison by reference to certain fixed criteria does not presuppose classical logic — one theory is not definitely true, making all others false — but fixed values do describe a non-relativistic multi-dimensional property of theory quality. Superintuitionistic logics, where linearity $(\alpha \rightarrow \beta) \vee (\beta \rightarrow \alpha)$ holds, model well such properties (see Horn 1969, Mulvihill 2015, DeVidi and Mulvihill 2017) and since stronger logics imply stronger metaphysical claims, we argue that acceptance of fixed criteria for theory evaluation implies an acceptance of at least a degree of realism.

Against a Force Theory of Evolution

Todd Nagel University of Western Ontario **and Aleta Quinn** University of Idaho

We identify a strength and some weaknesses of ZEFL. We argue that the strength is that in some situations, that a population is at HW equilibrium requires explanation. HW equilibrium is not always the default frame of reference. The weaknesses derive from the fact that in other situations, the default frame of reference does not include the occurrence of drift. We argue that the insights of ZEFL are better captured by this relativity of explanation framework, which sheds light on inconsistencies in the treatment of “forces”. We identify three such inconsistencies, two of which have not previously been noted. We conclude that philosophers should abandon the idea that there is one unique, privileged set of forces that counts as the Theory of Evolution.

Changing Explanatory Strategies in Structural Biology: an Example from Protein Allostery

Jacob Neal University of Pittsburgh, HPS

Allostery describes the process whereby ligand binding at one site on a protein transmits an effect to another distal site. Ever since its discovery in 1961, allostery has remained an important topic within structural biology because of its role in cell regulation. However, the concept has changed drastically since Jacques Monod and his colleagues first characterized it. This paper aims to recount the conceptual evolution of allostery over the past 50 years. I argue that the concept has evolved in three stages. First, from the late 1950s to the early 1960s, allostery was a population-level phenomenon, closely tied to biochemistry and heterodox enzyme kinetics. Then, starting in the early 1960s and extending to the mid-2000s, allostery became a feature of individual protein molecules with special structural and conformational properties. The final stage in this conceptual evolution, which introduced the ‘ensemble nature of allostery’, began in the mid-2000s (Motlagh et al. 2014). Creager and Gaudilliere (1996) have offered an explanation for the first historical transition based on the complex interplay between theory and experiment, and it is the primary aim of this paper to characterize the second transition and offer an explanation for it. I aim to show that the driving forces behind this conceptual shift from the structural-mechanistic view to the ensemble view were twofold: (1) the mounting body of anomalies that could not be explained by any of the structural-mechanistic models of allostery and (2) the increasing recognition that protein dynamics play an important role in protein structure and function.

Representationalism in Affordance-Based Robotocs

Zachariah A. Neemeh University of Memphis

The perpetually shifting nature of the environment poses a significant challenge to robotics research. Representational architectures limit autonomous agents’ capacity to rapidly and efficiently adapt to these dynamic conditions. Problems arise with the bandwidth, processing power, computational time, and programming time required to represent shifting environments. Nonrepresentational, affordance-based architectures have been proposed to overcome these difficulties. They do not rely on separate layers for perception, action, and planning. Instead, they offload part of the computational process onto the environment itself through affordance-perception. Natural affordances, like the graspability of a handle, are embedded in the basic informational structure of the immediate environment. The affordance arises as the agent interacts with the object and is an opportunity for action that is highly constrained by the agent’s form of embodiment.

However, one of the largest difficulties in implementing affordance perception has been perceiving *cultural* affordances. These are affordances that implicate background knowledge that is culturally mediated. While the graspability of a handle can be modeled as an online, dynamical interaction unfolding between the agent’s sensorimotor processes and the object’s properties, the mail-ability of a letter, for example, implicates a vast background knowledge of letters, the postal service, writing, and interpersonal communication. Most applications of cultural affordance perception have hence reverted to representations to

handle these aspects. I critically review extant AI implementations of cultural affordance perception and sketch a framework for perceiving cultural affordances with minimal recourse to representations. I argue that a robust representationalism is not conceptually necessary for cultural affordance perception.

Realism about Molecular Structures

Amanda Nichols Oklahoma Christian University **and Myron Penner** Trinity Western University

Since the beginning of the 19th century, chemists have represented molecules with various figures and shapes, and later, chemists moved to three dimensional objects with a particular orientation in space. While there have been evolving models of the chemical bond, many chemists think that molecular models as depicted by contemporary chemistry, are true or approximately true representations of molecular structures (Hendry, 2012). However, some argue that quantum field theory provides a powerful objection to realism about molecular structures. In our paper, we set out to do two things. First, we outline the basic contours of the standard chemical theory of molecular structures, or "structure theory." We explore some of the heavy lifting done by structure theory, including applications in molecular symmetry and molecular orbital theory. We conclude this section by arguing that structure theory and its applications provide a strong, empirically informed philosophical argument for "molecular realism." Second, we consider an objection to molecular realism based on quantum theory, specifically the Born Interpretation where the amplitude of the wave function of a system is interpreted as a probability distribution. Some philosophers and scientists have considered the implications of quantum theory to object molecular realism (Dawid, 2018; Chang, 2016). However, we argue that uncertainties about orbitals and the precise natures of subatomic particles does not undermine the plausibility of molecular realism. More specifically, we argue that our current understanding of molecular symmetry provides strong evidence for molecular realism that is able to withstand objections to realism based on quantum theory.

19th Century Geometry and Physical Theory Testing

Lydia Patton Virginia Tech

A leading narrative of the late nineteenth and early twentieth century in geometry (Gray, Torretti, others) emphasizes the increasing security of geometrical reasoning and demonstration, including the ability of mathematicians to construct gapless proofs that need not be supplemented by "intuition". This security goes along with the increasing independence of geometry itself from physical theory and from observation.

Nonetheless, as Hilbert and Lakatos observe, when geometry is applied in physical theories, the axiomatic method that provides security and independence in geometry itself allows for the counterintuitive and counterfactual application of geometry. The increasing independence of geometry from physical theory makes geometry a valuable engine of theory testing, as a source of counterexamples, hypothetical models, and no-go results. Moreover, in applied contexts there is the increasingly pressing question of representation, that is, the problem of how to represent a physical problem formally so that it is tractable.

My first aim in this paper is to trace how geometry is used at this time, not just as a source of demonstrative proof within geometry itself, but also as part of a framework for counterfactual reasoning and for theory testing. I emphasize the importance of the development of analytic geometry and group theory, and the significance of the beginnings of the model-theoretic tradition. The paper concludes with a brief exploration of how developments in applied geometry affected methods of problem-solving, and of how the problems that arise drive research in the field over the twentieth century.

Can Quantum Mechanics Unfreeze Time?

Kent Peacock University of Lethbridge

Since the days of Parmenides and Heraclitus, natural philosophy has been deeply divided about time and becoming. Heraclitus spoke obscurely of nature as "an everlasting fire". Parmenides, by contrast, argued that we could only consistently think of reality as an unchanging One. Many modern thinkers support an updated version of the Parmenidean picture, informed by special relativity. Hermann Weyl stated, "The objective world is, it does not happen". On the other hand, David Bohm argued, "Movement is fundamental and time is an order which we derive." Many indigenous traditions see the natural world as inherently dynamic. Lee Smolin argues that "quantum theory and relativity are deeply wrong about the nature of time … we have to find a way to *unfreeze* time." But it is difficult to capture the notion of dynamism in a formula. I am exploring the possibility that quantum mechanics may rule out the block picture. The Bell-Kochen-Specker theorem demonstrates that the statistics of entangled states cannot be represented by a Boolean property structure. It is not in general mathematically possible to consistently assign truth values to all possible propositions about quantum systems. If we follow Tim Maudlin's suggestion that the block universe is the claim that there is a "single determinate" truth-maker statements about all possible events, then the non-Booleanity of quantum mechanics is in *prima facie* conflict with the block theory because there cannot *be* such a truth-maker. I will explain this line of argument and explore its implications.

Taxonomic Responsibility

Aleta Quinn University of Idaho

The rapid proliferation of data and methods used for species delimitation has exacerbated taxonomic instability. I analyze challenges to effective species delimitation using recent philosophical work, arguing that problems must be understood at an institutional rather than individual level. I then argue that the General Lineage Concept, on its own, does not suffice for species delimitation. This does not mean that species are not "real". It does mean that some empirical cases are genuinely ambiguous. The power of genome-scale data and computational methods has accelerated the discovery of ambiguous cases. In all, I aim to provide a framework for further work on the concept of taxonomic responsibility.

Kraepelin's Psychiatry in the Pragmatic Age: Transitions from Germany to the United States

David Rattray Simon Fraser University

The movement of a pendulum is often used as a metaphor to represent the history of 20th century American psychiatry. On this view American psychiatry evolved by swinging back and forth between two schools of thought in constant competition: somatic accounts of mental illness and psychodynamic ones. I argue that this narrative misconstrues the actual development of American psychiatry. Instead, a careful study of German and American psychiatry at the turn of the 20th century reveals a smooth transition from German biological accounts of mental illness to American psychodynamic approaches. By framing this transition within the greater context of American medicine at the turn of the century, I show that pragmatic values motivated the shift toward psychodynamic psychiatry. Particularly, American psychiatrists on the East Coast were indebted to Emil Kraepelin's biological framework, but recognised that it could be combined with a wide range of tools to improve the treatment of mental illness. The rise of the American mental hygiene movement and William James' encouragement of a pluralistic and pragmatic approach to the study of mental illness make sense of this recognition. Far from being a drastic change of guard, American psychiatry's embrace of Freudian psychoanalysis should be understood as the culmination of a smooth progression towards a shared goal: the advancement of the understanding, treatment, and care of the mentally ill.

The Dynamics of Reason, Conceptual Analysis, and Scientific Progress

Nicholas Ray University of Waterloo

It's been two decades since Michael Friedman's 1999 Kant Lectures (published as Friedman, 2001), in which he outlines and defends his account of epistemological progress in the sciences. In the intervening years, this account has become the focal point for philosophers and historians of modern physics who are grappling with the problem of epistemological progress in post-Kuhnian philosophy of science. Friedman's "dynamics of reason" argues that dynamical or relativized a priori principles are sufficient to account for epistemological progress where purely syntactic or semantic accounts of the formal language of science have failed.

I think we have made a mistake. We don't actually address the problem of epistemological progress using Friedman's Kantian account. I will argue that Friedman's dynamics of reason responds to the problem of Kuhnian incommensurability, but that it does not address a more fundamental and underlying problem—one inherited from the logical empiricist theory of theories. The logical empiricists gave us an account of theoretical change as formal change in the language of science. But this account paints theoretical revision as a formal matter, failing to characterise the empirical concerns that motivate theory revision. Call this the Arbitrariness Problem. Friedman fails to solve the Arbitrariness Problem because his theory of conceptual revision is also insensitive to empirical concerns. The good news: we can respond to Kuhn without invoking Kant, all while addressing the Arbitrariness Problem. We must engage in a careful analysis of theoretical concepts as they are employed within the physical sciences. I will lay out how this kind of conceptual analysis works.

A New Value-free Ideal: Disrupting the Hegemony of 'Values' in Social Philosophy of Science

Alan Richardson University of British Columbia

From a variety of angles over the past few decades "the value-free ideal" in accounts of the objectivity of science has been under intense pressure. Sandra Harding, Helen Longino, Alison Wylie, and Heather Douglas is only the most prominent among a broad swath of contemporary scholars who are seeking to account for the objectivity or rationality of science in a way that embraces some kinds of values playing certain types of roles in science. I don't mean to dispute this project, which seems entirely right as far as it goes. I am here interested in why philosophers of science in the literature rethinking the objectivity and rationality of science deploy 'values' as their key term. After all, Weberian *Wertfreiheit* also involved notions such as disinterestedness (Merton's favoured term) and dispassion. There are several notions that seem importantly distinct and that all need to be appropriately theorized in an account of scientific objectivity: value, interest, norm, passion, commitment, ideology, perhaps even *Lebenswelt*, and others. My talk is a plea for freeing philosophy of science from an overly narrow focus on values and a simple means-ends account of practical reasoning. Examples from work by Nancy Tuana, Sergio Sismondo, Alison Wylie, Kim Tallbear, and others will be discussed.

Anti-Psychologism, Distributed Cognition, and the Cognitive/Social Divide

Gui Sanches de Oliveira University of Cincinnati

Some philosophers have recently proposed that the traditional gap between cognitive and social explanations of science can be bridged by theories of “distributed cognition" (see Hutchins 1995, Giere & Mo_att 2003, Nersessian 2005, Giere 2006, 2007, Toon 2014, Magnus & McClamrock 2015). In their view, because the cognitive processes at play in science are inherently socially-distributed, cognitive and social explanations of science are no longer at odds with each other.

This argument is compelling given the current meaning of “cognitive" as synonymous with “psychological." But, as I propose, the argument misconstrues the historical cognitive/social divide and it ignores the semantic evolution of the term “cognitive."

Both sides of the cognitive/social divide were historically committed to anti-psychologism. Sociologists, historians and others on the social side eschewed both psychological and logico-epistemological explanations of science (Latour & Woolgar 1979/1986, Bloor 1983, Latour 1987). Traditional philosophy of science, on the other hand, eschewed descriptive accounts of science, whether social or psychological (i.e., issues pertaining to the context of discovery: Popper 1963, Curd & Psillos 2013). This normative/descriptive divide was only framed as cognitive/social because “cognitive" then meant “logico-epistemological" in a normative sense (see Carnap 1950, Hempel 1951, and Salmon 1963).

As a psychological explanation of science, distributed cognition cannot bridge a divide between two sides committed to anti-psychologism. Not only that, but epistemological examination of representational content is still possible regardless of how distributed the processing is. Distributed cognition thus hasn't bridged the divide—and it can't.

The Role of Structural Explanation in the Study of Health Inequality

Daniel Saunders York University

Among social epidemiologists, there is now widespread agreement that income inequality has a negative effect on a wide range of individual health outcomes. This is an example of a broader class of phenomena known as contextual effects, which are defined as population-level variables that have effects on individual outcomes even after researchers control for relevant individual properties. While the existence of these effects is well established, there is substantial disagreement amongst social scientists on the best way to explain and interpret them. Some writers claim that contextual effects can be fully explained within an individualistic framework, while others argue that contextual effects show populations have irreducible, causal properties. Employing the research on the effects of income inequality on health as a case study, this paper clarifies key philosophical issues involved in the study of contextual effects. I show that individualistic frameworks are incapable of explaining crucial aspects of the empirical findings. Building on Haslanger’s recent work on structural explanation, I further argue the best way to make sense of the findings is to posit the existence of a social status structure which generates health inequality by constraining the range of possible individual outcomes through psychosocial and material processes. This work contributes to current debates about social ontology, reduction and methodological individualism through the analysis of recent innovations in social science.

The Emergence of Peer Reviewed Books: University Press Publishing Editorial Practice in the United States

Joshua Silver University of Chicago

This paper asks how the evolution of editorial practices in university press book publishing from the late 19th century to the mid 20thcentury shaped the evaluation of scholarship and standards of objectivity in academic fields. I use archival methods to unearth the processes of peer review and book acquisitions as evident in the archives of the University of Chicago Press, the largest university press for much of the 20th century. While I take this press as an exemplary case, I also examine the reports and documents of prominent institutions like the Rockefeller Foundation and Social Science Research Council, which were able to demand transparency and accountability from dozens of publishers in exchange for subsidizing publication. I argue that a subsequent reliance on outside readers facilitated by professionalized acquisitions editors was a crucial innovation that drastically changed the internal organization of presses, leading to a distributed network organization of authority in the social sciences and humanities. The abandonment of a model largely reliant on personal networks led to the development of the peer review process as we know it today, seemingly based on large, formalized, impersonal networks of experts. I conclude that processes of discovery, evaluation, and revision, which are often taken for granted as an essential feature of the academic system and a sign of objectivity, have a historically contingent trajectory and emerged unevenly over the first half of the twentieth century. A full understanding of the meaning of knowledge claims made by scholars in their time thus requires an understanding of the diverse social and historical conditions for their communication.

Revolutionizing Psychiatric Classification: Prospects and Problems

Nicholas Slothouber University of Western Ontario

Recent endeavours to improve the diagnosis and treatment of mental disorders have centred around ways in which psychiatric classification might be grounded on investigations into the causal structure of mental disorders. The most noteworthy attempt to tie classification to causes is the Research Domain Criteria (RDoC) project, implemented by the National Institute of Mental

Health (Cuthbert & Insel, 2010a, 2010b, 2013; Cuthbert, 2014; Insel et al., 2010). In an effort to transform psychiatric classification, proponents of the RDoC project are seeking to identify the causes of mental illness by incorporating evidence from genetics, neuroscience, and cognitive science. The hope is that by grouping together individuals whose signs and symptoms (low mood, insomnia, hallucinations, delusions, etc.) have similar causes (a genetic anomaly, a neurochemical deficiency, brain damage, trauma, etc.), more precise and effective treatment recommendations will be possible.
The purpose of the present paper is to highlight both the prospects of and problems with the RDoC approach to psychiatric classification. First, I outline the advantages and disadvantages of RDoC from both a research and clinical perspective. Second, I examine the viability of the RDoC approach by considering the case of Major Depressive Disorder (MDD). I contend that, while MDD is a heterogenous category in need of revision, the way in which it ought to be revised is far from obvious even when one considers the most recent findings from genetics, neuroscience, cognitive science, and psychology. Finally, I offer potential explanations for why it is that psychiatric classification has not progressed in the way that most have hoped.

Evidence for Ontological Weak Emergence

Hamed Tabatabaei Ghomi University of Cambridge

Ontological weak emergence is the surprising outcome of a computationally irreducible algorithmic process. Two types of evidence can be given for presence of ontological weak emergence in biology. One type is *theoretical* and is based on the analyses of the structure of biological systems. I suggest that first, due to lack of mathematical demonstrations for computational irreducibility and second, due to the conjecture of redundancy in biological systems these arguments cannot be conclusive, although they can increase the epistemic probability of ontological weak emergence in biology. Moreover, theoretical arguments cannot establish the element of being “surprising”, the necessary epistemic element of ontological weak emergence. Therefore, I suggest that we need to rely on the second type of evidence, i.e. *empirical* evidence coming from analysis of special biological cases. I then provide such empirical evidence from cases of synthetic biology. I argue that the failures of the purely engineering approach and the subsequent heavy reliance on trial and error in synthetic biology provide empirical evidence for prevalence of ontological weak emergence in biology. A Bayesian analysis of this type of evidence is given to show how we accrue empirical evidence of ontological weak emergence over time.

Analogy, Unity, and Scientific Understanding

Shuguo Tang University of British Columbia

An analogy is a comparison between different objects or systems. Peter Lipton (2009) points out that the analogy among a set of phenomena enhances our understanding of them by bringing to our attention “the unity that underlies the apparent diversity of superficial phenomena” (p.52). My paper is concerned with the nature of the unity and the ensuing state of understanding brought by the analogy. With a tripartite taxonomy of analogies into *material*, *formal*, and *pragmatic* comparisons (cf. Hesse 1966; Holyoak and Thagard 1989, 1995), I attempt to show that, accordingly, there are *material*, *formal*, and *pragmatic* senses of unity. Each type of unity then enhances understanding in a distinct way: *material unity* brings about the improvement of *explanatory understanding*—understanding coinciding with the grasping of an explanation, which is taken by some to be the central type of understanding (cf. Hempel 1965; Salmon 1984; Khalifa 2012, 2013); *formal unity* helps to enhance *manipulatory understanding*—the improvement of which comes with that of the ability to manipulate some conceptual tools (cf. Regt and Dieks 2005; de Regt 2009; Grimm 2006; Wilkenfeld 2013); *pragmatic unity* helps to understand human concerns within sciences.
As I argue, one consequence of this picture would be that some cases of scientific understanding brought by *formal* or *pragmatic analogies* can sustain as examples for understanding which neither consist of the grasping of a unified explanation, nor can they be improved by the grasping of such explanation, in the objective sense of “explanation”.

There is More to Probabilities than Meets the Eye: How Private Information can be Inferred from Announced Credences

Somayeh Tohidi Simon Fraser University

How should the fact that my friend has a different degree of belief towards a proposition affect me? Multiple strands of literature in epistemology dealing with this issue have recently attracted much attention, most notably, the literature on `the problem of updating on the credence of others' and `the problem of peer disagreement'. In this paper, I am going to introduce a framework borrowed from the economics literature on disagreement, i.e. probabilistic Aumann structures, that reveals a possibility for addressing these problems that has been largely ignored by philosophers. In this framework, agents can indirectly exchange private information simply by announcing their credence towards a certain proposition to each other. This possibility stems from the resources it has for modelling full-beliefs and graded-beliefs of agents separately. Integrating probability theory and modal logic, this framework allows agents to have two different kinds of information: hard and soft. Hard information is full beliefs that an agent does not revise no matter what new information he learns. Soft information, on the other hand, is graded beliefs that are updated every time something relevant is learnt. It can be shown that when agents have access to a history of each other's hard information, there is a certain updating procedure dictated by this framework that is the most rational thing to do upon learning

each other's credence towards a proposition. I show the relevance of this result to the problem of peer disagreement by arguing that asymmetry between hard information of agents does not necessarily undermine their peerhood. I conclude that disagreeing peers, in the presence of a history of their hard information relevant to the problem, are rationally required to use the procedure dictated by Aumann's framework, which is distinct from what the steadfast view or the equal weights view prescribe.

Schools for the Mathematically Gifted Students in the Former Soviet Union. Students' Selection and Admissions. Creating Diversity within Gifted Education.

Inna Tokar City College NYC, FIT, Calhoun School

This presentation will continue to examine programs for mathematically talented students in the former Soviet Union. Special emphases will be given to the boarding schools for gifted students at Moscow, Novosibirsk, St. Petersburg and Kiev Universities. The origins and history of education for gifted students in the former Soviet Union will be discussed. Specifically, the following questions will be considered:

1. What is the nature of and variations among special school curricula and student, faculty, and alumni bodies?

2. Student selection criteria and admissions policies. Diversity of student body.

To answer these questions, original literature from Russia and Ukraine was reviewed, including scientific publications, educational journals, government and university documents. Interviews were conducted with Soviet-born mathematicians and educators who created and taught at these schools.

From Metaphysics to Methods? Pluralism in Cancer Research

Katherine Valde Boston University

Metaphysical presuppositions guide scientific research by articulating an ontology for some domain of phenomena, i.e. by making a claim about what things there are and what they are like. These ontological claims, in turn, prescribe a particular methodology for how to go about investigating and explaining. There is thus what I call a move from metaphysics to methods.
One question that has yet to be addressed is what sort of attitude researchers should take towards such metaphysical presuppositions. While scientific research cannot take place in a metaphysical vacuum, there are better and worse attitudes one can take, as exemplified by recent cancer research. On the one hand, there is an attitude of "unreflective trust"; researchers accept a particular metaphysical framework uncritically, unaware of the nontrivial metaphysical choices that are being made. This view is exemplified by the currently dominant mechanistic approach to cancer. On the other hand, there is an attitude of "passionate affirmation"; researchers are fully aware of the substantive metaphysical choices being made, but nonetheless argue that theirs is the correct metaphysical framework to adopt. This attitude is illustrated by new processualist approach to cancer. I argue that both of these attitudes are mistaken and prematurely restrict scientific research. Instead, I argue for an "agnostic" attitude towards the metaphysical presuppositions guiding cancer research. I defend this agnosticism on two grounds: first, the underdetermination of metaphysical frameworks by empirical research, and second, on inductive risk, that when it comes to cancer research, there are non-epistemic consequences for making the wrong metaphysical choice. I conclude that one should instead allow for a pluralism of metaphysical frameworks to guide cancer research.

Space Allocation and the Mathematization of Hospital Work

Theodora Vardouli and David Theodore McGill University

This paper looks at the algorithmization of hospital design in postwar UK, at the intersection of applied mathematics, building science, and healthcare management. As a contribution to "Circles of Conversation," we focus on the production and dissemination of the influential 1965 paper "The planning of single-storey layouts." Written by two building scientists from the University of Liverpool, the paper argued that methods based on the upcoming field of graph theory could generate a hospital layout that minimized distance, and therefore time nurses spent walking, between related activities. This design method algorithmically reified hospital work as a set of discrete actions in discrete points in space. We argue that the graph-based abstraction, and not the system output, allowed the method to be severed from its original context and adapted for the design of other buildings, such as offices and homes, ultimately becoming a methodological pillar of automatic spatial synthesis. The graph's visual, geometric appearance, on top of an algebraic substrate, propelled its dispersion among visually-trained architects inculcated in drawing and paper tools. This productive historical case foregrounds the development of an epistemic community and the mobility of a technical practice, illuminating the multiple meanings and complex histories of algorithmic methods.

Measuring Minds: Boring, Skinner, McGregor, and Stevens, and the Origins of Operationism

Sander Verhaegh Tilburg University

In 1935, Stanley Smith Stevens published two articles in which he urged for a revolution in psychology. Building on P.W. Bridgman's methodological prescriptions for physicists, Stevens argued that all psychological concepts need to be strictly

defined in terms of public operations. If psychology is to be taken seriously as a rigorous science, Stevens argued, psychologists have to make sure that they are not talking at cross purposes when they are discussing their theories about 'experience', 'consciousness', and 'sensation'–they have to make sure that their concepts are 'operationally defined'.
In view of Stevens' success in spreading the operationist message, it is small wonder that he is widely viewed as the intellectual father of psychological operationism. In this paper, however, I argue that Stevens was not the first scholar to translate Bridgman's conceptual strictures to psychology. I show (1) that Gary Boring and B.F. Skinner had already been applying Bridgman's approach to psychology when Stevens was still an undergraduate student and (2) that Douglas McGregor coined the term 'operationism' before Stevens.
Since Boring, Bridgman, McGregor, Skinner, and Stevens were all affiliated with Harvard in the early 1930s, the question arises what role these scholars played in the development of psychological operationism. In this paper, I answer this question by examining a large set of documents from the Harvard University Archives. Instead of taking Stevens' papers as the *starting point* of the operationist turn, I reconstruct the intellectual climate at Harvard in the years leading up to the publication of the operationist manifestos.

The Materiality of Data: Collecting Scientific Information at a University

Erich Weidenhammer University of Toronto

What constitutes the material culture of science for the purpose of a historical artifact collection? The more one works with this material, the more apparent it becomes that scientific research cannot be documented through instruments and apparatus alone. The process of gathering, preparing, studying, and archiving samples and data is integral to the research process. This category comprises a vast range of objects, from test samples in the physical sciences, to wet samples and histological preparations in the natural sciences and medicine, to prehistoric materials subject to archaeometrical analysis. It includes data on obsolete media of all kinds, from paper computer tape to photographic plates made by astronomers. Many items embody the skills of particular scientific subspecialties that otherwise receive little attention. Some represent rich and ephemeral faculty research collections that typically vanish upon a faculty member's retirement.
This paper discusses some examples of samples and other data that were collected through the University of Toronto Scientific Instruments Collection project. It discusses the value of several example items, especially the insight that they provide towards a particular scientific context. Of special interest is the complicated relationship between the materials of scientific research collections and traditional university archives. Finally, this paper offers a simple suggestion to "sample samples" that could inform similar collection efforts.

The Roots of the Silver Tree: Alchemy and Final Causes in Boyle

Jennifer Whyte University of Pittsburgh HPS

Though Robert Boyle called final causes one of the most important subjects of a natural philosopher's study, his own treatise on the subject, the Disquisition about Final Causes, has received comparatively little scholarly attention. In this paper, I explicate Boyle's complex argument against the use of teleological explanations for the properties of inanimate bodies, such as metals. The central object of this argument is a mysterious allusion to a silver plant. I claim that the silver plant is best understood as a thinly-veiled reference to alchemical product: the *Arbor Dianae*, an offshoot of George Starkey's recipe for the Philosophers' Stone. Then, I show how the context of alchemy not only clarifies Boyle's argument but also places it within a wider Royal Society conversation about matter and teleology. I then contrast the parallel arguments of Boyle and John Ray on the question of whether metals have divine purposes and show that the difference is explained by Boyle's belief in the transmutation of metals.

A Woman's Place: Mary Warnock and the Public Face of Assisted Reproductive Technology

Angela Yu University of Oxford

From its inception, assisted reproductive technology (ART) – ranging from artificial insemination and in vitro fertilisation to surrogacy and egg freezing –invoked questions of the world to come. This constellation of emerging technologies was simultaneously accused of the disruption of marital sanctity, technological control of women's bodies, the advancement of eugenic fantasies, and the impending creation of a society of women without men. This paper traces how shifting conceptions of ART pivoted on the equally unstable notion of a woman's place in the late 20th century through a study of Baroness Mary Warnock (1924-), an Oxbridge moral philosopher who chaired the UK government inquiry on assisted reproduction from 1982 to 1984 in response to the first birth by in vitro fertilisation in 1978. The Report of the Warnock Committee established its eponymous leader as a central figure in the public debate on ART, and laid the groundwork for The Human Fertilisation and Embryology Act 1990. Situated within debates on women's health, labour and feminism, popular understanding of the progressive potential of ART was routed through the dual construction of Warnock as a modern woman par excellence and an enduring authority in science communication. This paper places the public speculation and state regulation of ART alongside Warnock's personal writings on the subject, and documentary and news media coverage of her private and professional life, in order to understand how gendered technologies of assisted reproduction, and biomedical technology more broadly, gain their public face.

Process, not just Product: the Case of Network Motifs Analysis

Shimin Zhao Simon Fraser University

It has been ubiquitous for scientists to study *complex systems* by representing these systems as *networks* and analyzing properties of these networks. Since this network approach allows scientists to focus on all relevant elements in a system and their interactions, networks are most popular in sciences which deal with complex systems directly like systems biology or social sciences.

The network approach has drawn attention from philosophers. For example, recent papers have considered the question of how network explanations relate to mechanistic explanations. However, these discussions are all about the *products*, namely, explanations generated by the network approach.

I will argue that a focus on the *product* is insufficient for understanding how the network approach deals with complex systems. My main example is the network motifs analysis, which has been a focus of some recent discussions. By analyzing the process of the network motifs analysis, I argue:

1. What lies at the heart of the network motifs analysis is the fact that a pattern's being identified as a network motif depends not only on its *internal* properties, but also on its *relationships* to the target network and the random networks.

2. This dependence on the target network and random networks is not reflected in the explanations, which are results of modelling network motif patterns *independently* of the target networks and the random networks.

As a result, an explicit focus on the *process* is indispensable for understanding how exactly the network approach deals with complex systems, which cannot be captured by focusing on explanations themselves.

Abstracts for sessions / Résumés pour les séances

in order of programme schedule

SESSION: NEW CONVERSATIONS IN THE FIELD OF SCIENCE AND RELIGION

Session organizer and chair: Anthony Nairn, University of Toronto

Science and religion, in the popular mind, are seemingly incompatible. This has been the source of rising tensions and vocal activism ascending from both sides. The conflict thesis, which began in the late 19th century by Draper and White, has had a powerful and lasting effect on the understanding of the interaction between these two powerful enterprises, even though historians and philosophers of science and religion agree that the conflict thesis is inadequate in explanatory power. However, conversations from perspectives outside of Christian based scholarship have been rather quiet in the field of science and religion, with only a few contributors beginning to break into the field. This is what this session intends to change, as novel approaches to religion, spirituality, and science have much to offer the field of science and religion. The aim of this session is to spark discourse on the relationship between science and religion/spirituality from a variety of investigatory lenses, specifically historical, philosophical, and sociological, to better carve out a theoretical and applied space for working and learning scholars to operate within. With the theme of this year's Congress as "circles of conversation," the time seems to have arrived for the conversation to take place in order to better understand how science and religion can be opened-up to new discussions on what constitutes interactions between these two enterprises.

Moving Beyond Complexity: Re-thinking Historiographical Approaches to Science and Religion

Sarah Qidwai University of Toronto

Scholars in the field of science and religion have moved away from the conflict model and have embraced complexity. This thesis adopts a historical methodology that refuses to break down the relationship between science and religion into simple narratives of conflict, harmony, or independence, but rather requires an empirical analysis in each historical context. This paper explores the historiographical themes in the field of science and religion and points to the complexity thesis as a starting point. Since most of the scholarship in the field has largely rested on Judeo-Christian perspectives on the topic, I argue that we need a more global and comparative approach in the field, and only then can we begin to draw some mid-level conclusions on the topic of science and religion. This paper explores the implications of the framework to Islam and where to go from here.

Psychedelic Testimony and Neurobiological Explanation

Andrew Jones University of Toronto

Scientific investigation into psychedelic drugs (e.g. LSD and psilocybin) is currently undergoing a dramatic resurgence after a decades-long hiatus. Contemporary psychedelics researchers seek to understand the neurobiological effects and therapeutic applications of these substances. As is well known, psychedelic drugs produce profound alterations in subjective experience that are often interpreted as spiritual experiences. This paper is concerned with the power dynamics that underlie the interpretation of what I call "psychedelic testimony", which refers to descriptions and assertions about one's own experience of the effects of psychedelic drugs. A handful of science studies scholars have argued that contemporary psychedelics researchers strive to legitimize psychedelic research by distancing their work from countercultural sentiments and interpreting psychedelics within the ontological framework of mainstream science (Langlitz, 2012; Corbin, 2012). Given this legitimizing framework, I explore the interpretation of psychedelic testimony as a crucial locus of political maneuvers within contemporary psychedelic science. More specifically, I focus on the tension between individual's interpretations of their own psychedelic experiences and the neurobiological explanations of these experiences offered by scientists. Rose and Abi-Rached (2013) have argued that neurobiological explanation in the 21st century has spread beyond science and become intertwined with popular culture and with the governance and understanding of the self. This social situation, I argue, impacts the epistemic importance of psychedelic testimony, as its epistemic value becomes reduced to its ability to support neurobiological explanation.

Perspectives of the Earth: The Distributed Affect of Three Photographs of the Earth and How the Transformation Perspective Exposes an Intersection Between Science and Religion

Anthony Nairn University of Toronto

The twentieth century marks a turbulent socio-temporal milieu filled with both great wonders and terrible tragedies. As a consequence of the Cold War, the United States began and carried out their famous Apollo program which sent human beings to the moon. The increase in funding and education from social and political support also led to "off-shoot" technological achievements such as the Voyager program. Each of these programs, specifically Apollo 8, Apollo 17 and Voyager 1, have become memorialized not only for their scientific and technological breakthroughs, but for three respective photographs—"Earthrise," "Blue Marble" and "Pale Blue Dot." This paper will explore the social and historical dimensions of each of these photographs while situating them within Charles Taylor's *transformation perspective*. I will argue that such a unique, transformative perspective of the Earth has what I call a *distributed affect,* which carried the sensory experience the view of Earth provided, through the technological apparatus of the camera and photograph, across the globe. Through this transformation experience and distributed affect, humanity was confronted for the first time with an artefact that had a *situating realization* of humanity's place within space and time, disconnected from lay understanding. I suggest that these images were instrumental in the re-awakening of a "cosmic perspective," situating this moment of social history within the dialogue of "complexity" within the field of science and religion.

SESSION: MINES, MOUNTAINS, CAVES: SCIENTIFIC, TECHNOLOGICAL AND POLITICAL SITES OF KNOWLEDGE MAKING

Session organizer: Ernie Hamm, York University

Session chair: Elspeth Gow

The Mine as Adversary: Leibniz versus the Harz Mountains

Andre Wakefield Pitzer College

Gottfried Wilhelm Leibniz was a visionary and an operator. His Protogaea contains penetrating analysis, compelling synthesis, and even the nascent structure of a whole new discipline: "natural geography." This is the Leibniz we know, the one who flowed effortlessly from metaphysics and theology to mining and invention. But his Protogaea grew out of a difficult period of venture and failure in the Harz Mountains. That's why he was there in the first place. It is something Leibniz scholars understand less well than his written work. In this paper, I will try to address the connections between Protogaea (the text) and his activities in the Harz Mountains. Leibniz was to discover the hard way that, for all of his connections and talents, the Harz system—technological, cultural, bureaucratic—had its own logic and agency. It would defeat him.

A Mountain, Romantics and a Nation: Science and the First Ascent of Mt. Ararat

Ernie Hamm York University

The first recorded ascent of Mt. Ararat took place in 1829 as part of a scientific expedition to the Caucasus led by Friedrich Parrot, Professor of Natural Philosophy at the Baltic German University of Dorpat (Tartu). Parrot's expedition had official Russian Imperial support and drew considerable international attention as an example of geographic science that bore distinct relations to the work of Alexander von Humboldt. It also had important consequences for the history of Armenia, thanks to Parrot's recruitment of Kachatur Abovian as a local guide and translator. Parrot was impressed by and supported Abovian in his application to study at Dorpat where, commentators regularly report, the young Armenian fell under the spell of German Romanticism. Upon his return to Armenia Abovian became the leading literary light of his time and a crucial figure in the history of Armenian nation building, thanks in no small part to his decision to publish in the modern Armenian vernacular. This paper does not seek to diminish Abovian's Romanticism, but rather than finding its starting point in Dorpat, it ties it to his experience on the Ararat expedition, an expedition with at least as many political connections as scientific ones.

National Spaces and Deepest Places: Politics and Practices of Verticality in the Scientific Research of Caves

Johannes Mattes Austrian Academy of Sciences

The nineteenth century witnessed a new appreciation of "depth," a concept that linked the longing for faraway places with new perceptions of earth's interior as an archive for the history of earth and humankind. Analogies between

subjective experiences of depth and subterranean spaces led to an increased focus on the vertical dimension of caves. In addition, the spatial visualization of earth in the form of a vertical section became a powerful epistemic tool offering new insights into the body of nature.
Although caves had been explored by upright descent since the eighteenth century, improved techniques for surveying, mapping and exploring deep shafts were crucial for the development of speleology (cave study) in the nineteenth and twentieth centuries. The growing political interest in the military and economic uses of caves, the development of national cave cadasters, state-owned speleological research institutes and legal regulations during WWI and the interwar period resulted in a vertical concept of territory. Especially in archaeology and the study of fossils of early humans, which were understood by contemporaries as primarily “national” sciences, politics and scholarly research became “resources for each other” (M.G. Ash) and were engaged with issues of natural or cultural underground heritage.
Disentangling these different layers of spatial reasoning and argumentation, this paper examines the practices and epistemic dimensions related to subterranean space that led to a new three-dimensional understanding of terrain, its scientific investigation, and political acquisition.

SESSION: NON-CAUSAL AND MATHEMATICAL EXPLANATIONS

Session organizer and chair: Nicholas Fillion, Simon Fraser University

I Can’t Get No Satisfaction, but I Can Explain It

Nicolas Fillion Simon Fraser University

There is a venerable tradition of rational reconstruction in philosophy of science, whose objective is to explain the success of scientific practices that we should regard as properly justifiable. This tradition has focused on semantic concepts that unquestionably deserve a central place: logical semantics based on satisfiability and probability, as well as useful combinations such as epistemic decision theory. However, this analysis fails to reach a large part of the reasoning deployed in applied mathematics. This is particularly striking in cases of explanation not on models and theories that are not strictly true. Indeed, we need a collection of concepts usually associated with perturbation theory—and we should regard those as having a role as fundamental as those of logic and probability theory—to understand how arguments that have approximately true or even false premises but (approximately) true conclusions work. After describing this collection of concepts, I will illustrate the kind of philosophical work it can do by briefly discussing how we ought to think about complexity and success in science.

Levels and a New Role for Mathematics in Empirical Sciences

Atoosa Kasirzadeh University of Toronto

A common philosophical view is that mathematics either is simply representational of empirical phenomena or has a genuinely autonomous explanatory role in empirical sciences. This paper identifies a third and distinct role, and one that may actually be pervasive in the empirical sciences. I call this the “bridging" role of mathematics, according to which mathematics acts as a reliable connecting scheme in our explanatory reasoning from lower-level to higher-level phenomena. I argue that this role differs from both the representational and the genuinely autonomous explanatory roles. Moreover, I show that the bridging role of mathematics complements the micro-level representational role in explaining why we observe a particular macro-level phenomenon.

Mathematical Explanation and the Problem of Counterpossibles

Erlantz Exteberria University of Western Ontario

Most explanations in science and everyday life adopt the form of a causal explanation, in which causes are responsible to explain their effects. A popular way to capture this explanatory relation is by means of counterfactual relations, that is, a relation that gives us information about how the explanandum would change if the explanans was different in some relevant way. Yet, not all explanations are of a causal nature; for example, certain natural facts of the world are explained by mathematical facts (Lange 2011). In order to make sense of these mathematical explanations, however, employing the same counterfactual approach is not straightforward. This is because counterfactual conditionals require an antecedent that is contrary to facts, and in the case of mathematical explanations, they require an antecedent that is contrary to mathematical facts. But if mathematical facts are necessary, then supposing that they are different is an impossible scenario. This is the problem of counterpossibles|counterfactuals with a mathematically impossible antecedent. Baron, Colyvan, and Ripley (2017) have proposed a way to evaluate these counterfactuals without the worry of dealing with contradictions that follow from the impossible scenario. In this talk I detail some of the worries of their suggestion, and I consider an alternative approach that consist in holding the mathematical relations fixed and tweak just the natural facts instead, thus removing the problem of counterpossibles.

SESSION: SCIENCE, SCIENCE POLICY AND THE FEDERAL STATE IN CANADA

Session organizer and chair: James Hull, University of British Columbia

This session looks at three case studies of science policy in practice in Canada from the early twentieth century to the start of the 1970s. The first examines the reorientation of federal research science from resource extraction to industrial transformation prior to the establishment of the National Research Council of Canada. The second discusses nutrition and food conservation policies in the early Cold War period. The third moves forward to the later Cold War period during the 1960s to look at nuclear testing and radiation and its effects on health. These studies examine the challenges of science policy formation and implementation in a federal state and a liberal political economy.

Science, Industry and Policy in Early 20th-century Canada

James Hull University of British Columbia

That science had been enlisted in support of first colonial and then national development in Canada has long been documented and understood by historians. But an important shift of emphasis in the work of federal government science agencies is apparent in the early years of the twentieth century. From a focus on the problems of agricultural production and resource extraction a wide range of such agencies devoted increasing attention to the processing of crops and resources. This can be seen in the work of the Dominion Experimental Farm system as well as agencies dealing with forest products, mines and fisheries. Significantly, this change came not as a result of a centrally directed science policy but in response to changes in the nature of Canadian industrial production. Not coincidentally this coincided with efforts to enlist both governments and universities more fully in the support of scientific industrial research. The success of these efforts helps to explain why Canada has been called one of the most successful adopters of the new science-based technologies of the Second Industrial Revolution.

You Can! Stop Waste So Others May Eat: Wastefulness, the Cold War, and Canada's National Food Conservation Campaign, 1947-1948

Eric Striikwerda Athabasca University

In the autumn of 1947, state nutrition experts and their food industry allies embarked on a national campaign encouraging Canadian families to reduce food waste in the nation's homes, shops, and hotels and restaurants. In part, the campaign imagined that reducing domestic food waste would free up food resources for export, and thereby ease the growing hunger crisis facing post-war Europe. On a deeper level, however, the campaign signaled Canada's witting alignment with emerging American foreign policy goals. Canada's enthusiastic participation in the Marshall Plan, for example, at once promised to address the European hunger crisis, preserve the solvency of a recovering European economy, and re-establish a European trading market for North American farm products. But making much-needed North American foodstuffs available to postwar Europe also, and not incidentally, was meant to serve as an immediate buttress against the spread of communism. Canada's campaign to end food waste at home thus became wrapped up in larger Cold War politics by offering a stark contrast between the inherently 'wasteful' planned economy of the Russians and the supposed 'efficient' free market economy of the West.

Nuclear Anxieties: Fallout Research and the Northern Radiation Study, 1963-70

Matthew Wiseman University of Toronto

In January 1963 a Whitehorse newspaper printed an article headlined, "Is A-Test Fallout Poisoning Caribou—And the Eskimos Who Eat Them?" In the article, biologist William Pruitt of the University of Alaska likened caribou and reindeer to "hot spots" of radioactive contamination in the northern regions of Canada, Alaska, Scandinavia and the Soviet Union. Atmospheric nuclear explosions, he suggested, had spread radionuclides over the Circumpolar North contaminating lichens and sedges, two primary caribou foods. As evidence, Pruitt referenced research studies showing increased radiation levels in Indigenous peoples from Alaska and Sweden, results that he claimed justified a systematic study of radioactive contamination in northern Canada. Pruitt's article captured the attention of medical authorities in Ottawa, and the

Department of National Health and Welfare initiated an experimental research study involving the collection and analysis of northern vegetation, animal meat, and human bone.
Between 1963 and 1970, federal scientists conducted the Northern Radiation Study (NRS) to determine the public health threat of radiative fallout in northern Canada. This paper uses recently declassified records from Library and Archives Canada to introduce and examine the NRS, revealing the colonial medical structures that reinforced a targeted radiation study involving northern Indigenous communities. I argue that nuclear anxieties prompted and legitimized state intervention, demonstrating the influence of Cold War security politics on federal science activities in the 1960s. These are important considerations for understanding the making, implementation, and effect of health science policies in Canada during a significant period in world affairs.

SESSION: WOMEN, TRANSNATIONAL MOBILITIES, AND MEDICO-SCIENTIFIC INNOVATION (OPEN SESSION).

Joint session with CSHM / SCHM

Session organizer and chair: Catherine Carstairs, University of Guelph

How does gender shape the transnational networks that are crucial to driving innovation in medicine and science? This interdisciplinary session takes up the experiences of women who studied, lectured, and practiced across diverse contexts as case studies to explore the multifaceted relationships between gender, professional mobility, and medical and scientific innovation. Focusing on Margaret Sanger's 1922 visit to China, Mirela David unpacks how eugenic discourses on birth control and overpopulation were shaped by encounters between western theorists and Chinese intellectuals. Moving forward a decade, Cheryl Krasnick Warsh teases out the gendered power dynamics that molded Frances Oldham Kelsey's educational experiences in the 1930s, tracing the Canadian-American pharmacologist's training from the University of Chicago, to the south of Texas, to Haida Gwaii. Finally, Jill Campbell-Miller discusses the transnational career of psychiatrist Florence Nichols, detailing how gender, class, and religion intersected to shape Nichols' practice – and embrace of pharmacological innovations including LSD – in India, Canada, and the United States.

Margaret Sanger in China: The Eugenic Debates on Birth Control and Overpopulation in 1922

Mirela David University of Saskatchewan

In 1922 Margaret Sanger visited China and enjoyed great attention from Chinese reformers for her birth control advocacy. This is a transnational project probing the dynamics of the intellectual encounter between western theorists and Chinese intellectuals. Sanger's trip to China held a double meaning: it reinforced images of China as a global example for the necessity of birth control because of overpopulation and insufficient resources, and it also sparked an intriguing debate around the eugenic quality of birth control in the Chinese press. I explore Sanger's interactions with Chinese intellectuals of the New Culture Movement, a movement upholding the adoption of Western science, and the initial reception of Sanger's birth control activism in 1922, examining the contents of Sanger's speeches and their translation into Chinese. I assess which of her ideas were prevalent in Chinese women's magazines, in the special editions published with the occasion of Sanger's visit in *The Ladies' Journal* and *Women's Review*. The insertion of eugenics into other types of debates allowed a deeper discussion of possible solutions for China's social problems to emerge. I investigate the intersections and explore the tensions between Malthusianism and eugenics, feminism and eugenics as well as the local specificities of these debates and the reception of Sanger's speeches. Chinese male intellectuals considered women's reproduction both in relation to women's individual bodies, as well as its repercussions for the future of the Chinese nation. This was crucial in considering the political potential of birth control advocacy in relation to the necessity of implementing birth control for improving women's health. While Sanger's feminist and eugenic ideas were well received, few shared her exclusive focus on birth control as a panacea for China's social ills. Sanger's ideas were not fully embraced in Chinese intellectual circles, mostly on account of the philosophical tensions between Sanger's eugenic line of argumentation for birth control and leftist and nationalist understandings of economic realities. At the height of the global popularity of eugenics, there is agency in its rejection by some Chinese intellectuals.

Hunting Armadillos and Whales: Frances Oldham [Kelsey] at the University of Chicago in the 1930s

Cheryl Krasnick Warsh Vancouver Island University

In 1935, Frances Oldham, one of only about 200 Canadian women with Masters of Science degrees, entered the new

doctorate programme in pharmacology at the University of Chicago. Working under Dr. E.M.K. Geiling, Oldham was investigating the pituitary glands of a variety of species, including dolphins, whales, and armadillos. Unlike humans and most animals, these species' Hypophysis (pituitary gland) comprised only two lobes, rather than three. Geiling postulated that in species with only two separate lobes, hormones were secreted in neural tissue. To prove this, Geiling and his students went on a series of adventures. Frances travelled to southern Texas to spend time on an armadillo ranch, hunting (with limited success) for pregnant armadillos to study. Geiling himself, and several of his students, participated in whaling trips in Haida G'waii (formerly the Queen Charlotte Islands), north of Vancouver Island. They accompanied whale hunters on their expeditions, harvested hypophyses from the carcasses, and then took the specimens back to Chicago. As a young, single women spending weeks on a whaling station, and then on a hunt, Frances was a rare sight, but she relished the adventure. Having grown up in an active outdoor life on Vancouver Island, she could line fish, hunt, and shoot, and she used her connections on the island to further her burgeoning career through public presentations in a variety of settings. The Geiling team then used filmed footage of their time at the whaling stations to create an educational movie, entitled "Whaling for Science", which was eventually deposited in the B.C. Archives. The 1930s was the decade of the first international treaty on the whale hunt, not yet enforced in Canada. Popular sensitivities about the nature and value of the whale will be discussed, and comparisons made between those of the interwar period, and today.

"This was a Drug that Healed — it was Love": the Life and Career of Florence Nichols, Medical Missionary and Psychiatrist

Jill Campbell-Miller Carleton University

This paper will review the life and career of Dr. Florence Nicholas (1913-1987), a Canadian psychiatrist and medical missionary. Using archival materials from the Anglican General Synod Archives, the Christian Medical College (CMC) archives (Vellore, India), and interviews and personal papers collected from her family members, it will examine the role that Nichols' Christian outlook played in shaping her approach to the practice of psychiatry, remaining sensitive to the ways in which her gender and class may have influenced her career trajectory. After earning a diploma in psychiatry at the University of Toronto in 1941, making her one of only a handful of women with those credentials in Canada, she went on to become an Anglican missionary, and took up a position with the CMC in 1946. Practicing during an era with a rapidly increasing focus in psychopharmacology, Nichols embraced new treatments, such as the use of LSD when it became available for medical purposes in India in the late 1950s. Yet her Christian faith also highly influenced her approach to the treatment of mental illness. Though personally deeply convicted of the rightness of Christianity, Nichols developed a treatment approach that encouraged patients to seek a feeling of love and wholeness within any faith framework, in combination with the use of common treatments of that era, including electro-convulsive and insulin therapies. Nichols also developed the practice of family psychiatry that continues to the be the hallmark of the CMC's approach to psychiatric in-patient care, and diverged strongly from the treatment approaches of mental hospitals prevalent in both Canada and India at that time. After returning to Canada, Nichols went on to specialize in the treatment of alcohol addiction in Toronto and then Colorado, and worked in British Columbia.

SESSION: BOOK PANEL WITH CHRISTOPHER BYRNE
MATTER AND TELEOLOGY IN ARISTOTLE'S NATURAL PHILOSOPHY

Joint session with CPA/ ACP

Session Organizer and Chair: Louis Groarke,St. Francis Xavier University

Author: Christopher Byrne,St. Francis Xavier University

In his book, *Aristotle's Science of Matter and Motion* (Toronto: University of Toronto Press, 2018), Christopher Byrne, (Department of Philosophy, St. Francis Xavier University) argues that Aristotle's natural philosophy is grounded in three main claims: 1) All perceptible objects are physical objects; 2) All physical objects are made out of a physical material cause; 3) The basic properties of the material elements cannot be understood teleologically. On the basis of these principles, Byrne offers an account of Aristotle's mechanics, laws of motion, and the role of physical matter in the composition and behaviour of perceptible objects generally. The purpose of this session is to examine these claims critically and to provide an opportunity for Byrne to respond to his critics.

Introduction (in French)
Louis Groarke St. Francis Xavier University

Mechanics in Hellenistic Philosophy
Sylvia Berryman University of British Columbia

The role of mechanics in Hellenistic philosophy and the influence of Aristotle's natural philosophy.

The Relation Between Aristotle's Physics and Biology
Byron Stoyles Trent University

The role of matter and material causes in Aristotle's biology and the extent to which this account is compatible with the kind of physics that Byrne attributes to Aristotle.

Aristotle's Physics and Late Scholastic Philosophy
Daniel Novotny University of South Bohemia

The account of Aristotelian hylomorphism found in late scholastic philosophy, in particular the non-Thomistic commentators.

Thomistic and Aristotelian Hylomorphism
Steven Balder St. Francis Xavier University

The Thomistic account of hylomorphism both in general and as St. Thomas Aquinas understands Aristotle's natural philosophy.

Response to Comments
Christopher Byrne St. Francis Xavier University

SESSION: NEW RESEARCH IN THE HISTORY OF SOVIET SCIENCE (OPEN SESSION)

Joint session with CAS/ ACS

Session organizer: Christopher Burton, University of Lethbridge

Session chair: Eric Johnson

A Science for Aerial Hygiene: Vladimir Riazanov and the Soviet Understanding of Clean Air
Christopher Burton University of Lethbridge

Warming Trend: Soviet Climate Science and State Policy
Connor Stewart Hunter University of British Columbia

Biosocial Boundaries, Abortions and Eugenics in Soviet Russia, 1920-1936
Alexei Kojevnikov University of British Columbia
Kirill Rossiianov Russian Academy of Sciences

Stranger Facts: Mass Scientific Literacy Campaign and Alternative Forms of Knowledge in the Post-World War II USSR
Alexey Golubev University of Houston