ANNUAL MEETING
RÉUNION ANNUELLE

PROGRAMME

27-29 May / mai 2023

Part of the Congress of the Humanities and Social Sciences

Dans le cadre du Congrès des sciences humaines

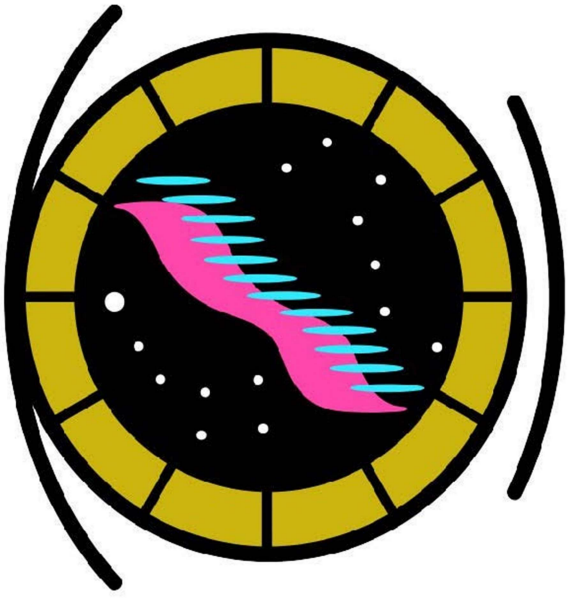
York University / l'Université York,

Toronto

Canadian Society for the History and Philosophy of Science

CSHPS SCHPS

Société canadienne d'histoire et de philosophie des sciences



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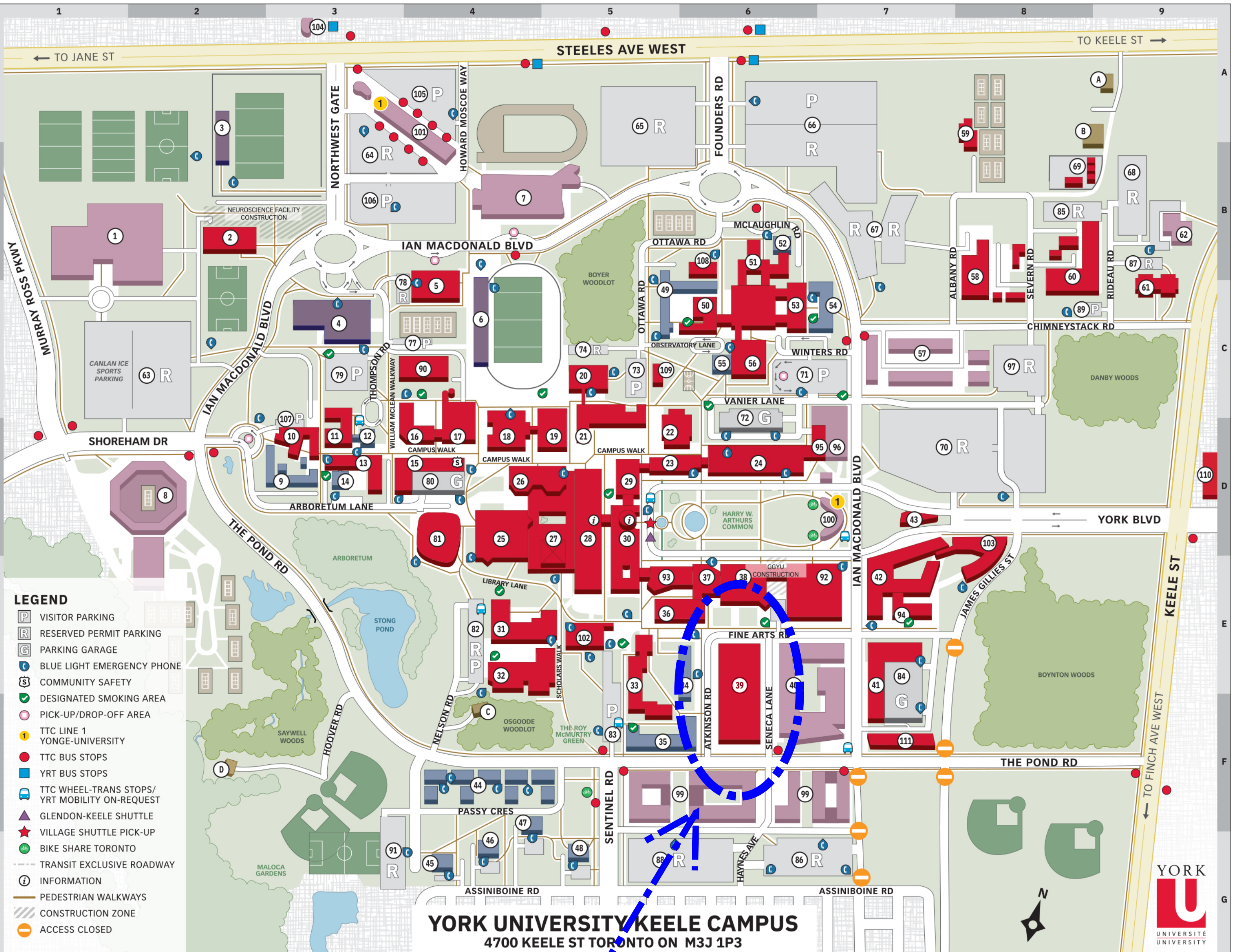
We acknowledge York's presence on the traditional territory of many Indigenous nations, such as the Mississaugas of the Credit First Nation, the current treaty holders.

To better reflect on land acknowledgements and a commitment to real reconciliation may we direct you to these interesting links and projects. Chi miigwetch.

Background to York's land acknowledgement

Cliff Cardinal's *The Land Acknowledgement*

One current project for your consideration



CAMPUS DIRECTORY

ACADEMIC, ADMINISTRATIVE & COMMERCIAL BUILDINGS

59	190 Albany Road	ALB	A8
110	4747 & 4751 Keele Street		D9
92	Accolade East	ACE	E7
93	Accolade West	ACW	E5
33	Atkinson	ATK	E5
17	Allan I. Carswell Astronomical Observatory, Petrie	PSE	D4
29	Behavioural Science	BSB	D5
41	**Bennett Centre for Student Services, Admissions**	BCS	E7
81	Bergeron Centre for Engineering Excellence	BRG	D4
24	Bookstore, York Lanes	YL	D6
69	Bus Compound		B8
10	Calumet College	CC	D3
27	Central Square	CSQ	D5
58	Central Utilities Building	CUB	B8
38	Centre for Film & Theatre	CFT	E6
16	Chemistry	CB	D4
26	Curtis Lecture Halls	CLH	D4
94	Executive Learning Centre	ELC	E7
21	Farquharson Life Sciences	FRQ	D5
23	First Student Centre	STC	D5
108	Founders Annex North	FAN	B6
109	Founders Annex South	FAS	C5
50	Founders College	FC	C6
31	Health, Nursing & Environmental Studies	HNE	E4
32	Ignat Kaneff Building, Osgoode Hall Law School	OSG	E4
36	Joan & Martin Goldfarb Centre for Fine Arts	CFA	E5
95	Kaneff Tower	KT	D7
61	Kinsmen	K	C9
19	Lassonde Building	LAS	D5
90	Life Sciences Building	LSB	C4
43	Lorna R. Marsden Honour Court & Welcome Centre	HC	D7
20	Lumbers	LUM	C5
51	McLaughlin College	MC	B6
11	Norman Bethune College	BC	D3
17	Petrie Science & Engineering	PSE	D4
60	Physical Resources Building	PRB	B8
103	Rob and Cheryl McEwen Graduate Study & Research Building	MB	D8
28	Ross Building	R	D5
25	Scott Library	SCL	D4
27	Scott Religious Centre, CSQ	SRC	D5
111	School of Continuing Studies	SCS	F7
102	Second Student Centre	SSC	E5
42	Seymour Schulich Building	SSB	E7
2	Sherman Health Science Research Centre	SHR	B2
18	Steacie Science & Engineering Library	STL	D4
22	Stedman Lecture Halls	SLH	D5
13	Stong College	SC	D3
4	Tait McKenzie Centre	TM	C3
56	Vanier College	VC	C6
30	Vari Hall	VH	D5
39	Victor Phillip Dahdaleh Building	DB	E6
5	West Office Building	WOB	C4
15	William Small Centre	WSC	D4
53	Winters College	WC	C6
24	York Lanes	YL	D6

RESIDENCES & APARTMENTS

48	320 Assiniboine Road	AS2	G5
47	340 Assiniboine Road	AS4	F4
46	360 Assiniboine Road	AS6	G4
45	380 Assiniboine Road	AS8	G4
34	Atkinson Residence	AR	E6
9	Calumet Residence	CR	D3
49	Founders Residence	FR	C5
12	Norman Bethune Residence	BR	D3
44	Passy Gardens, 2–18 Passy Cres.	PASSY	F4
14	Stong Residence	SR	D3
52	Tatham Hall	TH	B6
35	The Pond Road Residence	PON	F5
55	Vanier Residence	VR	C6
54	Winters Residence	WR	C7

PARKING GARAGES – VISITORS

80	Arboretum Lane Parking Garage	APG	D4
84	Student Services Parking Garage	SPG	E7
72	York Lanes Parking Garage	YPG	D6

PARKING LOTS – VISITORS

83	Atkinson Lot	F5
107	Calumet Lot	D3
66	Founders Road East Lot	A6
73	Lumbers Lot	C5
82	Nelson Road Lot	E4
64	Northwest Gate Lot	B3
105	Northwest Gate North Lot	A4
106	Northwest Gate South Lot	B3
89	Physical Resources South Lot	C8
77	Thompson Road East Lot	C3
79	Thompson Road Lot	C3
71	Vanier Lot	C6

PARKING LOTS – RESERVED PERMIT

67	Albany Road Lot	B7
97	Chimneystack Lot	C8
66	Founders Road East Lot	A6
65	Founders Road West Lot	A5
88	Haynes Avenue Lot	G5
87	Kinsmen Lot	B9
74	Lumbers North Lot	C5
82	Nelson Road Lot	E4
64	Northwest Gate Lot	B3
91	Passy Crescent Lot	G3
85	Physical Resources North Lot	B8
68	Physical Resources East Lot	B9
63	Shoreham Drive Lot	C2
86	The Pond Road Lot	G6
78	West Office Building Lot	C4
70	York Boulevard Lot	D7

VISUAL PERFORMANCE ARTS FACILITIES

92	Art Gallery of York University	ACE	E7
37	Burton Auditorium [x]	BU	E6
93	Gales Gallery	ACW	E6
38	Joseph G. Green Studio Theatre	CFT	E6
92	McLean Performance Studio	ACE	E7
92	Price Family Cinema	ACE	E7
92	Sandra Faire & Ivan Fecan Theatre	ACE	E7
92	Tribute Communities Recital Hall	ACE	E7

ATHLETICS & RECREATION FACILITIES

3	Alumni Field	STA	A2
4	Tait McKenzie Centre	TM	C3
6	York Lions Stadium	YLS	C4

HISTORICAL HOUSES

D	Hoover House	HOH	F2
C	Skennen'kó:wa Gamig ᖕᑲᓇᑰᐊ ᑲᒥᐠ	SKG	F4
B	Stong Barn	SB	A9
A	Stong House	SH	A9

NON-YORK U BUILDINGS

96	Archives of Ontario *	AO	D7
1	Canlan Ice Sports *	ICE	B1
62	CMiC Building	CMB	B9
57	Harry Sherman Crowe Housing Co-op	HCC	C7
101	Pioneer Village TTC subway station	PVS	A3
40	Seneca @ York, Stephen E. Quinlan Building	SAY	E7
8	Tennis Canada - Sobeys Stadium *	TC	D2
7	Track & Field Centre *	TFC	B4
99	The Quad Student Housing *(managed by Forum Campus Suites)*	QSH	F6
104	York Region Transit Terminal		A3
100	York University TTC subway station	YUS	D6

* Shared use
x Temporarily Closed

Please visit yorku.ca/mapskeele for the most up to date version of the campus map

June 20[illegible]

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KEY EVENTS

FRI 26 May

17:00-19:00, Congress 2023 opening reception, Shoukri Atrium, McEwen Graduate Building (invitation only)

17:30-19:30, CSHPS executive meeting, V.P. Daladeh Building (DB) 1012

SAT 27 May

SUN 28 May

11:00-12:30, Thoughts on science and research policy in Canada following the Advisory Panel on the federal research support system, Frédéric Bouchard, DB 0016

15:30-17:00, Stillman Drake lecture, 2023: Pragmatist philosophy for historians of science, Hasok Chang, DB 0016

17:00-19:00, President's reception, Scott Library Atrium

MON 29 May

12:30-15:00, Annual general meeting, DB 0016. All are welcome; a complimentary lunch will be served. The meeting time is kept *open but is not expected to run for the entire duration*. Highlights include the awarding of the Hadden Prizes for best graduate student papers, and discussions about the 2024 Congress and CSHPS meetings.

GREETING TABLE:

Next to DB 0015

BREAKS:

10:30-11:00
12:30-13:30
15:00-15:30

CSHPS gratefully acknowledges sponsorships by York University's Science & Technology Studies Graduate Program; the Department of Science, Technology, and Society; the Faculty of Liberal Arts and Professional Studies; and the Faculty of Science. For their financial assistance we also thank the Congress Open Speaker's Fund and the Rotman Institute of Philosophy, Western University.

BY SESSION

SATURDAY

DB: V.P. Daladeh Building, formerly TEL

SAT 27 May, 09:00-10:30, A, DB 0016, Novelty.
Contributed Paper Session

- Another Negative Program in Experimental Philosophy*, Andrew Richmond, Western University*
- Beyond Sexual Maturity: Towards a New Theory of Puberty, *Rebecca Jordan-Young, Barnard College, Columbia University, Sahar Sadjadi, McGill University*
- Is there such a thing as proof-of-concept research? *Christophe Malaterre, Université du Québec à Montréal*

Chair: **Ingo Brigandt**, University of Alberta

SAT 27 May, 09:00-10:30, B, DB 0005, Scientific understanding and the epistemology of scientific practice.
Organized Session

Philosophers of science have long been interested in explanation. More recently, they have taken seriously that understanding is the aim of explanation, providing deeper analyses of what it means to understand something scientifically. These analyses still focus on the role of explanation in producing explanatory understanding or understanding-why, demanding that to understand a phenomenon scientifically is to grasp a correct explanation of that phenomenon. Views like this are defended by Kareem Khalifa (2017), Henk de Regt (2017), Angela Potochnik (2020), Allison Hills (2016), Alexander Bird (2022), J. D. Trout (2002), and Michael Strevens (2013), to name only a few prominent players, and go back as far as to Carl Hempel (1965), Michael Friedman (1974), and Wesley Salmon (1989). Despite widespread disagreement about what grasping an explanation involves, there is still agreement on the key tenet of this traditional conception, namely the need for explanation to understand a phenomenon scientifically. Recently, some pressure has been put on this conception, through pragmatic accounts of explanation, where good explanations and good explanatory acts are defined in terms of their producing understanding (Wilkenfeld [2014], Woody [2014], Franco [2019]). But if explanation is defined in terms of the aim of producing understanding, then it is implausible to reduce or explain understanding in terms of explanation. Understanding must be understood on its own terms, even if explanations provide an important route to it. This session will explore alternative conceptions of scientific understanding and with it the possibility of rejecting the traditional conception, moving beyond a focus on explanations, understanding-why, and explanatory knowledge. Each of the speakers reject the claim that explanation is necessary

for scientific understanding, while doing so in different ways.

- Operational understanding: scientific understanding through method and meaning, *Oscar Westerblad, Department of HPS, University of Cambridge*
- Practical understanding and the genre conventions of scientific article writing, *Michael T. Stuart, National Yang Ming Chiao Tung University; LSE; University of York*
- The structure of understanding*, Adham El-Shazly, Faculty of Philosophy, University of Cambridge*

Chair: **Kino Zhao**, Simon Fraser University

SAT 27 May, 09:00-10:30, C, DB 1005, Investing in the future.
Contributed Paper Session

- A Transhuman Technological Future: Ideologies, Expectations, and Investments*, Dayna Jeffrey, York University.*
- The Vertical Farm: Modularity as Settler-Colonial Logic, *Hayley Birss, IHPST, University of Toronto*
- Space wheels and artificial worlds: megastructures in science and science fiction, *Stephen D. Snobelen, King's College, Halifax*

Chair: **Lesley Cormack**, UBC-Okanagan

SAT 27 May, 09:00-10:30, D, DB 0011, Managing the self.
Contributed Paper Session

- "A disease which tests the character of the patient": Expertise, trust, and the work of diabetes, 1920-1950*, Elizabeth Neswald, Brock University*
- Managing Nervous Disorders at Home: Psychiatric Self-Help Literature in the United States, 1900-1930, *Matthew McLaughlin, University of Toronto*
- Computing and Counselling: Ethical Issues in AI-facilitated Psychotherapy, *Rachel Katz, University of Toronto*

Chair: **Tara Abraham**, University of Guelph

SAT 27 May, 11:00-12:30, A, DB 0016, COVID, expertise and public participation. Roundtable

The COVID pandemic has continued to exacerbate challenges around what it means to be an expert: whose expertise is relevant and who is epistemically trespassing; who is granted credibility and who is marginalized; and how different forms of knowledge are normalized or ostracized by broader forces. Are there better modes to make these kinds of contested decisions? And how are communities pushing back in the face of oppression? In this panel, we explore these issues related to science deliberation, COVID, and public participation. This will be a roundtable format with short talks, discussion, then an opening up to the audience.

- A proposal for a science court, *Zeynep Pamuk, London School of Economics*
- Circum"venting" Debates: Science and the DIY Air Purification Movement*, Eric Kennedy, York University*
- What counts as legitimate public criticism of science? The role of values in public trust, *Heather Douglas, Michigan State University*

Session Organizer: **James Elwick,** York University
Chair: **Brian Baigrie**, University of Toronto

SAT 27 May, 11:00-12:30, B, DB 0005, Art, artifice, and artificial intelligence.
Organized Session

This panel explores current discussions surrounding Artificial Intelligence (AI) and Art. Questions to be considered include: can content generated by AI sometimes be considered art? Does AI-generated art involve authorial intent?

- Portrait of the Artist as a Young Algorithm*, Sofie Vlaad, Queen's University*
- The Work of Art in the Age of Algorithmic Reproduction, *Rohan Khan, Brandon Ye and Alvin Shen, Queen's University*
- Trading in Value: Digital artist counterculture and the struggle against AI generated "art", *Alyse Allred, University of Washington*

Session Organizer: **Sofie Vlaad**, Queen's University
Chair: **Stephen D. Snobelen,** King's College, Halifax

SAT 27 May, 11:00-12:30, C, DB 1005, Evolution.
Contributed Paper Session

- Interspecies Sympathy in Darwin's *The Descent of Man*, *Michael Cameron, Dalhousie University*
- Was Darwin's "I think" diagram a tree, or is it now? The rights and wrongs of pure history*, Mary P. Winsor, University of Toronto*
- "Science is Justified by Works, not by Faith": American Biologists reject Ernst Haeckel's Evolutionary Religion, 1874-1924, *Daniel Halverson, University of Toronto*

Chair: **Antoine C. Dussault**, Collège Lionel-Groulx / Université de Montréal

SAT 27 May, 11:00-12:30, D, DB 0011, Philosophy of physics.
Contributed Paper Session

- Shifting Limits of Knowledge in Modern Cosmology, *Nichole Levesley, IHPST, University of Toronto*
- ~~Philosophy of Physics, The Principle of the Identity of Indiscernible (PII), Determinism, and Locality: An Example of Organizing Principles*, Xiaoqian (Lara) Hu, The Chinese University of Hong Kong, Shenzhen*~~ **MOVED TO SUN AT 11**
- Finite-temperature field theory: We're alright but we're not ØK, *Adam Koberinski, University of Pittsburgh*

Chair: **Laurent Jodoin**, Collège Lionel-Groulx / Université de Montréal

SAT 27 May, 13:30-15:00, A, DB 0016, Philosophical issues in deep learning.
Organized Session

The papers in this session all concern current Deep Learning models (with a focus on models of vision and language), and the question of whether these models are successful. What success ought to mean is a theme running through this session. Methodological advice about how to judge these models is drawn from neuroscience, comparative psychology, philosophy of science, and philosophy of language.

- Philosophical Issues in Deep Learning, Interventional methods for relating representations in DNNs to representations in the brain, *Cameron Buckner, University of Houston*

- Adversarial Perception in Deep Neural Networks*, Catherine Stinson, Queen's University.*
- Philosophical Issues in Deep Learning, Understanding LLMs: from benchmarks to cognitive ontologies, *Charles Rathkopf, Jülich Research Centre; Dimitri Coelho Mollo, Umeå University*
- Le Problème de L'Ancrage Vectoriel, *Raphaël Millière, Columbia University*

Session Organizer: **Catherine Stinson**, Queen's University
Chair: **Andrew Richmond**, Western University

SAT 27 May, 13:30-15:00, B, DB 0005, <u>Forgetting and remembering</u>.
Contributed Paper Session

- D. C. Miller's 'Disproof' of Special Relativity*, Patrick Fraser, University of Toronto*
- Forgetting and remembering, Laura Chalk and the Stark Effect*, Daniela Monaldi, York University*
- Not Be Missed: Harriet Brooks and the rewriting of the history of science, *Megan Krempa, University of King's College*

Chair: **Soroush Marouzi**, University of Toronto

SAT 27 May, 13:30-15:00, C, DB 1005, <u>Co-production</u>.
Contributed Paper Session

- One Lonely Glassblower: Making and Mending in 1920s Canadian Physics, *Victoria Fisher, University of Toronto*
- Theorizing the "Heritable Factor" in the Tristan da Cunha Working Party's Asthma Investigations (1961-1972): Studying Human Difference Between Imperial Biology and the "New Science" of Population Genetics*, C. K. Massey, IHPST, University of Toronto*
- Duplicates: Nature and Artifacts in an imperial museum. *Gordon McOuat, University of King's College/Dalhousie University*

Chair: **Eleanor Louson**, Michigan State University

SAT 27 May, 13:30-15:00, D, DB 0011, <u>Philosophy of science</u>.
Contributed Paper Session

- Component-level understanding is necessary for Explainable AI to succeed, *Travis O'Brien, Indiana University*
- Theory-Centrism and the Formal Study of Macro-Units, *Bobby Vos, University of Cambridge*
- Operationalization of Scientific Realism/Anti-realism Accounts for Semi-Structured Interviews. *Angella Yamamoto, University of Waterloo*

Chair: **Jacob Neal**, Western University

SAT 27 May, 15:30-17:00, A, DB 0016, <u>Numbers</u>.
Contributed Paper Session

- Is Temperature a Continuous Function? Lessons from Idealisations in Thermal Physics, *Aditya Jha, University of Canterbury, NZ and Massachusetts Institute of Technology*
- The History and Philosophy of Probability*, Ken Archer, Independent Scholar*
- Precision in the Art of Navigation: a study of significant figures in Norie's Epitome of Practical Navigation, *Matthew Maxwell, University of Wisconsin - Madison*

Chair: **Michael Cameron**, Dalhousie University

SAT 27 May, 15:30-17:00, B, DB 0005, History of science and technology.
Contributed Paper Session

- British Meteorology and the Response to the Tambora Climate Effects (1815-1820), *Nayani Jensen, University of Toronto*
- The Rise of Reefer Containers and the decline of Reefer Ships, *Michel Nguessan, Governors State University, Illinois*
- Footprints in the Snow: Tracking a cryptozoological history of expeditionary science, *Danielle Inkpen, Mount Allison University*

Chair: **Jamie Shaw**, University of Toronto

SAT 27 May, 15:30-17:00, C, DB 1005, Annihilation.
Contributed Paper Session

- Attachment theory: Towards an Ethological Approach to Grief*, Migdalia Arcila Valenzuela, Cornell University*
- Iran's Atomic Technophobias: Humanism, orientalism, and technological fear during the Cold War (1941-1991), *Ata Heshmati, University of Toronto*
- Doxastic and Axiological Transformations following Near-Death Experiences. A Case of Underdetermination? *Alexandru Manafu, York University, David Zarebski, Data Scientist, Juensung Kim, University of Toronto*

Chair: **Gordon McOuat**, University of King's College

SAT 27 May, 15:30-17:00, D, DB 0011, Algorithms and the machines that use them.
Contributed Paper Session

- Epistemic opacity in scientific computing, *Nicolas Fillion, Simon Fraser University*
- New Loops: Algorithms in the Context of Ancient Babylonian Astronomy, *E.L. Meszaros, Brown University*
- Presenting the Future: the case of the IBM Selective Sequence Electronic Calculator, *Allan Olley, Independent Scholar*

Chair: **Isaac Record**, Michigan State University

SUNDAY

SUN 28 May, 09:00-10:30, A, DB 0016,
Historical causation & explanations.
Contributed Paper Session

- A Network of Evidential Constraints – A Functionalist Perspective on Historical Explanations*, Matilde Carrera, Boston University*
- What makes the historical sciences tick? Geochronology and the ontology of scientific methods, *George Borg, National Science Foundation/University of Pennsylvania*
- Edward Hitchcock and A New Research Factor in History of Paleontology: Fossil Footprints and Formation of the Field of Ichnology*, Ali Mirza, University of Saskatchewan*

Chair: **Mélanie Frappier**, University of King's College

SUN 28 May, 09:00-10:30, B, DB 0005,
Science policy.
Contributed Paper Session

- A clarification of the Precautionary Principle based on irreversibility, *Laurent Jodoin, Collège Lionel-Groulx / Université de Montréal*
- Science policy, Peer Review, Innovation, and Predicting the Future of Science: The Scope of Lotteries in Science Funding Policy, *Jamie Shaw, University of Toronto*
- Science in Crisis: Evidence, Policy, and Science Communication During Public Emergencies, *Tyler Paetkau, McGill University*

Chair: **Maria Amuchastegui**, York University

SUN 28 May, 09:00-10:30, C, DB 1005,
Evolution of complex traits.
Contributed Paper Session

- A Feminist Assessment of What's Wrong with Evolutionary Selfishness, *Letitia Meynell, Dalhousie University*
- Irreducible Complexity and Contemporary Darwinism, *Yussif Yakubu, University of Guelph*
- Where are Colors? Perspectival perceptual realism, *Paul Patton, IHPST, University of Toronto*

Chair: **Daniel Halverson**, University of Toronto

SUN 28 May, 09:00-10:30, D, DB 0011,
Science, enlightened knowledges and empire.
Organized Session

The explanatory power and instrumental promise of the natural sciences were at the core of enlightened knowledge in the eighteenth and nineteenth centuries. Enlightened knowledge and the Enlightenment have served as shorthand for a Eurocentric, undifferentiated view of knowledge that projected imperial power at the expense of environment and other ways of knowing. This session considers diverse kinds of knowledge to offer a more nuanced account of the power-knowledge nexus. Debates about the nature of music were of great interest in the Enlightenment in France, especially as taken up by Jean-Jacques Rousseau, who looked beyond mathematical accounts of music to engage with the full range of musical diversity in non-

systematic ways. Eighteenth-century theories of the earth were infamously speculative and are sometimes depicted as giving way to more empirically cautious geosciences. The experimental philosopher and aphorist Georg Christoph Lichtenberg, writing in the shadow of the French Revolution, offered a more challenging view of theories of the earth, contending that they were deeply important for the intellectual and moral development of humanity. Watermills have long been seen as idyllic places in harmony with their environment, a view that had become rampant in late twentieth-century Ontario. However, Ontario water power was a key link in the British empire, once that tied naval power and commerce to the European settlement. Watermills were sites for the production of power and of scientific and environmental knowledge, and as such are crucial for understanding European and Indigenous relations in the nineteenth-century.

- "Geological Fantasies" in a Revolutionary Age, *Ernie Hamm, York University*
- Acoustics or Natural History? Rousseau, Rameau, and the Nature of Music, *Brandon Konoval, University of British Columbia*
- Metabolism of Empire: Watermills in Long Nineteenth Century Ontario, *Johannes Chan, York University*

Session Organizer: **Ernie Hamm**, York University
Chair: **Michel Nguessan**, Governors State University, Illinois, USA

SUN 28 May, 11:00-12:30, A, DB 0016, Thoughts on science and research policy in Canada following the Advisory Panel on the federal research support system.

Frédéric Bouchard (Université de Montréal), Chair of the Advisory Panel Report on the Federal Research Support System, discusses this report and its findings about Canada's research ecosystem and its future. The session will be 45 minutes in duration. (The Bouchard report can be found at https://ised-isde.canada.ca/site/panel-federal-research-support/en/report-advisory-panel-federal-research-support-system)

Session Organizer: **James Elwick**, York University
Chair: **Lesley Cormack**, UBC-Okanagan

SUN 28 May, 11:00-12:30, B, DB 0005, New directions in history of science.
Contributed Paper Session

- Think Like a Genius: History of Science for Middle School Students, *Adam Richter, University of Toronto*
- What is to be Done About the "Decline Narrative" in the Historiography of Science in the Islamic World? *Zeyad El Nabolsy, Cornell University*
- How priority disputes can become fashionable again: From priority disputes to citational justice, *Maria Amuchastegui, York University*

Chair: **Jagdish Hattiangadi**, York University

SUN 28 May, 11:00-12:30, C, DB 1005, Models.
Contributed Paper Session

- Credibility is in the Eye of the Beholder: Minimal Models, Feminist Epistemology,

and the Production of Ignorance, *Patricia Marino, University of Waterloo*

- Ontological Commitments in Non-Causal Scientific Explanation, *Jahangir Moazzenzadeh, University of Guelph*
- ~~Why is it (still) Difficult to Understand Black-Box Models? Explainable Artificial Intelligence and the Experimenter's Regress, *Siyu Yao, Indiana University Bloomington*~~ **MOVED TO BELOW**

Chair: **Joel West**, University of Toronto

SUN 28 May, 11:00-12:30, D, DB 0011,
Papers without Borders.
Contributed Paper Session

- Why is it (still) Difficult to Understand Black-Box Models? Explainable Artificial Intelligence and the Experimenter's Regress, *Siyu Yao, Indiana University Bloomington*
- Philosophy of Physics, The Principle of the Identity of Indiscernible (PII), Determinism, and Locality: An Example of Organizing Principles, *Xiaoqian (Lara) Hu, The Chinese University of Hong Kong, Shenzhen*
- Does the biosphere have a demarcation mechanism?, *Banin Sukmono, University of Kansas*

Zoom link:
https://yorku.zoom.us/j/7283143887

Chair: **TBD**

SUN 28 May, 13:30-15:00, A, DB 0016,
Eating disorders: values in conflict.
Organized Session

This symposium focuses on the conflicts between different types of values in eating disorders, and the importance of involving patients' perspectives in addressing and resolving these conflicts. These conflicts of values are the differences in goals, desires, and ideals of the good life that occur between patients and clinicians, patients and society, or even conflicts within patients themselves. The first talk critiques the "obesity epidemic" rhetoric and its negative impact on those in eating disorder recovery. It highlights how societal and medical standards for "healthy weight" can take priority over addressing the underlying mental illness and can lead to misdiagnosis, delays in care, and increased distress for patients. The second talk addresses the bioethical implications of treating anorexia nervosa, highlighting the potential conflict of values between patients and clinicians. The author argues that rather than shying away from this fact, it is important to confront the potential conflict in values head-on. The third talk will explore how the focus on operationalism in psychiatric nosologies and the lack of consideration for patients' perspectives leads to inadequate treatment. The authors suggest that we must incorporate patients' perspectives, while also acknowledging potential conflicts between patient and clinician values. Overall, the talks highlight the complexity and nuances of treating eating disorders and the importance of incorporating patients' perspectives and values in treatment.

- Facing the Issue of Conflicting Values in Anorexia Nervosa Treatment Head-On, *Amanda Evans, Washington University in St. Louis*
- The Incompatibility of "Obesity Epidemic" Rhetoric and Eating Disorder Recovery, *Kayla R. Mehl, University of Washington*

- Valuing Patient Perspectives in the Context of Eating Disorders, *Amy MacKinnon, Hershy Jaiprakash, Jacob P. Neal and Sarah Arnaud, Western University*

Session Organizers: **Sarah Arnaud** and **Jacob P. Neal,** Western University

Chair: **Catherine Stinson**, Queen's University

SUN 28 May, 13:30-15:00, B, DB 0005, Mind.
Contributed Paper Session

- Autism and the Pseudoscience of Mind, *Travis LaCroix, Dalhousie University*
- Embodied Memory in the Slime Mold, *Emma Sigsworth, IHPST, University of Toronto*
- Mind, Mnemonics and Memory: A View from C S Peirce and Sussanne Langer, *Joel West, University of Toronto*

Chair: **Rachel Katz**, University of Toronto

SUN 28 May, 13:30-15:00, C, DB 1005, What models are not.
Contributed Paper Session

- An Empirical Study in Light and Dark: Galileo's Phenomenological Model of the Lunar Surface, *Brian Baigrie, IHPST, University of Toronto*
- Modeling and Thought Experiments: Rebuilding the Distinction, *Jennifer Whyte, University of Pittsburgh*
- What are False Models Good For? Lessons From a Case Study in Economics, *Ahmed Aljuhany, University of Calgary*

Chair: **Zeyad El Nabolsy**, Cornell University

SUN 28 May, 13:30-15:00, D, DB 0011, Levels of individuality and agency.
Contributed Paper Session

- Microbiome Malleability*, Andrew Inkpen and Jane Dryden, Mount Allison University*
- Reconsidering the Terrestrial in an age of artificial intelligence, *Katrina Nicole Matheson, York University*
- ~~Does the biosphere have a demarcation mechanism?, *Banin Sukmono, University of Kansas*~~ **MOVED TO SUN AT 11**

Chair: **Suze Berkhout**, University of Toronto

SUN 28 May, 15:30-17:00, A, DB 0016, Stillman Drake Lecture, 2023.
Pragmatist philosophy for historians of science.

Hasok Chang, Cambridge University

History of science and philosophy of science have become more distant from each other in recent decades. One key reason for this disengagement is the fact that the majority of historians of science have not found mainstream ideas in the philosophy of science useful for the framing of their research questions, or for the construction of their research methods. Instead, historians of science have increasingly turned to social and cultural studies for their theoretical and methodological inspiration and resources. However, historians of science stand to lose a great deal by disregarding philosophy entirely. This is because knowledge, inquiry, truth, evidence and reality are important notions operative in scientific practices, and very often they are even actors' categories. In this talk I offer a kind of philosophy of science that will hopefully be useful and even indispensable for historians of science, based on some ideas articulated in my

recent book, *Realism for Realistic People: A New Pragmatist Philosophy of Science* (Cambridge, 2022). This pragmatist philosophical history of science takes knowledge primarily as an ability to do things (not merely the possession of information), uses "epistemic activities" and "systems of practice" as the main units of analysis, and understands truth and reality as concepts based on the operational coherence of activities. I will illustrate these proposals through the example of one extended study, namely my current work on the history of batteries and "battery science."

Chair: **Tara Abraham**, University of Guelph

SUN 28 May, 17:00-19:00, Scott Library Atrium, President's reception

MONDAY

MON 29 May, 09:00-10:30, A, DB 0016,
Where next? Rethinking the history of the circulation of scientific knowledge.
Organized Session

At the 5th joint meeting of the BSHS, CSHPS, and HSS held in Halifax almost 20 years ago, Jim Secord invited historians and philosophers of science to examine more carefully how scientific knowledge—as well as scientists, theories, specimens, and instruments—circulate across borders, and how local, individual knowledge thus acquires global significance. It was time, Secord argued, to eschew the view that science's global reach was easily explained by its rational methodology and the strong empirical evidence supporting its claims. The problem, Secord warned, was not merely that we had to rethink how and why science circulates, but that the general historiographical frameworks in existence—because of their Eurocentrism—were not suitable to such a global history. The response to Secord's address, we now know, was enthusiastic and marked by a series of international collaborations, including Situating Science and Cosmopolitanism and the Local in Science and Nature. Now that the positivistic account of science's success has been abandoned, the complexity of "knowledge transit" has become clear. As our panellists, Geoff Bill, Fa-Ti Fan, Dhruv Raina, Lesley Cormack and Gordon McOuat show, gone are the days where scientific knowledge was understood as moving from colonies to metropoles in a movement of accumulation. As they explain, as knowledge circulates, it is resisted, translated, and refashioned before being accepted and recirculated. Thus, out of a series of local encounters between individual actors meeting, so to speak across borders, arises a global history of knowledge, one that is not a naïve reconstruction of human rationality, but a complex set of processes where humans but also natural specimens, artifacts, measuring instruments, languages, policies, and communities play central roles.

- Circulation, Translation, and Ethnoscience in Twentieth-Century Sumatra*, Geoff Bill, University of Delaware*
- Is Cosmopolitanism a Useful Concept at All? Gordon McOuat, University of King's College/Dalhousie University
- Reciprocity and the Varieties of Epistemic Justice, *Dhruv Raina, Jawaharlal Nehru University*
- Reflections on the Past, Present and Future of HPS International Collaboration, *Lesley Cormack, University of British Columbia | Okanagan Campus*
- Windmills of Your Mind: Prof. McOuat, Circulation of Knowledge, and the Global History of Science, *Fa-Ti Fan, Binghamton University*

Session Organizer: **Mélanie Frappier,** University of King's College

Chair: **Ernie Hamm**, York University

MON 29 May, 09:00-10:30, B, DB 3072,
Whither CSHPS?
Workshop

The post-lockdown resumption of in-person meetings at Congress gives all scholars a chance to think about the future direction of their societies. CSHPS, too, will benefit from imaginative suggestions about future directions. This session uses the (https://conversationcafe.org) format to encourage participants to come up with diverse answers to the question, "In what ways would you like to see CSHPS change and evolve?"

Session Organizer: **James Elwick**, York University

MON 29 May, 09:00-10:30, C, DB 1005,
Values in science.
Contributed Paper Session

- Non-epistemic values and scientific aims: an adequacy-for-purpose view, *Greg Lusk, Durham University; Kevin Elliott, Michigan State University*
- COVID-19 and the generation of novel scientific knowledge: Research questions, study designs, evidence-based decisions and data sharing, *Lucie Perillat, University of Toronto*
- Non-Epistemic Values For Epistemic Gaps, *Kino Zhao, Simon Fraser University*

Chair: **Andrew Inkpen**, Mount Allison University

MON 29 May, 11:00-12:30, A, DB 0016,
History of philosophy of science.
Contributed Paper Session

- Between Paradigms and Political Theories: Revisiting the Fuller-Gunnell Debate on Thomas Kuhn, *Lewis Page, University of British Columbia*
- John Maynard Keynes' Anti-Intellectualism, *Soroush Marouzi, University of Toronto*
- Logique des savants, logique des philosophes : Méthodologie et causalité chez Claude Bernard et John Stuart Mill, *Vincent Guillin, Université du Québec à Montréal*

Chair: **Sarah Arnaud**, Western University

MON 29 May, 11:00-12:30, B, DB 3072,
Creative classrooms: drawing, journaling, and making in science and society courses.
Workshop

In this interactive workshop, we will explore three activities designed to get students engaged and thinking about course content at a deeper and more personal level. Drawing comics provides insight into how to approach topics from multiple perspectives and provides insight into multiple ways of knowing. Nature journaling helps students be present in nature and reflect on their experiences as well as their relationships with nature. Making physical models invokes tacit knowledge and redirects theoretical musings. Our session will end with a discussion/Q&A to help participants plan to incorporate these activities within courses and understand their potential benefits for student learning, engagement, and wellness. All necessary supplies will be provided; all levels of artistic experience are welcome.

- Critical Making and Wicked Problems in the Classroom, *Isaac Record, Michigan State University*
- Drawing Comics as a Way of Knowing, *Megan Halpern, Michigan State University*

- I Notice; I Wonder; It Reminds Me Of…: Nature Journaling for Undergraduate Courses, *Ellie Louson, Michigan State University*

Session Organizer: **Isaac Record**, Michigan State University

Chair: **Daniela Monaldi**, York University

MON 29 May, 11:00-12:30, C, DB 1005, Functions.
Contributed Paper Session

- Functions need not explain the presence of their bearers, *Antoine C. Dussault, Collège Lionel-Groulx / Université de Montréal*
- Work for Concept Functions: From Scientific Concepts to Conceptual Engineering, *Ingo Brigandt, University of Alberta*

Chair: **Adham El-Shazly**, Cambridge University

MON 29 May, 11:00-12:30, D, DB 0001, Three decades of James R. Brown's *The Laboratory of the Mind*.
Organized Session

This panel hosts three papers that engage with the analysis of thought experiments offered by the Canadian philosopher James R. Brown. The principal aim of the panel is to appreciate the enormously constructive effect that Brown's work has had on the growth and direction of discussions about thought experiments in the sciences and beyond. Unlike other early monographs published on the subject, The Laboratory of the Mind (first published in 1991) provoked international protest. Like Alexandre Koyré before him, Brown insists that scientific thought experiments demonstrate the significant limits of empiricism. Good empirical work is one thing and certainly important, Brown reasons. But without the mind's eye, metaphorically speaking, we wouldn't get to laws of nature from observable regularities. And, sometimes, scientists even manage to make the jump to laws of nature without much supportive empirical work beforehand. Thought experiments aid them in such astonishing undertakings. Galileo showed us how it's done. Therefore, thought experiments require a Platonic account, Brown concludes. His central claim is: Thought experiments are not simply unexecuted physical experiments. The necessities that laws of nature express about observable regularities find their truth makers in a Platonic realm of universals and their relationships. And insights into such necessities do require a kind of Platonic idealization at times. Brown is very much aware of the many challenges his proposal faces. A Platonic theory of TEs is to be accepted by means of an inference to the best explanation, argues Brown, though it is difficult to establish the existence of a Platonic realm of objects and the capacity of the mind to reach that realm. Sure enough, it is these soft spots that critics jump at. The panellists are united in the view that a dismissal of Brown's theory of thought experiments on the grounds of those weaknesses seems premature at best.

- An Unexpected Window: Platonic Thought Experiments in Chemistry, *Michael T. Stuart, National Yang Ming Chiao Tung University; LSE; University of York*

- Are There Blind Thought Experimenters? *Mélanie Frappier, University of King's College*
- Plato's Heaven is not Good Enough! *Yiftach Fehige, IHPST, University of Toronto*

Session Organizer: **Yiftach Fehige**, University of Toronto

Chair: **Letitia Meynell**, Dalhousie University

MON 29 May, 12:30-15:00, A, DB 0016, <u>Annual general meeting</u>.

All are welcome; a complimentary lunch will be served. The meeting time is kept open *but is not expected to run for the entire duration*. Highlights include the awarding of the Hadden Prizes for best graduate student papers, and plans for the 2024 meeting.

MON 29 May, 15:30-17:00, A, DB 0016, <u>Psychiatry</u>.

Contributed Paper Session

- "My dull brain was wrought with things forgotten:" Considering the Origins of Model Psychosis, *Matthew Perkins-McVey, Dalhousie University*
- Reductionist explanation, psychiatric disorders, and health care policy, *Derek Andrews, Dalhousie University*
- Situating the Chemical Cure: Chlorpromazine and the Rise of Psychiatry's Neuromolecular Gaze*, Suze Berkhout, University of Toronto*

Chair: **Migdalia Arcila Valenzuela**, Cornell University

SCHPS / CSHPS 2023 ABSTRACTS

OPEN EVENTS

All events occur in the Victor Phillip Daladeh Building, formerly known as TEL

Stillman Drake Lecture (Open Event)

Pragmatist Philosophy for Historians of Science, Hasok Chang, Cambridge University

- History of science and philosophy of science have become more distant from each other in recent decades. One key reason for this disengagement is the fact that the majority of historians of science have not found mainstream ideas in the philosophy of science useful for the framing of their research questions, or for the construction of their research methods. Instead, historians of science have increasingly turned to social and cultural studies for their theoretical and methodological inspiration and resources. However, historians of science stand to lose a great deal by disregarding philosophy entirely. This is because knowledge, inquiry, truth, evidence and reality are important notions operative in scientific practices, and very often they are even actors' categories. In this talk I offer a kind of philosophy of science that will hopefully be useful and even indispensable for historians of science, based on some ideas articulated in my recent book*, Realism for Realistic People: A New Pragmatist Philosophy of Science* (Cambridge, 2022). This pragmatist philosophical history of science takes knowledge primarily as an ability to do things (not merely the possession of information), uses "epistemic activities" and "systems of practice" as the main units of analysis, and understands truth and reality as concepts based on the operational coherence of activities. I will illustrate these proposals through the example of one extended study, namely my current work on the history of batteries and "battery science."

Congress / Association Event, Reckonings and Re-Imaginings (Open Event)

Thoughts on science and research policy in Canada following the Advisory Panel on the Federal Research Support System, Frédéric Bouchard, Université de Montréal

- Frédéric Bouchard (Université de Montréal), Chair of the Advisory Panel Report on the Federal Research Support System, discusses this report and its findings about Canada's research ecosystem and its future. The session will be 45 minutes in duration. (The Bouchard report can be found at https://ised-isde.canada.ca/site/panel-federal-research-support/en/report-advisory-panel-federal-research-support-system).
- Frédéric Bouchard (Université de Montréal), président du rapport du comité consultatif sur le système fédéral d'aide à la recherche, discute de ce rapport et de ses conclusions sur l'écosystème de la recherche au Canada et son avenir. La session durera 45 minutes. (Le Bouchard rapport est disponible sur https://ised-isde.canada.ca/site/comite-soutien-federal-recherche/fr/rapport-comite-consultatif-systeme-federal-soutien-recherche).

PAPERS (ALPHABETIZED BY AUTHOR)

What are False Models Good For? Lessons From a Case Study in Economics, Ahmed Aljuhany, University of Calgary

- A growing number of philosophers are coming to think of scientific models as tools that are built and used for particular purposes (Van Fraassen 2008; Currie 2017; Parker 2020). But all too often, even those who endorse this way of thinking about models offer up standards for model evaluation that are too restrictive to account for how highly idealised - or "false" (Wimsatt 2007) - models are used in practice. These standards typically assume that models owe their usefulness to their representation of some specific theory or target system (e.g. Morrison & Morgan 1999; Maki 2009; Giere 2010). Standards like these can't account for false models that serve a variety of purposes without representing either. In this paper, I show that false models can serve a number of different purposes even if they do not represent any particular theory or target system. Through the example of Gale and Shapley's (1962) famous two-sided matching model, I show that these sorts of false models can be used as orientation devices (which highlight key problems and solutions) and detection devices (which identify the assumptions that should be included or excluded in our models, given our goals) to achieve at least three purposes: (1) generating theorems, (2) building new models, and (3) guiding real-world interventions. I conclude that, to account for models like these, our standards for model evaluation will have to better reflect how false models are used in practice.

Trading in Value: Digital artist counterculture and the struggle against AI generated "art", Alyse Allred, University of Washington

- Last year, the public launch of DALLE 2 and other stable diffusion-based AI image generators sparked discussion and debate around the use, misuse, and ethics of the now readily-accessible technology. Digital artist communities stood out among the detractors, upset over the nonconsensual algorithmic scraping of their work and predicting the ways that it would devalue and exploit the community. Although the community has largely rejected the technology, they have struggled to articulate exactly why this instinctive repulsion towards AI generated imagery occurs. Much of the public discourse has been framed around the evergreen question of "What is art?" However, this is an argument in bad faith, one easily twisted to depict digital artists as exclusionary luddites set on gatekeeping the meaning of art itself. Beyond the impossibility of the question itself, it's also the wrong question. In order to get at the heart of the issue, we frame these artist communities as digital countercultures that crossover heavily with online transformative fandom. This overlap provides a framework for better understanding digital artist communities as participatory cultures populated heavily by marginalized identities. With this come anticapitalistic underpinnings and a gift economy, which value art based on intangible qualities (i.e. care, time, context, effort, etc...) rather than on monetary worth or functional use. This reframing offers the insight that the core tension was never about defining "art," but rather navigating the

explicit violation of an implicit ethical and social norm within the digital artist community.

How priority disputes can become fashionable again: From priority disputes to citational justice, Maria Amuchastegui, York University

- This paper will review the historiographic and sociological literature on priority disputes, taking into account recent scholarship on citational justice and the insights of postcolonial STS. A priority dispute is an argument—often carried out by proxies—over who was the first to have invented or discovered something. Historians of science used to study priority disputes, but they later became deeply unfashionable, as they imply an individualistic, Whig view of history. The sociologist of science Robert K. Merton points out that priority disputes often have national overtones—and hence have much to do with geographies of knowledge. The philosopher of science Sandra Harding reminds us that the scientific contributions of marginalized communities are often disregarded. The STS scholars Henke and Gieryn argue that the sociology of translation—that is to say, actor-network theory—does not sufficiently emphasize the importance of Latourian centres of calculation in legitimizing knowledge claims. More recently, STS scholarship on scientometrics has pointed out that women and people of colour are systematically under cited, and argue that citational practices should be reformed to account for "citational justice."

Reductionist explanation, psychiatric disorders, and health care policy, Derek Andrews, Dalhousie University

- There is increasing evidence that mental disorders may be most accurately understood as being underlain by stable neurobiological mechanisms (Tsou, 2021). For example, compelling evidence suggests that depression is underlain by deficient serotonin, dopamine, and norepinephrine activity (Nestler & Carlezon, 2006; Moret & Briley, 2011; Tsou, 2012; 2017; Hancock & McKim, 2018), resulting in, for example, the fatigue and lack of motivation that commonly presents in depression (Stahl, 2002), and that schizophrenia is underlain by dysfunctions in glutamate and dopamine mechanisms (Laruelle, Kegeles, & Abi-Dargham, 2003; Kendler & Schaffner, 2011), producing, for example, the excessive (and deficient) dopamine activity behind its positive (Howes & Kapur, 2009) and negative symptoms (Kring et al., 2017; Hancock & McKim, 2018). Given this, there are strong reasons to adopt a naturalist, biological approach to psychiatry, such as improvements to diagnosis and prognostication. By developing diagnostic categories oriented to the causes of mental disorders, rather than symptoms, such approaches generate projectionable diagnostic categories that can yield reliable inductive inferences about their members (Tsou, 2016). However, while reductive explanations themselves well to reaching conclusions about the presentation of mental disorders qua disorders, I argue that they cannot be relied upon to produce justifiable health care policy governing persons with mental disorders. This is due to their reductionist nature, as it is their myopic focus on underlying causes that pushes out consideration of factors that, along with symptoms, explain the actual conduct of these persons. Without attending to these factors - such as variations in neurology, social

context, and decision-making processes - we lack the resources required to make the requisite accurate predictions. Accordingly, relying on reductive explanations of mental disorders to build policy renders the resulting policy epistemically unjustified and, in turn, results in unjustified restrictions on patient autonomy.

The History and Philosophy of Probability, Ken Archer, Independent Scholar

- This paper demonstrates how scientific concepts originate, as meaningful and ethically normative through a process of idealization and metaphor, with the important case of the origin of probability as our guide. Probability arose in the late 17th century in Europe, with no historical precursors. Traditional history and philosophy of science treats this historical event as the discovery of the objective existence of randomness, and the primary concern of philosophy of statistics, accordingly, is whether randomness exists in objective reality or in the mind. More recent histories, however, uncover how randomness was originally a metaphor of a random lottery, idealized from its original intersubjective meaning within gambling contracts and then applied to all other aleatory contracts in the civic and economic realms, so that the latter may be practiced through reasonable agreement free of the conflict associated with 17th century Europe. The origin of probability not only shows a third way through the objectivist-constructivist debates on the origin of scientific concepts, it also challenges the instrumentalist conception of scientific concepts by disclosing such concepts as analogically oriented towards an intersubjective good. This paper grounds this analogical nature of scientific concepts such as probability first in Aristotle, for whom technical reasoning analogically participates in phronetic perfections, and second in Husserl, for whom the idealization, sedimentation and desedimentation of scientific concepts manifest one's self-responsibility or evasion of such responsibility. The history of probability and statistics, of its promise and its harms from eugenics to the replicability crisis of science to artificial intelligence, is thus explicable as a history of the life and death of its central metaphor of randomness: a history of using an idealization from one domain as a metaphor to understand another domain, and then dogmatically insisting it's not a metaphor and inauthentically reducing the target domain to the sedimented abstraction.

Attachment theory: Towards an Ethological Approach to Grief, Migdalia Arcila Valenzuela, Cornell University

- Grief poses a dilemma. On the one hand, there is evidence of the universality of grief among humans and non-human animals that suggests that grief is a reaction favored by natural selection. On the other hand, grief usually involves detrimental behavioral tendencies such as loss of appetite, loss of sexual drive, and suicidal ideation. Therefore, there are reasons to think that grief is also maladaptive. Current accounts of grief (Cholbi, 2022; Marusic, 2022) have approached this problem by denying the second horn of the dilemma, i.e. they sustain that grief has a function that consists in rebuilding one's identity after the death of a loved one and re-accommodate one's life after such loss. In this paper, I argue that these approaches ignore relevant evidence from ethology. Grief is as a byproduct of the system of attachment that allows us to sustain

social bonds and as such has no function, instead is the price we pay for the possibility of sustaining social bonds that provide security and comfort. To understand this claim, I rely on John Bowlby's attachment theory (1969, 1973, 1980), according to which grief originates in the same biological system that promotes social behavior, both in humans and in large mammals. As a response to abandonment, grief becomes fruitless in cases where there is no possibility of a reunion with the attachment object. This would help us to understand the relevance of ethology within philosophical debates about the nature of grief.

An Empirical Study in Light and Dark: Galileo's Phenomenological Model of the Lunar Surface, Brian Baigrie, IHPST, University of Toronto

- This paper presents an account of the reasoning that led to Galileo announcing, in *Sidereus Nuncius* (1610), that "the Moon is by no means endowed with a smooth and polished surface, but is rough and uneven and, just as the face of the Earth itself, crowded everywhere with vast prominences, deep chasms, and convolutions." This and other passages from the *Sidereus* have been touted as evidence that Galileo's reasoning is based on a Moon-like Earth analogy. The position advanced in this paper, in contrast, is that Galileo's reasoning is an instance of model-based reasoning. Based on lunar drawings that served as the template for the engravings of the *Sidereus*, Galileo generated a phenomenological model of the lunar surface that was restricted to its measurable properties, namely, changing patterns of light and dark. This model was deployed by Galileo as an instrument to produce measurements of the height of lunar elevations that were otherwise invisible to human observation. Through the exploration of his phenomenological model, Galileo was able to stand on the lunar surface itself, albeit vicariously. Galileo was well-aware of the Moon-like Earth analogy. His goal, however, was not to show that the Moon is analogous to the Earth but "to place the Earth in the host of the stars." Galileo's conclusions were not based on this well-established analogy, nor did they provide empirical support for it. He does appeal to a novel analogy (restricted to the lunar surface's measurable features), but only to gain purchase for his model-based reasoning.

Situating the Chemical Cure: Chlorpromazine and the Rise of Psychiatry's Neuromolecular Gaze, Suze Berkhout, University of Toronto

- A contemporary neuroculture is argued to have developed from the 1960s onward, providing an understanding of human experience in neurochemical terms. Within this cultural shift, there has been a proliferation of biological explanations of psychosis that hold a central role for dopamine, from scientific to public/lay understandings. But the story of psychiatry's neuromolecular gaze is longer and more complex than is often portrayed in historical and cultural studies of psychiatry. This is a story of alternating waves of therapeutic optimism and nihilism; it is a story of the transit and coordination of scientific models of thought in the context of competing ontological paradigms regarding mental disorders; it is a story about hubris, mastery, and epistemological frontiers. In this paper, I explore the conditions of possibility for the rise of the neuromolecular gaze through a material and social history of chlorpromazine, the first

synthesized antipsychotic medication. And connected to chlorpromazine and the rise to prominence of chemical signalling as an explanatory mode in psychiatry is the dopamine story of psychosis. In this paper I draw on findings from my own three-year ethnographic study in a first episode psychosis clinic that examined narratives of psychosis from patients, care providers, family members, and researchers. In addition, I extended this analysis through archival research at McGill University and the University of Toronto. I argue that despite its widely acknowledged limitations, the dopamine hypothesis has remained compelling even as more complex neurobiological models have developed in part due to the coordination of various human and non-human actors, practices, technologies, events, and genres - an "ontological choreography." Moreover, understanding the history of chlorpromazine's arrival and the rise of a neuromolecular gaze as choreography helps to situate this staying power and also make sense of its impact on individuals navigating care for first episode psychosis.

Circulation, Translation, and Ethnoscience in Twentieth-Century Sumatra, Geoff Bill, University of Delaware

- The circulation and translation of knowledge, as a wealth of science studies scholarship demonstrates, are closely interwoven processes. Ethnoscience—by definition a science of translation in its concern to apprehend the knowledge systems of diverse peoples and cultures— brings this connection to the fore. This paper analyzes this dynamic as it pertains to two ethnobotanists: Rahmat si Boeea [Buia] (ca. 1910-?), a Pardembanan Batak collector headquartered in northeastern Sumatra, and Harley Harris Bartlett (1886-1960), a botanist at the University of Michigan. Both figures worked across multiple languages—Toba Batak, Pardembanan Batak, Latinate, Malay and English—in their connected efforts to make Sumatran plants and plant uses legible to elite botanical institutions in the 1920s and 1930s. Both were also transformed by this very process: Rahmat, into a paid emissary of U.S. interests, and Bartlett, into a translator of Sumatran botanical and environmental knowledges. This story unfolds, moreover, against the backdrop of Sumatran environments themselves transitioning from locally governed territories to Dutch- and American-controlled rubber and palm oil plantations, and later still, to properties of an independent Indonesian state. Although materially beholden to colonizing interests, Rahmat and Bartlett's ethnobotanical translations were equally, I argue, about circulating a perspective on Perdembanan Batak knowledge and culture inconsonant with its corporate- and state-sponsored marginalization.

The Vertical Farm: Modularity as Settler-Colonial Logic, Hayley Birss, IHPST, University of Toronto

- Amidst climate change, there is an urgent need to identify technologies that can mitigate the crisis and help imagine an equitable future. Part of this process is recognizing attempts that fall victim to age-old myths of capitalist progress and settler-colonial logics—logics that have contributed to the climate crisis from its very outset. Drawing on postcolonial science and technology studies (STS) and Actor-Network Theory (ANT), this work uses a vertical farming start-up—Infarm Indoor Vertical Farming—to demonstrate that settler-colonial logics can affect contemporary venture capital

projects. To illuminate the modern effect of settler-colonial logics, I introduce environmental imaginaries to Infarm's technopolitical network—specifically, European environmental conceptions of arid and desert frontiers as 'unproductive' land in need of optimization. European settler-colonial environmental imaginaries are a type of speculative fantasy that seeks to optimize space and modern venture capital project perpetuates this logic. I use Israel's modern settler-colonial project, its agricultural foundations, and current frontier architecture to demonstrate how settler-colonial logics influence modern projects. Funded largely by Israeli venture capital, I argue that Infarm inherited settler-colonial logics and imaginaries. This manifests materially in its turn to modularity: it deploys thousands of small farming units directly into urban grocery stores, restaurants, and distribution centres using its productivity as a justification for the quick and efficient technological reappropriation of 'unproductive' space across an urban frontier. This paper sheds insights into how venture-capital start-ups that develop 'green' technologies are susceptible to recycling European colonial expansionist logics and techniques—a folly that puts 'environmentally friendly' initiatives in jeopardy.

What makes the historical sciences tick? Geochronology and the ontology of scientific methods, George Borg, National Science Foundation/University of Pennsylvania

- There has been increasing philosophical interest in the role of technological progress in the historical sciences. Geochronology is the field of geology devoted to the measurement of geologic time. It experienced an explosion of its research boundaries in the 20th century. I explain this productivity by analyzing the ontology implicit in geochronological techniques. The immediate object of inquiry of geochronological measurement is the 'apparent age' of a sample. This concept is not intrinsic to the geological domain, but to the measurement method, which is based on the law of radioactive decay and mass spectrometry. The concept allowed the measurement of geologic time to be detached from specific geologic processes. Its application presupposes a technologically mediated, mereological decomposition of geologic samples into their constituent elements and isotopes. I argue that mereological relations introduce a further dimension in our understanding of the methodology of the historical sciences. In conclusion, I argue that the geochronological case illustrates a more general dynamic caused by modern science's dependence on technology. The latter is essential for providing new kinds of data to test and develop theories. The history of 20th-century geochronology provides an excellent illustration of this dynamic as it, to a considerable extent, consisted in a co-evolution of technology and the discovery of new categories of geochronological data, as geochronologists exploited the potential of mass spectrometry to access the many kinds of isotope systems in nature, thereby deepening their reach into the past.

Normative Work for Concept Functions: From Scientific Concepts to Conceptual Engineering, Ingo Brigandt, University of Alberta

- Historians and philosophers of science have addressed how particular scientific concepts happen to behave, e.g., having undergone transformation and diversification through

their history. The recent literature has also addressed the normative question of how to respond to situations where concepts exhibit substantial variation (e.g., regimenting variation as opposed to splitting one concept into several distinct concepts). In parallel, more clear-cut normative questions -- including issues of social-political and bioethical import -- have come to be addressed in the growing literature on conceptual engineering. Assessing whether to revise or discard concepts or when to develop novel concepts, conceptual engineering has scrutinized the concept of torture, food concepts, and the concepts of race and gender, among others. With an eye to normative issues, this talk will critically compare and evaluate resources from these two largely independent traditions and bodies of literature. One idea that can be found in studies of scientific concepts and in conceptual engineering is the function of a concept. I will lay out how concept functions have actually been appealed to for different purposes or questions one may have about a concept—some of little, others with interesting normative impact. Based on several examples, the presentation will also investigate which of the different accounts of function to use for understanding concepts. Although different notions of function can be relevant, I argue that the project of putting concept functions to normative work (e.g., concerns that direct people to use one rather than another concept) calls for a more specific construal.

Interventional methods for relating representations in DNNs to representations in the brain, Cameron Buckner, University of Houston

- Based on their ability to predict behavioral and brain responses to inputs on vision and language tasks, some researchers have described deep neural networks as the "best" models of biological vision or human language production. These bold claims have led to some skeptical pushback, particularly from researchers who have shown that good predictions of neural and behavioral responses could be exhibited by networks that are known not to correspond in their categorization strategies to biological vision or language production. In this talk, I explain and analyze several examples of an alternative approach to validating DNNs as models of biological cognition which are based on interventional methods. I discuss in particular Li, Nye, & Andreas (2021) method to discover implicit domain models in neural language models, Ravfogel, Prasad, Linzen, & Goldberg's (2021) iterative null space projection method for locating representations of syntactic properties in language models, and (going back from DNNs to the brain) Toneva, Mitchell, & Wehbe's (2022) interventions on neural language models to discover representations of "supraword" meaning in the brain (meanings of composite phrases not captured by merely adding the meanings of the phrase's individual words). I argue that these interventional methods are not subject to the same concerns as the prediction-based methods, strengthening the case that DNNs can be good models of brain function in the face of recent skepticism.

Functions need not explain the presence of their bearers, Antoine C. Dussault, Collège Lionel-Groulx / Université de Montréal

- Discussions of function have identified various desiderata for satisfactory accounts of functions, and arguments for and against proposed accounts often boil down to

observations that some accounts better satisfy some of these desiderata. As many discussants of function recognize, however, the alleged desiderata conflict with each other in such a way that no account of function can satisfy them all. This suggests that, at the current state of the "function debate," discussion of the desiderata themselves is crucially necessary if any progress is to be made. In this presentation, I will focus on the (alleged) desideratum that a satisfactory account of function makes functions explanatory of the presence of their bearers, a desideratum with respect to which etiological theories of function are commonly thought to fare better. I will maintain that this "explanatoriness desideratum" should be given up. Concessions made by many proponents of etiological accounts indicate that explanatoriness is not essential to function. First, it is not sufficient—many proponents of etiological theories concede that not all items whose effects explain their own presence bear functions (e.g. hard rocks on a beach, whole organisms). Second, it not necessary—many proponents of etiological theories concede that some items that do not explain their own presence bear function, although in a sense covered by nonetiological accounts (e.g. traits used for other purposes that those for which they were selected, items of their environment used by organisms). I will argue that function pluralism can at best provide illusive avoidance of this conclusion.

Interspecies Sympathy in Darwin's *The Descent of Man*, Michael Cameron, Dalhousie University

- This paper explores the ostensible contradiction of Darwin's two models of interspecies sympathy as depicted in The Descent of Man. On the one hand, Darwin lays out a teleological account of the expanding scope of sympathy. This notion of sympathy, premised as it is on quintessentially Victorian notions of refinement and civility, argues that the greater a population is civilized, the further its sympathy will reach, first beyond the small tribe to the larger community, then to the nation, to the whole species, and finally to all sentient beings. In this sense, sympathy beyond species lines is a mark of advanced social progress and is thus reserved for the most highly advanced social animal: humanity. On the other hand, Darwin recounts numerous examples of cross-species sympathy that resist a teleological interpretation, suggesting instead a non-teleological approach to interspecies community. Darwin cites not only examples of non-human animals such as dogs and monkeys showing sympathy to their human keepers but also many examples of sympathy between distinct non-human species, such as that shown by a dog toward a cat and by a parrot to other birds. Nowhere does Darwin attempt to explain how sympathy across species lines could develop in such a way, yet such examples serve less as refutations to Darwin's theories than they do unacknowledged compliments, for they temper the strict teleology of the almost Spencerian developmental narrative with the experimentation and variation we come to expect from Darwin's vision of the natural world.

A Network of Evidential Constraints – A Functionalist Perspective on Historical Explanations, Matilde Carrera, Boston University

- How is explanatory knowledge about the past obtained? How do scientists provide explanations about past events? Traditionally, historical sciences have been understood as providing "common-cause" explanations – explanations tracing more recent events back to a single causal origin (Cleland 2002) - or narrative explanations in which several events are causally linked into a temporal chain leading to the explanandum (Currie 2014). In this talk I want to put some pressure on these traditional accounts using paleoanthropological research into the origins of Homo sapiens as case study. Recently, new explanatory models for the origins of our species have been proposed, in which multiple lines of evidence such as fossils record, archeological, genetic and palaeoecological datasets were synthesized into comprehensive explanatory models that could account for possible scenarios of human evolutions (Scerri et al. 2018). I suggest that traditional views of historical explanations do not correctly account for such explanatory practice, insofar as they black box the functional role of evidence. Descriptive information initially acquired in different fields becomes evidence supporting explanatory claims neither because it independently converges towards the same explanandum, nor because it fits into the same causal chain; but rather by virtue of its relation with other types of information within the explanatory model. In explanatory models of past events, such paleoanthropological models of human origins, multiple data and lines of evidence are integrated at different levels, functioning as a network of mutual constraints. The explanation reveals therefore a layered and interconnected structure, in which data becomes explanatory evidence by virtue of its functional role.

Metabolism of Empire: Watermills in Long Nineteenth Century Ontario, Johannes Chan, York University

- Watermills proliferated along Ontario rivers throughout the long nineteenth century, becoming inscribed in the names of housing subdivisions, subway stops, and on the art hung in Canadian galleries. Behind this idyl of memorialization exists a history of technological infrastructure that made possible the colonial project of Canada and transformed river and forest ecologies shaped by millennia of Indigenous and multispecies worldmaking. Watermills, while catalyzing industrial capitalism in Ontario, were also metabolizing white pine forests into vessels of imperial power for the British Navy, processing settler commodity crops for global circulation, and bringing Atlantic salmon species on which the Anishinaabe relied to the point of extinction. I turn to the Marxist notion of social metabolism, which focuses on the material and energy exchanges between human society and nature through production. This ecological concept underscores the "metabolic rift" that formed over the long nineteenth century between humans and the more-than-human ecologies of Ontario under colonialism and capitalist production. Watermills mediated metabolic processes between British empire and local environments, enabling rapid deforestation and subsequent export-oriented monocultural agriculture. Watermills were sites of production, not merely of commodities, but also of scientific and environmental knowledge. The by-products of watermills included not only pollution but settler regimes of public health knowledge, the demise of local salmon along with colonial technologies of reproduction. Mills

preoccupied slave-owning merchants and colonial officials whose attempts to sustain dwindling fish and forests were overshadowed by their primary commitments to the project of British empire and its military and commercial dominance.

Reflections on the Past, Present and Future of HPS International Collaboration, Lesley Cormack, University of British Columbia | Okanagan Campus

- This section reflects on how initiatives from both individual scholars, the CSHPS, and academic networks like Situating Science and Cosmopolitanism and the Local in Science and Nature have advanced the scholarship on the circulation of knowledge. It opens a discussion with the audience about how we might best cultivate a truly global, transcultural, and epistemically fair history of knowledge.

What counts as legitimate public criticism of science? The role of values in public trust, Heather Douglas, Michigan State University

- This talk will discuss how to differentiate between legitimate criticism (i.e. a critique that needs serious attention) and illegitimate criticism (i.e. a critique that can be dispensed with quickly) of science, particularly coming from the public. The talk will argue that it is not the presence or absence of values driving the criticism that makes the difference, but rather the mode of engagement the critic utilizes. Keeping science open to critique is crucial for trust, but productive critique must be elevated over fake critique.

What is to be Done About the "Decline Narrative" in the Historiography of Science in the Islamic World?, Zeyad El Nabolsy, Cornell University

- The thesis that the study of natural philosophy experienced a decline in the Islamic (or Islamicate, if one prefers) world from the mid-thirteenth century onwards was held by some Muslim intellectuals during the nineteenth century such as Mohammed Abdu. Furthermore, it became the standard narrative amongst European Orientalists. Yet, over the past few decades, this narrative has been criticized as misrepresenting historical developments in the Islamic world and as being Orientalist in the pejorative sense of that word. Contemporary intellectual historians such as Khaled El -Rouayheb and Ahmed Ragab have attempted to show that claims to the effect that the study of natural philosophy (or the natural sciences, to speak anachronistically) experienced a decline after the thirteenth century are simply empirically false. However, El- Rouayheb and Ahmed Ragab go further and claim that the “Decline Narrative” is closely related to claims about the uniqueness of the “Scientific Revolution” as it developed in early modern Europe. In fact, Ragab goes so far as to say that the “Decline Narrative” is essential to claims about the uniqueness of the “Scientific Revolution”. In this paper, I attempt to show that this is not the case, and that one can reject the “Decline Narrative” while also holding the view that around the sixteenth and seventeenth centuries developments took place in Europe which brought about a way of understanding natural phenomena that was different in kind from other ways of attempting to understand natural phenomena.

The structure of understanding, Adham El-Shazly, Faculty of Philosophy, University of Cambridge

- Understanding is a desirable epistemic goal. Yet what does it mean to understand something, if and when we do? There is an influential view in philosophy that takes understanding to be just a form of propositional knowledge. My primary contention in this paper is that knowledge views lack the resources needed to do full justice to how the phenomenon of understanding functions, either in ordinary life or in systematized inquiry. Capturing the special cognitive and epistemic features of understanding requires a shift of focus, both in the cognitive tools we use to describe it and the epistemic frameworks we use to evaluate it. Instead of describing understanding at the level of what a thinker's knows, I motivate an alternative non-propositional and non-doxastic, yet strongly cognitivist picture of understanding in terms of a thinker's noetic system, the system which concerns how one's overall thinking about a target is structured and organized. More specifically, combining recent literature from cognitive network science and philosophy of conceptual thought, I argue that cognitive and epistemic state of understanding is comprised of (1) a distinct kind of structural representation and (2) dispositions that operate on that representation in a way conducive to inquiry and practical activity. The overall upshot is an epistemic framework that moves beyond the limits of the doxastic and the propositional.

Facing the Issue of Conflicting Values in Anorexia Nervosa Treatment Head-On, Amanda Evans, Washington University in St. Louis

- Philosophy of psychiatry has seen a recent push towards acknowledging and incorporating the first-personal experiences and value structures of individuals with anorexia nervosa (AN) (Charland et al. 2013, Radden 2022, Stanghellini 2021). While it is likely that this initiative will prove to be epistemically valuable, many of the stated motivations for the push are bioethical in nature. That is, given the egosyntonic (i.e., aligning with one's values) nature of the condition, concerns over the permissibility of compulsory treatment loom large in the absence of a thorough understanding of how the patient's values interact with the disorder itself. While well-intentioned, I will argue that this recent effort to acknowledge and incorporate the patient's values will not on its own resolve the ethical issue at hand. This is because the suggestion to take seriously and incorporate anorexics' values does nothing to address the fact that, in some instances, these values will be fundamentally at odds with the aims of treatment. Furthermore, these values are often deeply relevant to the anorexic's self-understanding, which renders any potential paternalistic intervention more morally suspect than if this were not the case (Groll 2019). Rather than shy away from this reality, I will argue that our best way forward is to face the issue of a conflict in patient and clinician values head-on. It then becomes clear that the question we are faced with is whether it can ever be permissible to treat an individual in a way that goes against her considered values with the hope that these values will shift over the course of treatment (Giordano 2021). The case of AN thus puts the normative and value-laden nature of psychiatry into glaring focus, making it clear that we do ourselves (and

anorexic individuals) a disservice by attempting to shy away from this uncomfortable reality.

Windmills of Your Mind: Prof. McOuat, Circulation of Knowledge, and the Global History of Science, Fa-Ti Fan, Binghamton University

- My paper will start with two of Prof. McOuat's works. I chose them not because they are the best known among Prof. McOuat's many influential publications. Indeed, one of them is quite obscure, stashed away in a conference proceeding, and the other, an edited volume to which I had the privilege of being included, gave me much pleasure but also some heartache. I want to start with them because they have inspired me and influenced me. His short paper on Bunzō Hayata, the Japanese botanist who proposed a radical system of classification in the early 20th century, is brilliant. And the volume he co-edited with Professors Bernard Lightman and Larry Stewart on the circulation of knowledge has, in many ways, guided my thought despite my resistance and protest. My presentation will explain how Prof. McOuat's ideas have helped me explore ways to think about the global history of science.

Plato's Heaven is not Good Enough! Yiftach Fehige, IHPST, University of Toronto

- In my contribution to the panel, I draw the oldest science into the discussion, namely theology. Brown is as much committed to atheism as he is to Platonism. Still, in the field of science and religion, there are not only a few who embrace mathematical Platonism for theological purposes. Some find that mathematics is the language one can use to read God's mind as it is reflected in the physical universe insofar as it is the product of divine creation. My intention is not to endorse this view. Instead, my aim is to look at the noteworthy similarities between Platonism and theology in epistemic and ontological respects. I will argue that closer examination reveals that the promise of Platonism for theology is rather deceptive.

Epistemic opacity in scientific computing, Nicolas Fillion, Simon Fraser University

- Since the Second World War, science has become increasingly reliant on the use of computers to perform mathematical work. Today, computers have justifiably become a trusted ally of scientists and mathematicians. At the same time, there is a panoply of cases in which computers generate demonstrably incorrect results; and there is currently no reason to expect that this situation will change. This prompts the careful user to verify computer-generated results, but it is clear that we are often not in a position to review the work of computers as we would traditionally review a putative derivation or calculation. In this sense, computational processes are epistemically opaque. Since Humphreys introduced the phrase `epistemic opacity' in the philosophical literature in 2004, the concept of opacity has been developed along different lines; furthermore, many incompatible claims have been advanced---be they about what opacity is or about whether we should worry about it---leaving this field of the philosophy of computing in a state of confusion. In this paper, we propose a framework that disentangles three core questions (1. What kinds of epistemic opacity are there in scientific computing? 2. Should we worry about epistemic opacity? 3. Should we seek

greater transparency whenever possible?) and systematically survey how their answers inter-relate.

One Lonely Glassblower: Making and Mending in 1920s Canadian Physics, Victoria Fisher, University of Toronto

- In 1920s Canada, in the wake of the First World War, one of the most prominent and public successes in physics was the liquefaction of helium at the University of Toronto. This was not a world 'first,' yet it represented a significant accomplishment and step in a country still finding its research feet. By focusing on the work of glassblower Reuben Harold Chappell, including surviving pieces of glassware, this paper will explore the involvement of instrument makers, technicians, and their workshops in the liquefaction effort. It will show how the relatively rare skills and training of these largely unknown people played a crucial role both to the project and the functioning and development of the physics department as a whole. It will demonstrate how this centrality of mechanical skill and workshops fitted a pattern in interwar Canadian physics research programs at a time when Canadian scientific research was entering a period of ambitious change.

Are There Blind Thought Experimenters?, Mélanie Frappier, University of King's College

- It is remarkable how visually striking many thought experiments would be if they were actually conducted. For many, this ability to visualize scenarios as spectacular as trains racing along embankments at relativistic speeds is key to understanding the epistemological significance of thought experiments. For some, this visual aspect proves that thought experiments are mental models where knowledge is reached by the mental manipulation of their various elements. For Platonists, like Jim Brown, thought experiments take us beyond what we would usually perceive by offering idealized depictions of the world enabling us to grasp the laws of nature intuitively. But both the Platonist and the mental modeller fail to explain how people with aphantasia—i.e., people who cannot visualize pictures in their minds—conduct thought experiments. Perhaps inspired by Diderot's *Lettre sur les aveugles*, one might be tempted to deny that people with aphantasia have the required sensibility to conduct thought experiments. If so, the mental processes in which they engage upon hearing about relativistic trains might presumably be nothing more than the rehearsals of various arguments. However, this emphasis on visual imagination of the Platonist and mental modeller makes it hard for them to explain how thought experiments work for many non-visual counterfactual scenarios, including many iconic mathematical thought experiments. In the face of these considerations, we might prefer to embrace a pluralistic approach to thought experiments where not only the model theoretic and argument-based account of thought experiments, but also Jim Brown's Platonic approach are accepted together as reflecting the diversity of experience of human thought.

D. C. Miller's 'Disproof' of Special Relativity, Patrick Fraser, University of Toronto

- During the 1920s, D.C. Miller claimed to produce a significant effect detecting an aether wind. Not only could this have undermined the primary motivation for adopting special relativity, but it gave experimental force to a theory that had largely been rejected by

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

Logique des savants, logique des philosophes : Méthodologie et causalité chez Claude Bernard et John Stuart Mill, Vincent Guillin, Université du Québec à Montréal

- « [L]es savants, affirmait Claude Bernard dans *l'Introduction à l'étude de la médecine expérimentale*, font leurs découvertes, leurs théories et leur science sans les philosophes ». Et leurs méthodes, devrait-on ajouter. Cette déclaration d'indépendance épistémologique et méthodologique, elle s'inscrit, historiquement, dans une lutte plus large pour le contrôle du discours « logique » qui oppose philosophes et savants au XIXe siècle. Mais cette volonté d'autonomisation se redouble, chez Bernard, au sein même de la « logique des savants », puisque le physiologiste français revendique pour sa discipline une spécificité méthodologique irréductible à un régime « logique » unique emprunté aux autres sciences naturelles. Dans ma présentation, je vais plus particulièrement m'intéresser à la critique d'origine expérimentale que Bernard va adresser aux idées méthodologiques de John Stuart Mill, dans la mesure où celle-ci va croiser ces deux perspectives – parce que, pour une bonne part, la méthodologie millienne est fortement influencée par les méthodologies caractéristiques de l'astronomie, de la physique et de la chimie. Mais, comme j'essayerai aussi de le montrer, ces réflexions méthodologiques engagent aussi certaines considérations métaphysiques liées à la manière dont il faut concevoir la causalité.

Drawing Comics as a Way of Knowing, Megan Halpern, Michigan State University

- This presentation explores student work in a senior seminar for drawing comics about science and society. Throughout the course, students developed their drawing and storytelling skills while engaging in critical readings of graphic narratives (comics) in three thematic units. In this session, I will engage participants in a short example of a warm-up activity from the course followed by a brief discussion. I will then discuss the initial analysis of student work, which suggests that incorporating arts practice into non

arts courses can have multiple benefits. Drawing comics allowed students to engage with multiple points of view and express their own situated perspectives. In addition, it provided an experiential way to learn core concepts about the relationship between science and society. Students also left the course with new drawing, storytelling, and visualization skills. Finally, there is some evidence suggesting that engaging in creative expression reduced student anxiety and improved mental health. The skills and concepts students were able to develop during this course points to the incorporation of arts practice into STS classrooms as a way to foster experiences with multiple ways of knowing.

"Science is Justified by Works, not by Faith": American Biologists reject Ernst Haeckel's Evolutionary Religion, 1874-1924, Daniel Halverson, University of Toronto

- At the turn to the 20th century, Ernst Haeckel was the world's leading popularizer of Darwin's theory of evolution by natural selection. His worldview was defined by a militant atheism, a commitment to polemics and the advancement of a unique monism. I examine the works of eight American biologists who wrote about evolution and religion during Haeckel's lifetime, and shortly after. In this paper, the first systematic discussion of the Haeckel reception among biologists in the United States, I find that they routinely rejected him and his evolutionary monism. In some cases they disputed his religious opinions, in others his assessment of the facts, but they most often complained that Haeckel frequently overstepped the bounds of legitimate science by dogmatizing and speculating. As the zoologist William Keith Brooks wrote for the journal *Science*, "Science is justified by works, not by faith, and when Haeckel says 'Credo' and not 'Scio' we need not discuss the value of his belief." In the United States, the principal group which embraced Haeckel's identification of evolution with atheism were Protestant fundamentalists, who regularly pointed to Haeckel's anti-Christian polemics as the manifestation of everything they feared Darwinism portended for the future.

"Geological Fantasies" in a Revolutionary Age, Ernie Hamm, York University

- As the eighteenth century waned on and out, theories of the earth's formation flourished and became the subject of occasional amusement and ridicule, an attitude that can still be found in the historiography of the sciences whenever one reads of speculative accounts eventually giving way to the triumph of sober-minded empirical work. Georg Christoph Lichtenberg, enlightened physicist, aphorist and professor at Göttingen, might be counted among those who took such an attitude in his essay "Geological Fantasies," though he did so with more wit than most. Theories of the earth were of great importance, he observed, not only for the history of the earth, but for that of the mind: "It is incredible what revolutions of the earth have done for revolutions of the mind. Just as one finds sea creatures on mountain peaks in the former, without trace of a sea far and wide, so one finds in the latter, with astonishment, conclusions without trace of a sure premise so far as the eye can see." Lichtenberg was having fun; he was also making a serious argument about the challenges of connecting observations in a coherent understanding of the earth, and of the ways in which the geosciences

were tied to the ambitions of states and mining. Lichtenberg's insights on the challenges of doing geology in a revolutionary age are considerable, and of ongoing relevance.

Iran's Atomic Technophobias: Humanism, orientalism, and technological fear during the Cold War (1941-1991), Ata Heshmati, University of Toronto

- Germs were not the only spreading source of anxiety during the COVID-19 pandemic. The pandemic amplified the anxieties and fears of anything digital too. Loosely categorized as "technophobia", it paired with vaccine hesitancy to render different groups of people invisible and intensify the biopolitical stratification within society. Rational and irrational fears of technology had become excuses for racism, oppression, and violence. However, despite germ and vaccine hesitancy, "tech-hesitancy" has rarely caught the attention of scholars. This paper suggests an historical study to fill this gap by asking how technophobia has divided or united people differently in times of crisis. I will situate this question within contemporary Iran, particularly highlighting fears and hopes flourishing after the emergence of nuclear power during the Cold War. This spatiotemporal context allows me to put some general assumptions about nuclear fears into question: claims that suggest technophobia is irrational, reactionary, or homogeneous. On the contrary, my initial and general hypothesis is that technological fear, this seemingly familiar mental state, functions as a commodity, which, like every other commodity during a crisis, is supplied, regulated, and distributed unequally. This is particularly true in the case of a seemingly growing "global fear" about the rise of Iran as a dangerous nuclear power. Technophobia has multiple material, psychological, social, intellectual, and most importantly, political dimensions each of which can lead to different categorizations, and hence, different historical studies of this phenomenon. In contemporary studies of technophobia, psychologists usually diagnose technological fear as a mental disorder. A normally reflexive and natural feeling associated with a human's survival instinct, fear can be intensified by spreading anxiety of being surveilled, being infected, or simply being harmed through technologies. This feeling is targeted towards things that are "normally" considered harmless. Hypothetically, an intellectual, cultural, and political study of technofear in Iran might reverse this narrative and suggest that technophobia had long roots in the semi-colonial position of Iran between the rivalry of Western powers. Fear is path-dependent. The first part of this project will present a pre-nuclear history of technophobia as a contagious thought appearing times and again during the first half of the 20th century when the Anglo-Russian convention of 1907 divided Iran into two semi-colonial zones of influence, a constitutional revolution happened, and nationalist sensations were on the rise in the aftermath of WWI. Many intellectual and fictional texts in this era expressed their fear of technology mostly towards the intended and unintended consequences of mechanization which were associated with forced displacement of people, high-speed transportation, and dangerous accidents caused by it. Despite a common interpretation of technological fear, framing it as merely a psychological "reaction" induced by unsure or unknown situations, I will argue that people were consciously afraid of technology because they largely knew what they were facing. Although nuclear technology was a new thing by the 1940s, anxiety around it should not be merely associated with its

novelty and unfamiliarity. I will trace the roots of atomic fear in a pre-existing collective expectation about technology which, most of the time, was not established on anything even close to trust.

The Principle of the Identity of Indiscernible (PII), Determinism, and Locality: An Example of Organizing Principles, Xiaoqian Hu, The Chinese University of Hong Kong, Shenzhen

- In my paper, I discuss three organizing principles: Principle of the Identity of Indiscernible (PII), Determinism, and Locality. These principles together form the foundation of experimental and theoretical physics. Organizing principles are those that must be assumed to be a working hypothesis to perform experiments and interpret their results, and so cannot be affected by results of such experiments: PII ("[t]hings which are different must differ in something or must have within themselves some diversity that can be noted" (L529)) that helps us to identify a physical event as "the same" as another physical event; "Determinism" that tells us that a physical event can pertain to one and only one trajectory of events, hence it allows us to individuate physical events in time; and "Locality" allows us to separate one physical event from another, hence it allows us to individuate physical events in space. My argument and examples only stay in the domain of non-relativistic quantum mechanics (NRQM). The generalization of the investigation is limited to this realm. PII (also as put forward by Leibniz) is an a priori metaphysical principle and an organizing principle. As such, I will argue, it must be presupposed before any experimental physics can take place. It must be presupposed even before experiments that purport to invalidate it or vindicate it can take place. I will review an experimental set up put forward by Chung Ki Hong, Zhe Yu Ou, and Leonard Mandel (Hong-Ou-Mandel) that concerns interference with bosons and fermions. This set up which investigates the degree of indistinguishability of elementary particles, demonstrates the inherent difficulty of performing precision measurements and serves as another reminder of the importance of metaphysics as a pre-condition for physics. Determinism is one application of PII. Just as PII is an organizing principle that captures the notion of "symmetry" which allows one to identify a physical system as "the same" as another physical system, so does determinism. I will discuss determinism in the context of Classical Mechanics and Quantum Mechanics, and argue that it is impossible to test wave-function collapse if determinism fails. To conclude, I will expose a misconception among philosophers, such as Earman and Norton (1987), and Wuthrich (2010) who have treated determinism as a contingent matter of fact. Locality is another application of PII. Just as PII is an organizing principle that captures the notion of "symmetry" which allows one to identify a physical system as "the same" as another physical system, so does locality. Accordingly, locality is an organizing principle that allows us to individuate one physical system from another in space via interaction. Then, I will discuss locality in the context of Classical Mechanics and the debate regarding Newton's action at a distance. I introduce the philosophical debate about locality in NRQM. To conclude, I will expose a misconception among philosophers and physicists, such as Gisin et al (2018), who have treated locality as a contingent matter of fact and argue that it is impossible to test locality empirically in NRQM. My argument is twofold. First, I will argue that the three pillars above are necessary pre-conditions for

experimental and theoretical physics, as they allow us to conduct experiments that underwrite physical laws. The corollary here is that since metaphysics constrains (places boundaries on) the various (and contradictory) theories scientists advance and the sorts of experiments they conduct, it is unwarranted to vindicate or refute these principles with an experiment. Second, I will argue that since these three principles are all principles of what it means to be "the same" (in general, in space, in time), then if one of them fails, all of them fail. The corollary here is that, viewed from this lens, some theories that have been advanced in the foundations of quantum mechanics that now appear inconsistent.

Microbiome Malleability, Andrew Inkpen and Jane Dryden, Mount Allison University

- Much excitement around clinical application of human microbiome research is linked to the perception that our microbiomes (particularly our gut microbiome) are more malleable than our genetic constitution, as they can be altered through various interventions, such as fecal microbiota transplants (FMTs), prebiotics, and probiotics. Many acknowledge that there remain technical and scientific obstacles: the direction of causation between differences in gut microbiota and certain health conditions is still unclear, and there is little consensus about what constitutes the healthy human microbiome (NIH 2019). The microbiome may be more malleable, but assumptions about what's good for human beings that underlie microbiome research are much the same as those underlying genetic research; the seductive promise of malleability risks leading us to overlook important philosophical and STS lessons developed in that previous context (we should be cautious about locating health and disease fully in the genome—in the microbiomics context, our metagenome—and about instinctively treating variation as deviation rather than difference). Although leading researchers acknowledge there is no single, ideal microbiome, the vision of health often presumed by published research, press releases, and the media is nonetheless monolithic and shaped by healthist pressures. We explore the role of difference within the microbiome in order to resist deterministic and healthist pressures. The microbiome could open up possibilities for ecological thinking that enmesh us in our environments, and thus should enable us to resist old assumptions, rather than fall back into them.

Footprints in the Snow: Tracking a cryptozoological history of expeditionary science, Danielle Inkpen, Mount Allison University

- One hundred years after a series of British attempts to summit Chomolungma (Everest) which ended, infamously, with the deaths of George Mallory and Sandy Irvine, scholars are seeking new ways to understand the legacies of such expeditions and the questions posed to them. This paper is part of that effort. Overlooked by historians, lurking on the borderlands of science and legend, is the Yeti, shaping how interwar British mountaineers imagined and engaged with the Himalaya. In expedition narratives, the Yeti is revealed as a compound lens through which the British refracted visions of themselves and others onto the mountain landscape. We might expect that through the Yeti the British straight-forwardly and belittlingly othered their indigenous guides, porters, and hosts: more than animal, less than "civilized man" –a reading that would

situate the Yeti and indigenous Himalayans in the same room within the mansion of the imperial mind. The reality is more complicated. I hope to show that ideas of the Yeti, circling the expeditionary and scientific motivations of interwar mountaineering, was a fracturing figure representing their most colonial frame of mind while also hinting at the limits of their enterprise.

A Transhuman Technological Future: Ideologies, Expectations, and Investments, Dayna Jeffrey, York University

- This paper examines how future expectations within transhumanism configure the current development of innovative technologies. Transhumanism advocates for the transformation of the human condition through AI, biotechnologies, cryonics, and other emerging technologies. Transhumanists desire a world where technology will integrate with the human body, preventing aging and enhancing cognition, requiring highly advanced forms of AI. Transhumanist visions of super-intelligent AI are highly influential in that they reflect popular imaginaries of progress through technological innovation; although transhumanist narratives may sound controversial, they draw heavily on tropes about the human benefits of technology that are very familiar (Hurlbut & Tirosh-Samuelson 2016). Transhumanist imaginaries extend this logic of progress beyond near-term outcomes, advocating for the technological transformation of our very understanding of humanity itself, reflecting a particular ethics of new and emerging technologies like AI. This paper will discuss some of the authors latest research from her fieldwork with transhumanists, technologists, and AI policy makers examining the impact of radical future narratives on technological development. Rather than reduce transhumanist imaginaries as dangerous, absolutes, or extreme, I take these discourses seriously by dissecting the role of transhumanist imaginaries in contemporary AI development. While future narratives have been criticized for being overly speculative, these visions and imagined futures challenge fundamental values and concepts of our current historical and cultural assumptions about time and societies (Jasanoff & Kim, 2015; Mali, 2016). Studying the production of the future may then help us to better understand our current societies (ibid).

British Meteorology and the Response to the Tambora Climate Effects (1815-1820), Nayani Jensen, University of Toronto

- The 1815 eruption of Mount Tambora in Indonesia caused disastrously cold, rainy weather across the northern hemisphere that resulted in years of crop failures, widespread famine in Europe, a 'year without a summer,' and fears of the sun going out. This climate event has attracted intense attention in recent years from climate scientists and scholars of environmental humanities. While literary visions of environmental disaster produced in these years (*Frankenstein*, Byron's *Darkness*) continue to hold enormous influence in eco-critical studies, the response of meteorologists has been less closely examined. The early 19th century was a crucial period for the still-emerging field of meteorology and atmospheric science, with increasing efforts at standardized record-keeping and efforts to find laws regulating the weather—all of which were challenged by the Tambora weather events. This paper analyses the response to the Tambora

climate effects in the years 1815-1820 in the British periodical press and meteorological publications to show that the weather events prompted increasing collation of data and new techniques for data visualization and analysis. Focusing particularly on the work of meteorologist and namer-of-clouds Luke Howard, this paper argues that the Tambora climate effects most notably prompted an increasing interest in global networks of data collection and comparison—a shift from 'local weather' to a consideration of 'global weather systems.'

Is Temperature a Continuous Function? Lessons from Idealisations in Thermal Physics, Aditya Jha, University of Canterbury, NZ and Massachusetts Institute of Technology

- There is a commonly held misconception that temperature varying across a region of space or time can always be modelled as a continuous analytic function. I argue against this misconception by demonstrating that the idealisation of temperature as a continuous function does not necessarily hold in our best scientific representations of the world, and its continuity, where applicable, is a contingent matter. To this end, I examine three inter-related cases in the study of heat flow, and show how this point holds generally for modelling other physical variables as (dis)continuous variables. The three case-studies are: a) phase transitions in evaporative processes leading to temperature discontinuities across water droplets (Fang and Ward 1999; McGaughey and Ward 2002); b) temperature and velocity jump at walls in fluid flows such as in micro-channels (Colin 2014); and c) thermal boundary resistance across solid-solid, solid-liquid or liquid-gas interfaces leading to temperature discontinuities (Cahill et al 2003; Chen et al 2022). In (a), I review the experimental evidence of the existence of significant temperature discontinuities (of as much as 8 K) across evaporating water droplets. I then demonstrate how modelling temperature as a continuously varying function often leads to incorrect predictions of temperature profiles across evaporating droplets. I further show how removing the 'continuity' idealisation has significantly improved the predictions of evaporation models. In (b), I show how slip flows and breakdown of local thermal equilibrium near boundary layers in fluid flow invalidate the continuity assumption. This is because the representative sample volume over which temperature can be averaged as a macroscopic variable is no longer suitable due to significant microscopic fluctuations of the fluid flow parameters. In (c), I demonstrate the temperature discontinuities across material interfaces resulting from the reflection and scattering of thermal carriers lead to a breakdown of local thermal equilibrium. I then discuss how this invalidates the idealisation of temperature as a continuous variable in thermal boundary resistance models. I discuss how some of the difficulties stated above arise from the extension of the scientific concept of temperature from equilibrium regimes (the domain where it was originally envisaged) to non-equilibrium regimes (where ongoing work on the definition of temperature challenges some of our intuitive notions of temperature). I conclude the discussion by noting that temperature can seldom be defined in many such situations, much less can anything necessarily be said about its continuity, and that this has consequences for modelling of physical variables in general.

A clarification of the Precautionary Principle based on irreversibility, Laurent Jodoin, Collège Lionel-Groulx / Université de Montréal

- The Precautionary Principle (PP) has often been characterized as 'vague' but it is agreed it concerns decisions under great uncertainty about a possible grave danger. Another criticism is, then, that it has not been clearly differentiated from conventional risk assessment. Mariam Thalos (2012) suggested that irreversibility should be the reason for precaution. Piggybacking on her suggestion that this idea must be further developed I contend that the concept of irreversibility should be conceptualized from a thermodynamical (entropic) framework (and then move beyond) in which three parameters are identified: intervention, equivalence, and time. This will allow us to clarify the PP by providing differentiations with conventional risk assessment and objections to claims about its unduly normative character.

Beyond Sexual Maturity: Towards a New Theory of Puberty, Rebecca Jordan-Young, Barnard College, Columbia University; Sahar Sadjadi, McGill University

- Puberty, like other concepts used in biology, is not a natural phenomenon, but is a construct that foregrounds certain aspects of the natural world while obscuring others - the product of both nature and worldview. The word puberty derives from the Latin and French ("pubertas" and "puberté") meaning "adult" or "the period of life that follows childhood." But current usage of the term is much narrower. For instance, the authoritative Guyton and Hall *Textbook of Medical Physiology* (14th ed., 2021) defines puberty as "the onset of adult sexual life," collapsing everything about the adult stage of human anatomy & physiology into the concept of sexual maturity. In this paper, we review evidence that suggest the dominant definition of puberty is biologically misleading, both obfuscating non-sexual aspects of maturation processes and inaccurately depicting maturation in a sex-dualistic framework. Prior critics of puberty discourse have argued that the current framing of puberty in the human biology literature is both heteronormative and ideologically infused with racial and class biases. We advance a new model for puberty that better accommodates a broad variety of evidence about this stage of maturation and argue that this newer model may be less prone to the biases identified by earlier critics.

Computing and Counselling: Ethical Issues in AI-facilitated Psychotherapy, Rachel Katz, University of Toronto

- AI-facilitated psychotherapy has grown significantly in the last five years, with interventions that range from chatbots to interactive apps that make use of methods such as cognitive behavioural therapy (CBT). These apps and chatbots have their uses; they can serve as a stop-gap solution while a patient is either on a lengthy waiting list for in-person therapy services or act as a check-in point for patients between appointments. AI therapy bots can help a patient new to psychotherapy take their first steps as disclosing their symptoms, helping to reduce stigma. They can also help reduce clinician burnout by taking on the routine tasks of administering psychotherapy (such as patient intake) and reducing a clinician's caseload. However, there are consequences of the AI-ification of psychotherapy that have been underexplored in the philosophical

literature. Does the outsourcing of some psychotherapy interventions actually address the ever-increasing gap between the supply of human psychotherapists and the patient demand for their services? How does the use of AI therapy tools affect patients' sense of community (both with respect to the bioethical "disease community" and the patient's more general community)? Additionally, most of the AI therapy tools use formulaic approaches to psychotherapy, such as CBT, a format that is demonstrably harmful for some mental health concerns. Will the outsourcing of psychotherapy to apps and chatbots leave more room for patients who require more intensive dialogical therapy, or will it force more patients to contort their therapeutic needs to be better served by CBT? How might public health units steer patients towards AI psychotherapy options or how may governments use these limited AI tools to completely replace human therapists in already underserved communities? These and other vital ethical questions must be discussed before these tools develop further.

Circum"venting" Debates: Science and the DIY Air Purification Movement, Eric Kennedy, York University

- The question of whether or not COVID - and other viruses - are airborne was (and remains) a hotly contested topic. In the midst of these debate and varied national responses, a movement of activist innovators emerged to attempt to disrupt airborne transmission pathways. In this talk, we explore engagement with uncertainty and stabilization, new scientific needs and practices that emerged through their efforts, and the implications of these efforts on the use (or lack thereof) of science in mainstream decision-making.

The Work of Art in the Age of Algorithmic Reproduction, Rohan Khan, Brandon Ye and Alvin Shen, Queen's University

- Recent advances in machine learning have led to freely available text and image generators, which are raising questions about what whether AI-generated art should count as art, and who, if anyone, should be considered the artist. Many claims are being made about the ways in which AI-generated art either fails to measure up to human-produced art, differs from it, or surpasses it. In this paper we begin to explore the problem of how to evaluate AI-generated images in terms of their artistic quality. Starting from the assumption that art is often an expression of a point of view or feeling of the artist, and the common anecdotal observation that AI-generated art is often dark in tone, we devise a method of evaluating the emotional content of AI-generated images. The dataset used is a repository of Stable Diffusion images and the text prompts they are based on. We first run face recognition software on the images, to find those that contain a face, then run facial emotion detection software on those faces, to label them as expressing positive, neutral or negative emotions. Next we run sentiment analysis on the text prompts to label them as having positive, neutral or negative emotional content. We find that a much larger proportion of the faces in the images express negative emotions than are found in the text prompts. As a check, we also manually label a sample of the images and prompts by hand, and again find that the images are more likely to be emotionally negative than the prompts used to create

them. These results, while preliminary, support the suggestion that AI-generated images may systematically distort the emotional content of the prompts they are based on. We discuss the implications of treating these images as art.

Finite-temperature field theory: We're alright but we're not ØK, Adam Koberinski, University of Pittsburgh

- Quantum field theory (QFT), as used for most applications in particle physics, is formulated at absolute zero temperature. This means that the ground state of the fields are the lowest energy states: the vacuum states. QFT at finite temperatures adds additional complexity, both mathematically and conceptually. Nevertheless, finite-temperature field theory is essential for understanding particle physics effects that take place in a background of high-energy particles, such as heavy ion collisions, particle physics in the core of stars, or even understanding phase transitions in the early universe. In this talk I will provide a groundwork for philosophical interpretation of finite-temperature field theory. I start by clarifying some of the conceptual subtleties of the single-time formalism, noting changes from the modelling setup of ordinary QFT, before moving on to some open interpretive questions regarding the multi-time formalism. Disentangling the purely formal manipulations from those that should have physical significance is even harder here than in ordinary QFT, and significant further work will be required to arrive at something like a consensus view. My goal here is to open this field to philosophical scrutiny, by carefully restating the textbook views and testing their coherence.

Acoustics or Natural History? Rousseau, Rameau, and the Nature of Music, Brandon Konoval, University of British Columbia

- With the distinctive mathematical light it cast on the relationship between acoustic phenomena and human perception, the field of music came increasingly under the scrutiny of early modern science. At the same time, colonialism brought to light marked contrasts in global music practices, provoking close consideration of the forces guiding the development of diverse musical cultures, and the forms of scientific perspective that could be trained upon them. A striking divide in these perspectives crystallized in mid-18th century France, resonating with larger debates over scientific methodology and the role of mathematics in natural philosophy: this debate was framed by an ostensibly acoustics-based account of musical practice as theorized by Jean Philippe Rameau (1683–1764), a “science des sons” (Diderot 1748) subjected to intensive critique by the lead author for entries on music in the *Encyclopédie*, Jean-Jacques Rousseau (1712–1778). Rousseau’s technical grasp of Rameau’s theories, seldom recognized or addressed, informed an incisive critique of those theories on their own terms, unmasking pronounced limitations both in Rameau’s empirical account of musical practice itself, and in the scientific ambitions of the would-be ‘Newton of harmony.’ In response, Rousseau offered what could be understood as a ‘natural history’ of music that closely corresponded with his contemporaneous writings on social, political, linguistic, and anthropological concerns, above all through the deep imprint registered on Rousseau’s thought by the *Histoire naturelle* of Buffon. Rousseau thereby envisaged

a comparative, non-mathematical physique des sons that could encompass musical diversity, providing a non-systemic account of its distinctive formations and prospects.

To Not Be Missed: Harriet Brooks and the rewriting of the history of science, Megan Krempa, University of King's College

- The history of science has been plagued by the hero narrative, one in which only one person is acknowledged as being the reason for theories or results to exist. It erases the contributions of many of the most vital people—whether that be the assistants, the secretaries, or the students. Add a layer of sexism and racism, and the history of science seems plagued by the omission of critical stories. Feminist views of the history of science have both criticized this model and turned to a different model: that women are not included in the history of science because of objective ideals of masculinity and what it means to be a scientist. Today, these two views—the heroic and the objective—permeate nearly all biographies of scientists—marginalized or not. However, I will argue that none of these models are sufficient to writing the history of science. I argue through Harriet Brooks (1876-1933)—the first female nuclear physicist in Canada—that it is not scientific heroism or objectivism that prevented her from gaining recognition, but that it was the patriarchal expectations that removed her contributions from science. Instead, I demonstrate through Brooks that we ought to reconsider how we write the history of science, and suggest that we write histories as people-centred material cultures, whereby an object or material is taken as a focussing point around which the people involved are then included.

Autism and the Pseudoscience of Mind, Travis LaCroix, Dalhousie University

- Research on autism spectrum disorder (ASD) has aimed to elucidate the psychological or cognitive mechanisms underpinning autism's behavioural manifestations. Such cognitive explanations are supposed to further our aetiological understanding of ASD by positing an 'intervening variable' between biology and behaviour. Numerous hypotheses have been forwarded in the past half-century, including the popular claim that autistics lack a theory of mind. Theory-of-mind-deficit explanations of autism have been of particular interest to philosophers in light of the normative and theoretical entailments of an individual who is 'unable' to attribute mental states to others. This fact would have consequences for epistemology, theories of mind, theories of meaning, and normative theory, among others. However, the claim that autistics lack a theory of mind is false. The purpose of this paper is to describe how this claim is false. I begin by reviewing research that suggests that theory-of-mind-deficits cannot be adequate as an explanatory model for autism. I then rehearse the empirical failures of experiments intended to measure theory-of-mind abilities. Finally, I argue that experimental 'evidence' for the theory-of-mind-deficit explanation of autism amounts to pseudoscience by exploring the following two questions: Do tests of theory of mind measure theory of mind? What test could disprove the claim that autistics lack a theory of mind? I conclude by examining this argument's consequences for philosophers who uncritically invoke autism (qua theory-of-mind deficit) as a thought experiment.

Shifting Limits of Knowledge in Modern Cosmology, Nichole Levesley, IHPST, University of Toronto

- Cosmologists and philosophers of cosmology have identified several limits on our cosmological knowledge, including the physics horizon, observation horizon, and speed of light limits. Much discussion in the philosophy of cosmology has focused on what these horizons entail for new theories, and philosophers have increasingly inquired into what, in principle, is scientifically knowable in cosmology. What has received less attention, however, is the fact that the scope of what is considered knowable in principle has changed through time. This paper aims to fill this gap by investigating how the perceived limits of scientific knowledge have shifted in the history of modern cosmology. I consider three episodes. The first is the rise of astrophysics in the nineteenth century, when the development of spectroscopy led astronomers to reject the belief that qualitative knowledge of astronomical bodies was impossible to obtain. The second is the 'Great Debate' in 1920, which resulted in the acceptance of the island universe theory and with it, the acknowledgement of the possibility of gaining information about extragalactic bodies. Finally, I investigate the debate between the steady state and big bang theories in the mid-twentieth century to highlight how the perceived restriction on cosmogonical knowledge was rejected. In each of these cases, I identify the motivations that drove scientists to originally posit the limitations on knowledge, as well as what technological, theoretical, and observational factors contributed to their rejection. The analyses of these episodes highlight an important distinction relevant to current discussions on cosmological horizons: that between local and intrinsic limitations. Local limitations identify questions that cannot be answered now, but may be answered in the future. These limits arise due to technological, social, or other contextual obstacles. Intrinsic limitations, on the other hand, are those that purport to identify what questions cannot in principle be answered scientifically. While it is readily acknowledged that local limitations change, there has been little discussion on whether limitations that are perceived as intrinsic also shift. This paper shows that in each of the three episodes, the posited limitations were considered intrinsic. By investigating what factors contributed to these limitations and their eventual rejections, I provide a historical perspective that can inform current debates on the nature of cosmological horizons.

I Notice; I Wonder; It Reminds Me Of…: Nature Journaling for Undergraduate Courses, Ellie Louson, Michigan State University

- This interactive workshop explores nature journaling, an activity that encourages students to be present in nature, carefully observe their surroundings, and mindfully reflect on their experiences. Nature journaling is a pedagogical tradition for training observational skills within the life sciences and natural history, as well as amateur conservation and wildlife observation. Incorporating nature journaling for in-person, hybrid, or virtual classrooms can engage students in a deeper understanding of course content, help them reflect on their relationship with/in/within nature, and contribute to student wellness and mental health. I will demonstrate resources of established nature journaling techniques, an example assignment from a third-year undergraduate course,

and samples of student work. Participants will reflect on their own experiences and relationships with nature by responding to nature journaling prompts through writing from direct observation, memory, virtual footage, or photography; drawing or creating digital art; and/or personal reflection. We will discuss possibilities for course field activities or individual nature journaling assignments that can fit a variety of learning outcomes and course needs.

Non-epistemic values and scientific aims: an adequacy-for-purpose view, Greg Lusk, Durham University; Kevin Elliott, Michigan State University

- The literature on values in science struggles with questions about how to describe and manage the role of values in scientific research. We argue that progress can be made by shifting this literature's current emphasis. Rather than arguing about how non-epistemic values can or should figure into scientific assessment, we suggest analyzing how scientific assessment can accommodate non-epistemic values. For scientific assessment to do so, it arguably needs to incorporate goals that have been traditionally characterized as non-epistemic. Building on this insight, we show how the adequacy-for-purpose framework recently developed for assessing scientific models can provide a general framework for describing scientific assessment so that it goes beyond purely epistemic considerations. Adopting this framework has significant advantages and opens the possibility of effecting a partial rapprochement between critics and proponents of the value-free ideal.

Valuing Patient Perspectives in the Context of Eating Disorders, Amy MacKinnon, Hershy Jaiprakash, Jacob P. Neal and Sarah Arnaud, Western University

- Many psychologists, psychiatrists, and philosophers have taken issue with operationalism in psychiatric nosologies and with the lack of first-person perspectives in research and clinical practices. Within the context of eating disorders (EDs), Stanghellini and colleagues (2021) critique the focus on behavioral symptoms of EDs at the expense of the integration of first-person accounts and perspectives. They level three objections against the tendency to focus solely on objective criteria to understand EDs: (1) they argue that the adoption of the DSM has led to a problematic focus on observable signs, (2) they criticize the tunnel vision that narrows the scope of potentially relevant symptoms, and (3) they reject the subordination of patient values to clinician values and other paternalistic approaches to therapeutic intervention. Although we agree with Stanghellini and colleagues' critiques as far as they go, we contend that the problems they identify are more difficult to solve than they suggest and their potential solutions are underdeveloped. In this talk, we extend and more fully develop the three critiques identified by Stanghellini and colleagues. We first argue that fully accounting for the richness of patients' subjective experiences requires a more rigorous analysis of the concept of "first-person perspective". We then identify how these 3 perspectives can be integrated into nosologies and psychiatric practices. Finally, we consider Acceptance and Commitment Therapy (ACT) as a concrete way to improve therapeutic intervention by focusing on patient values. We argue that ACT is a promising psychotherapeutic

approach for EDs that takes patient values seriously, and we show how it can respond to the critiques highlighted by Stanghellini and colleagues.

Is there such a thing as proof-of-concept research?, Christophe Malaterre, Université du Québec à Montréal

- Proof-of-concept research is increasingly put to the forefront by funding agencies, especially in high risk - high reward programmes. Yet, the characteristic features of this type of research remain poorly specified. For some, novelty is the key feature, while for others it is projectability, understood as the likelihood of being applicable to a broader class of phenomena. Here, using research about electricity-producing nanotubes as a case study, we propose a formal model of proof-of-concept research that bridges these features. The model construes systems targeted by proof-of-concept research as systems that should simultaneously exhibit three sought-after properties whose conditional probabilities of being jointly instantiated are the object of specific asymmetric assumptions. Depending on the likelihood one assigns to these assumptions, the model characterizes a paradigmatic mode of proof-of-concept reasoning. We apply this model to other case studies and show how it incorporates the two dimensions of novelty and projectability while remaining qualitatively distinct from normal science.

Doxastic and Axiological Transformations following Near-Death Experiences. A Case of Underdetermination? Alexandru Manafu, York University, David Zarebski, Data Scientist, Juensung Kim, University of Toronto

- In this presentation we will discuss a case of underdetermination of theory by data in relation to an empirical research study that we have conducted. We have conducted a study on 1128 reports of Near-Death Experiences (NDEs), which aimed to evaluate the transformations undergone by people who have experienced NDEs along 2 dimensions: 1) Beliefs (belief in God , the afterlife, and in the meaning of life); and 2) Values (compassion, and the importance placed on spiritual life). While our data shows that the transformations are significant, it also supports the hypothesis that they were caused by the cognitive content of the NDEs, such as out-of-body experiences, panoramic life review, experiences of another realm, encounters with deceased persons or God/mystical beings, etc. Indeed, many subjects attributed these transformations specifically to the cognitive content of their NDEs. However, some studies on post-traumatic growth (PTG) show that increased religiosity, meaning, and spirituality are often correlated with stress-related growth after a traumatic event (Park et al., 1996). Thus, it is possible that the changes in beliefs and values following NDEs are due simply to the experience of trauma involved in a brush with death, and not to the cognitive content of the NDEs. In this presentation we will analyze and evaluate these competing hypotheses and try to determine whether current empirical evidence is enough to distinguish between them.

Credibility is in the Eye of the Beholder: Minimal Models, Feminist Epistemology, and the Production of Ignorance, Patricia Marino, University of Waterloo

- Sugden (2000) asks how formal economic models, often presented without specific empirical justification, can be useful. His answer focuses on credibility: useful models provide a description of the way the world "could be" (2000, 2013). Till Grüne-Yanoff argues that useful minimal models present "relevant" possibilities (2009). For example, the much-discussed Schelling checkerboard model describes moving coins according to contextual rules; it is often interpreted as informing us that sharp racial segregation can arise through shared, weak, innocuous preferences. As Sugden acknowledges, credibility is in the eye of the beholder: what seems possible depends on a person's background beliefs, experiences, etc. (2013). Grüne-Yanoff and Verreault-Julien distinguish between epistemic and logical possibility; the latter concerns possibility in our world and is evaluated through knowers' background knowledge (2021). Feminist standpoint theory and epistemologies of ignorance have emphasized that perspectival differences have epistemic consequences (Collins 1990, Grasswick 2018, Mills 2014, Sullivan and Tuana 2007). Using Schelling's model, I explore these: knowers with different sets of background beliefs and experiences will come to different conclusions about whether Schelling's model seems credible in a given context and also about whether it is an epistemic or merely objective possibility. I argue 1) both views of minimal models show new dangers of homogeneous epistemic communities, 2) credibility faces challenges in contexts where the causal factors are complex and multi-faceted, and 3) development of new how-possibly explanations may contribute to agnotology -- the production of ignorance -- and is thus not an unalloyed epistemic good.

John Maynard Keynes' Anti-Intellectualism, Soroush Marouzi, University of Toronto

- There is a long-lasting debate around the nature of relationship between John Maynard Keynes' philosophical work, *A Treatise on Probability* (1921), and his economic work, *The General Theory of Employment, Interest, and Money* (1936). Some scholars argue that Keynes' economic theory must be understood in continuation of his earlier philosophical project. Yet others deny this. A specific type of narrative is gaining more credibility among these deniers: the economist Keynes abandoned some of his earlier philosophical views as a result of his attraction to Frank Ramsey's philosophy in the 1920s. Various versions of this narrative have been offered in the literature, each with different understanding of what Ramsey's philosophy was and what elements of his philosophy influenced Keynes. I argue for a new version of this narrative. Ramsey's philosophy was an outcome of his engagement with a distinct tradition in the history of ideas known as 'anti-intellectualism,' according to which, the typical sources of motivation in human action are non-intellectual elements such as instincts and habits. Ramsey built upon this empirical thesis of orthodox anti-intellectualism by arguing that there is no separation between the domain of rationality, on the one hand, and the domain of instincts and habits, on the other; that is, human rationality could be predicated on instincts and habits. It was this anti-intellectualism of Ramsey that attracted the later Keynes. To accommodate it in his economic theory, Keynes had to

abandon his account of rational decision making under uncertainty as presented in his earlier philosophical work.

Theorizing the "Heritable Factor" in the Tristan da Cunha Working Party's Asthma Investigations (1961-1972): Studying Human Difference Between Imperial Biology and the "New Science" of Population Genetics, C. K. Massey, IHPST, University of Toronto

- In the 1960s, asthma became a domestic and international public health concern as morbidity rates climbed in Japan, New Zealand, Australia, Norway, and the United Kingdom (UK). Guided by the allergenic hypothesis, British researchers viewed the asthma epidemics as a side-effect of the modernization process in industrial societies, associated with rising pollution rates in these countries, as well as with increased exposure to common allergens such as dust mites found in carpeted family homes. As asthma was considered a disease of "modernity," clinical researchers working under the UK's Medical Research Council (MRC) drew scientific interest in its prevalence on Tristan da Cunha, home to a small rural island community in the South Atlantic. Beginning in 1961, the MRC-sponsored Tristan da Cunha Working Party ("Working Party") performed clinical examinations, recorded family histories, and collected blood samples to investigate the cause of asthma on Tristan da Cunha. Challenging the allergenic hypothesis, researchers put forward a novel genetic theory of asthma using family pedigree analysis and early computer modeling programs to determine the "genetic structure" of the population. Exploring the "co-production" of science and society, my paper examines how the dominant theory of asthma as a "civilization disease" shaped the Working Party investigations, as well as how these imperial categories used to demarcate the boundaries between human populations were negotiated, reinforced, but also brought into question by practitioners of the "new science" of early population genetics research. Attending to the material dimensions of this study, I explore the legacy of scientific imperialism in the collection practices of mid-twentieth century genetic research as human blood, tissues, and pedigrees from overseas populations such as Tristan da Cunha were retrieved, circulated, and stored as valuable experimental objects in British laboratories for broader research into human variation, health, and disease.

Reconsidering the Terrestrial in an age of artificial intelligence, Katrina Nicole Matheson, York University

- Building upon his own concept of agency in the context of actor-network theory (ANT), Bruno Latour defines the Terrestrial as a "new political actor" which serves to represent the whole "earth system" in the context of impending climate change (2018: 40, emphasis original). Latour's implication is that, though the physical realities of the Terrestrial have always existed, the epistemic orientation of science and technology studies (STS) heretofore tended to omit them. Although STS as a discipline embraces Latour's general body of work as canonical, scholars have been slow to incorporate the Terrestrial dimension into applications of ANT and threads of critical studies. Earth's growing energy consumption imbalance and corresponding climate instability suggest a change is needed. With epistemic considerations in mind, I compare the emergence of

the agential earth system with another emerging non-human agent: artificial intelligence technology.

Precision in the Art of Navigation: a study of significant figures in Norie's *Epitome of Practical Navigation*, Matthew Maxwell, University of Wisconsin - Madison

- Significant figures, or significant digits, are an understudied part of measurement and scientific practice. While the history and use of statistics is well-studied, no literature has taken up the history or use of significant figures. This paper aims to make a first effort at filling that gap. Significant figures are not simply conventional rules for rounding. Nor are they, as is frequently assumed, a statistical concept or a measure of error. Rather they are a report of the level of resolution of the measurement procedure. As reports, significant figures play a distinctive role in the measurement, calculation and reporting of measured values. Because they are communicative instruments, they may be understood as instantiating Grice's conversational maxims of quantity and quality. This paper makes a study of significant figures in John W. Norie's 1805 *A New and Complete Epitome of Navigation*. While significant figures are notably absent in the mathematical literature of the 18th and early 19th Centuries, Norie's book is usually quite attentive to significant figures. The capacities of the measurement tools, the provided aids to calculation, and needs of the navigator are neatly matched. In particular, Norie's tables of logarithms and trigonometric functions---with some revealing exceptions---are sensitive to significant figures.

Managing Nervous Disorders at Home: Psychiatric Self-Help Literature in the United States, 1900-1930, Matthew McLaughlin, University of Toronto

- In the second half of the 19th century, American psychiatrists became concerned that major transformations brought on by industrialization and urbanization were harmful to the population's health. These anxieties persisted into the early 20th century, with medical experts arguing that the stress and demands of modern American society were detrimental to the nervous system and the reason a significant number of citizens were suffering from nervous disorders. In response, many experts began producing self-help literature to help the population recognize, treat, and prevent nervous symptoms. This paper examines three self-help books and corresponding articles written by the psychiatrists Abraham Myerson, Josephine Jackson, and John Mitchell between 1900 and 1930. It will assess to what extent these different experts encouraged self-diagnosis, offered advice on how to establish a treatment plan, and explained the underlying causes of the nervous symptoms, while also evaluating discrepancies in the advice provided for men and women. Furthermore, it will use reviews written by scholars and non-experts to illuminate what elements of the self-help texts were embraced by readers. In doing so, this paper will illustrate the similarities and discrepancies between the presumed utility of the authors and the elements that the general audience they were writing for valued and sought after.

Duplicates: Nature and Artifacts in an imperial museum., Gordon McOuat, University of King's College/Dalhousie University

- Museums, collections, and collectors trade in "duplicates". But what exactly is a "duplicate"? Manufactured reproduction provided one answer the question -- books, for example. But what about natural objects? And the idiosyncratic? This paper participates in the recent rise in interest in "the issue of duplicates" (BJHS, Sept. 2022), by focusing on fractious internal debates within the leading imperial "British Museum" during its formative years in the 19th century. The vociferous debate over duplicates and what to do with them pitted Keepers vs Librarians, donors vs. "scientists", radicals vs. conservatives. Around "duplicates" gathered questions about commodities, art, patronage, types, the nature of "natural kinds", and the very role of an imperial museum. Provincial and colonial institutions petitioned and scavenged for the pieces. The dispute was one of the main contribution towards the institutional separation of the artifactual collection from the natural history collection in the later half of the century. Yet, within the British Museum's debate over duplicated "things" yawned an even deeper division: the debate about the difference between hermeneutical vs. natural ways of being. On the grounds of that separation, colonial rule grew.

Is Cosmopolitanism a Useful Concept at All? Gordon McOuat, University of King's College/Dalhousie University

- Our last big Canadian/international STS/HPS collaboration grouped itself under the title “Cosmopolitanism and the Local in Science and Nature/East and West” (2015-2019). In 2015 the term “cosmopolitanism” had witnessed a certain recrudescence in political and ethical philosophy (Anthony Appiah, Amartya Sen, Ulrich Beck, Martha Nussbaum, etc). The worry over there was the rise of parochial nationalism and populism and nativist reaction as a threat to Enlightenment universalism and political liberalism. In STS/HPS, the pressing issue seemed to be about how “local” knowledges and practices can cross borders and engage the “universal” – this in the midst of an urgent reappraisal of the circulation of knowledge in colonial and post-colonial periods and criticisms of the centre-periphery model of knowledge transfer. This paper will explore the history and suitability of the term “cosmopolitanism” in knowledge circulation, focusing on the ways in which local communities encounter bordercrossings, and how certain scientific objects/practices themselves make short work of borders – that is, they are “cosmopolitan” from the get-go. The paper will finish by rehearsing the notion of the “cosmopolitan-vernacular”, taken from the Sanskrit literary scholar, Sheldon Pollock, and applying it to models of knowledge transfer and growth in science and technology.

The Incompatibility of “Obesity Epidemic” Rhetoric and Eating Disorder Recovery, Kayla R. Mehl, University of Washington

- Widespread reports in the media depict a society struggling with an “obesity epidemic.” Despite the recognition that “obesity” has many contributing factors (many of them social, environmental, and genetic) and the recognition that being “overweight” is not always a detriment to health, moral panic accompanies discussion of the “obesity epidemic” and over-emphasizes individual responsibility for losing weight and the

dangers of not doing so. This approach has harmful consequences, particularly for those recovering from eating disorders. Testimonies of people in recovery from eating disorders, and particularly those with “atypical anorexia” (i.e., anorexia in individuals who are not “underweight”), demonstrate that the goal of altering their body to better conform to societal/medical standards of "healthy weight" takes priority over the mental illness that fuels the disorder and contributes to high suicide rates. Patients recovering from eating disorders have reported that their health care providers are reinforcing their fears of gaining too much weight in recovery (Tovar 2018), and people with atypical anorexia report experiencing longer duration of symptoms, greater levels of weight loss, and increased distress as a result of misdiagnosis, delays in care, or avoidance of healthcare (Harrop 2019). In virtue of these testimonies, I argue that public health and medical recommendations related to the “obesity epidemic” work to undermine effective treatment for people in eating disorder recovery.

New Loops: Algorithms in the Context of Ancient Babylonian Astronomy, E.L. Meszaros, Brown University

- Modern scholars have grappled successfully with many of the often opaque components of Babylonian astronomy. The fragmentary record emphasizing observations and computed data rather than methodologies and theory has made it necessary for many ideas to be reconstructed. While modern historians of science have identified how Babylonian practitioners used and developed these astronomical theories, they often do so while casually identifying these procedures as “algorithms.” Carrying this modern term, often inextricably linked with computers and even racist bias, into ancient Mesopotamia suggests interesting questions about what an algorithm might mean in a drastically different context. This presentation will look at how common components of modern algorithms are realized in ancient Babylonian planetary procedures. Relying on a series of tablets as primary sources, it will identify characteristics of algorithms, like variable use and the control of the flow of logic through a procedure, but focus on how these aspects appear in cultures far removed from the traditional background of the idea of “the algorithm.” This presentation will then address whether these planetary procedures can be — or should be — productively identified as “algorithms” in modern discourse based on these characteristics.

A Feminist Assessment of What’s Wrong with Evolutionary Selfishness, Letitia Meynell, Dalhousie University

- It’s tempting to think that the selfish gene, and the idea of evolutionary selfishness more generally, is a thing of the past. In fact, selfishness is written so deeply into evolutionary theorizing that we fail to notice it. The evolutionary selfishness of Darwinian individuals—in other words, the tendency of members of evolving populations to differentially increase the fitness of their own offspring (or close relatives), typically by endowing them with fitness-enhancing traits through inheritance, at the cost of others—is simply assumed as the driver of natural selection and written into the mathematics that represents it (Neto, Meynell and Jones 2023, 17-19).

Whenever the evolution of cooperation is characterized as inherently fraught because it is prone to cheaters, this is done against a background assumption that evolutionary selfishness is essential to natural selection. Indeed, even Ford Doolittle, a current defender of the Gaia hypothesis—the idea that the Earth is, in some sense, an organism—proposes a how possibly explanation of the evolution of this planet-level cooperation on the basis of an interactor-replicator dynamic that assumes that selfish genes are driving the process (Doolittle 2022; Doolittle and Inkpen 2022, 126-32). Although there are a number of critiques of selfishness as an explanatory concept in evolutionary psychology (e.g., Dupre 2001; Rose and Rose 2010; Sober and Wilson 1999), defences of various kinds of group or multilevel selection that convincingly undermine simplistic genetic reductionism (e.g., Roughgarden et al. 2017; Doolittle 2017), and, of course, important critiques of adaptationism (e.g., Gould and Lewontin 1979; Lloyd 2016), critical assessments of selfishness understood as the driver of natural selection generally (i.e., in the more than human world) are less common. In this presentation, I will consider whether we should simply reject the idea of selfishness that is deployed in natural selection explanations. Though I share with others a disdain for deploying a fundamentally normative term like “selfishness” in supposedly descriptive accounts of natural history, I will take particular aim at Richard Dawkins’ notion of the extended phenotype, a necessary corollary of the selfish gene (1982/2016), and argue that it is just as prone to the problem of cheaters as symbionts, groups, microbial communities, and other evolved cooperators. I will conclude by suggesting that “rational self-interest” may be a better metaphor for natural selection than “selfishness,” being less politically noxious and equally (if not more) empirically adequate (Longino and Lennon 1997), as it foregrounds, rather than troubling, cooperation and altruism.

Le Problème de L’Ancrage Vectoriel, Raphaël Millière, Columbia University

- La performance impressionnante des algorithmes de traitement du langage naturel actuels (également connus sous le nom de "modèles du langage") concernant des tâches linguistiques complexes a suscité un débat houleux sur la manière de comprendre leurs capacités. Leurs résultats linguistiques étonnamment convaincants ne sont-ils qu'une simple répétition statistique de l'énorme quantité de textes sur lesquels ils ont été entraînés, sans ancrage ("grounding") dans le monde réel, et donc dépourvus de sens intrinsèque, incapables de parler du monde ? Dans cet article, notre objectif est double. Premièrement, nous distinguerons différents sens de l'ancrage ("grounding") représentationnel : référentiel, sensorimoteur, communicatif et épistémique. Nous soutiendrons que le sens référentiel de l'ancrage est le sens central pour évaluer si les modèles du langage sont plus que de simples perroquets stochastiques. Deuxièmement, nous soutiendrons que, à la lumière de leur architecture et de leur apprentissage, les modèles du langage pourraient satisfaire les conditions minimales pour l'ancrage référentiel. En effet, les modèles du langage sont généralement entraînés sur des données dont la structure implicite dépend essentiellement des interactions causales entre les humains et le monde, et doivent apprendre à représenter et à exploiter cette structure pour produire leurs résultats. Nous montrerons que nos meilleures théories

du contenu représentationnel peuvent rendre compte de l'ancrage représentationnel dans les modèles du langage entrainés uniquement sur des données linguistiques, et plus encore dans les modèles visuo-linguistiques.

Edward Hitchcock and A New Research Factor in History of Paleontology: Fossil Footprints and Formation of the Field of Ichnology, Ali Mirza, University of Saskatchewan

- This paper looks at the analysis of many fossil footprints in New England by Edward Hitchcock (1793-1864), President and Professor at Amherst College. It first shows how Hitchcock's analyses of these footprints influenced evolutionary theories such as those of Charles Darwin and James Dwight Dana. Second, I show how this led to the formation of a new discipline, called ichnology, which studied the interactions between organisms and substrates—such as footprints, burrows, and nests—using laws that were irreducible to those studied by biology, geology, or chemistry. Lastly, and most critically, I show that Hitchcock's views regarding the underpinnings of his new field must be understood in reference to the quarrying technology common in 19th century Massachusetts. The methods by which fossils have been extricated from the field and moved to museums, such as occurred in those quarries, has been a blind spot for contemporary historians and scientists. Scientists studying taphonomy study how a footprint is preserved until discovered. Historians, however, have mostly studied how the organization of collections in cabinets and museums, what Paula Findlen calls "mosaics," affects scientific work. I present a new method of analysis, "exonomy," which studies how different ways of extricating and transporting fossils from the field to the museum affects scientific research and present Hitchcock as a model example this.

Ontological Commitments in Non-Causal Scientific Explanation, Jahangir Moazzenzadeh, University of Guelph

- Explanation is an essential aim of science, and the dominant approach to scientific explanation is causal. According to these causal accounts, scientific theories explain phenomena by appealing to causes or a network of causal relations. There has been a renewed interest in non-causal approaches to explanation in the last twenty years, which we call the new generation compared to the old generation like Carl Hempel, Philip Kitcher, and their followers (Hempel 1965; Kitcher 1981). This new generation introduces examples in different scientific fields where causal explanations do not work and argue for the existence of non-causal explanations. Contrary to the old generation, which absolutely rejects ontological commitments in their theories of explanation, the new generation is silent about the ontological commitment of their accounts. The new generation appeals to the model explanation to defend their non-causal approaches. Through her model explanation approach, Alisa Bokulich introduces semiclassical models as fictional models with explanatory power (Bokulich 2008, 2012). We follow her non-causal approach to the explanatory power of these models, but instead of considering them as fictional models, we introduce them as emergent properties. Periodic orbits are weakly emergent properties that satisfy dependency and autonomy as essential characteristics of emergent properties. Introducing classical structures like

periodic orbits in semiclassical models as emergent properties show that even these non-causal accounts are not free of ontological commitments.

Laura Chalk and the Stark Effect, Daniela Monaldi, York University

- Laura M. Chalk (1904-1996) was the first woman to obtain a Ph.D. in Physics at McGill University in Montreal, Canada. She was a student of J. Stuart Foster, who is credited with having introduced quantum mechanics into Canada, and the results of her doctoral research on the quantum phenomenon called Stark effect were the first published data to confirm the validity of Erwin Schrödinger's wave mechanics. This paper reconstructs her life and work, asking what the quantum revolution looked like from the standpoint of a young woman toiling in a sub-basement lab and striving to be, as she wrote in a later memoir, "just one of the boys". It also seeks to place her in historical perspective, comparing her experience to that of her predecessor at McGill, Harriet Brooks.

"A disease which tests the character of the patient": Expertise, trust, and the work of diabetes, 1920-1950, Elizabeth Neswald, Brock University

- In 1917, only a few years before the development of insulin, diabetes specialist Elliot Joslin described the heavy burden that diabetes management placed on the patient. Self-control, careful obedience, self-monitoring, and the patience to record these observations for personal and physician reference were all necessary, he maintained, to keep the disease under control. While the history of science and medicine offer numerous examples of self-observation and self monitoring, such as Santorio's experiments to detect insensible perspiration or Edward Smith's extended self-study of the effects of climate and diet on his well-being, most of the cases involved individuals, experiments, or limited-duration studies. Diabetic self-monitoring, in contrast, is one of earliest examples of self-monitoring and self-observation not as an experiment or individual interest, but as a routine practice. This paper discusses the early history of patient self-monitoring in diabetes management. Self-management and self-monitoring placed everyday disease management responsibility and control in the hands of diabetic patients, leading to shifts in the physician-patient relationship: Could patients be trusted to follow their regimen, report truthfully, test skilfully? Whose knowledge and expertise carried the most weight – the physician's medical knowledge of disease and physiology or the patient's intimate knowledge of their own life circumstances and bodies? Discussions between physicians and between physicians and patients reveal the challenges of managing the relationships of diabetes management.

The Rise of Reefer Containers and the decline of Reefer Ships, Michel Nguessan, Governors State University, Illinois, USA

- This paper discusses historical developments about the global logistics of refrigerated trade. Reefer ships started in the last quarter of the 19th century with pioneers such as James Harrison (Australia) in 1873, Thomas Mort in 1876 (Australia), and Ferdinand Carré (France). In 1882, the reefer ship Dunedin shipped a large cargo from Port Chalmers (New Zealand) to London (U.K.). The history of the modern shipping container started in the 1950s when Malcolm McLean started testing different types of containers

and shipped containers from New Jersey to Houston on April 26th in 1956. Reefer containers developed alongside dry containers in the 1950s and 1960s. Advantages of reefer containers in terms of loading and unloading efficiency and intermodalism became obvious to the shipping industry. Consequently, the refrigerated trade shifted gradually from reefer ships to reefer containers. Today, reefer containers handle more than 80% of refrigerated trade, causing an irreversible decline of reefer ships. The paper discuses: 1) the history and development of reefer ships from the last quarter of the 19th century to the 1950s; 2) the history and development of reefer containers since the 1950s. The study concludes that the rise of reefer containers caused an irreversible decline of reefer ships.

Component-level understanding is necessary for Explainable AI to succeed, Travis O'Brien, Indiana University

- Scientists have begun to use artificial intelligence (AI) to aid in scientific discovery. But these AI tools are accused of being black boxes, thereby jeopardizing the security of scientific knowledge generated. Explainable AI (XAI) is a family of methods to help understand these opaque AI models. In this paper, we argue that these XAI methods do not contribute to understanding because (1) they are post hoc not just in practice but also in principle; and (2) the results from different XAI methods are inconsistent from one another as shown by empirical studies (Mamalakis et al. 2022). We propose instead analyzing AI models based on how other scientific models are analyzed, focusing particularly on dynamical complex climate simulation models (henceforth: climate models). We argue that decomposability is a prerequisite for understanding any complex models, including AI models. Take climate models, for example. Here, practices such as robustness analysis and error diagnosis demonstrate that climate models are decomposable. E.g., error diagnosis involves linking anomalous model behaviors to specific model components to offer a physical explanation of said behavior. This exemplifies (a degree of) component-level understanding of complex models. We then argue that decomposing models is not only doable in XAI but also that doing so helps improve model performance and increases the transparency of model behavior. This can be seen by looking at some examples from the tech industry, where AI models are sometimes analyzed in a piecemeal fashion (Siahorin et al. 2019; Siahorin et al. 2021). We end by contrasting the component-level understanding of AI models with GCMs in relation to the broader philosophical literature on understanding (e.g., Toulmin 1961; Woodward 2005; Levy 2014; de Regt 2017; Bechtel 2022).

Presenting the Future: the case of the IBM Selective Sequence Electronic Calculator, Allan Olley, Independent Scholar

- The IBM Selective Sequence Electronic Calculator (SSEC) was the first large electronic calculating machine IBM produced. Dedicated to science on January 27th of 1948, the machine was featured in newspaper stories, news reels, advertisements, a fashion shoot and even appeared as a location in the 1952 spy thriller Walk East on Beacon. These presentations illustrate both the way cutting edge technology was perceived, talked about and people and companies sought to associate with it in the era. It presents a

snapshot of the way high-technology and science were viewed at the time. IBM's own goals and attitude are displayed in the presentation of the SSEC and other IBM products. Also on display are recurring themes in the presentation of computers including the metaphor of computer as brain and the feminized presentation of some aspects of computers. Anxieties about automation replacing, dominating or otherwise rendering humans impotent are also present. More trivial aspects of presentation are also interestingly displayed such as jokes about the complexity of calculating one's income tax returns. I will discuss these depictions and themes in light of both the primary material and later scholarly analysis of media coverage and IBM's messaging around computers.

Science in Crisis: Evidence, Policy, and Science Communication During Public Emergencies, Tyler Paetkau, McGill University

- In recent decades, there has been significant work advocating for evidence-based policy and the need to close the evidence-policy gap. While there are merits to science-informed public policy, the overuse and over-reliance on an evidence-based policy framework risks contributing to public distrust in science, thereby undermining the efficacy of the policies in question. Nowhere is this more true than in times of crisis. Through an investigation of policy and science communications during the Covid-19 pandemic, I propose three distinct sources of distrust that arise from over-reliance on an evidence-based approach during a public emergency. These are the politicization of science, fatigue from policy changes, and misuse of scientific transparency. I conclude by recommending ways to combat these sources of distrust, including complimenting evidence-based practices with ethical and political values and limiting scientific transparency to specific topics and time-frames.

Between Paradigms and Political Theories: Revisiting the Fuller-Gunnell Debate on Thomas Kuhn, Lewis Page, University of British Columbia

- As the sixtieth anniversary of the publication of *The Structure of Scientific Revolutions* passes, the implications of the seminal book for the relationship between facts and values remains contested. In my paper, I will examine a debate concerning Thomas Kuhn that has taken place over the last thirty years between the philosopher of science Steve Fuller and the political scientist John Gunnell. Fuller has argued that Kuhn had a profoundly conservative effect, because of his portrayal of the “revolutionary” moment as an irrational struggle of wills in contrast to the reasoned advances of “normal science.” Gunnell has argued that critics such as Fuller are motivated by an antipathy to the image of science that Kuhn advanced because it relocated the criteria of truth in the practice of the natural sciences and left no place for the transcendental claims of philosophy. I contend that Fuller and Gunnell have similar interpretations of Kuhn. The two scholars clash because of their conflicting beliefs about the proper relationship between normative claims and the empirical production of facts, as displayed in their disagreement about how to situate Kuhn in the history of the conflict over methods in the discipline of political science in the United States in the 1960s. By returning to a set of texts written by the political theorist Sheldon Wolin that explicitly engaged with Kuhn

in the mid-1960s, I intend to outline a novel interpretation of how Kuhn's work was once, and could be again, used to envision a mutually beneficial relationship between normative philosophy and social-scientific truths.

A proposal for a science court, Zeynep Pamuk, London School of Economics

- This talk identifies key challenges to healthy democratic decision making on scientific issues, focusing on how experts' values shape the agenda and terms of debate, citizens have difficulty evaluating competing expert claims, and asymmetries in knowledge and authority make deliberation between experts and citizens unproductive. It then offers a proposal for an adversarial "science court" with a citizen jury and shows how it could mitigate these difficulties.

Where are Colors? Perspectival perceptual realism, Paul Patton, IHPST, University of Toronto

- Direct perceptual realism is the claim that we perceive the external world. Indirect realism claims we perceive an inner construct created by our perceptual mechanisms. Indirect realism is self-undermining because it doesn't explain how the inner construct is perceived. The claim that we perceive the external world likewise isn't plausible if we take physics theories to provide our sole account of the external world. Many features of phenomenal experience—colors, for example—have no straightforward counterpart in our physical ontology. To address this problem we need a new approach: perspectival perceptual realism. Perspectival perceptual realism derives from perspectival scientific realism. It is based on the observation that complex systems with multiple levels of organization are typically understood by multiple different but compatible theoretical frameworks picking out different constellations of interrelated features of the system. The functions of bodily organs are invisible from the physical perspective. They are visible from the perspective typically adopted by biologists, in which living things are organisms—organized, adapted systems in which parts sustain the whole by performing their functions. Colors are visible from an ecological perspective that takes perception to be an interaction between a living organism and its environment. The distinctiveness of colors and their similarity relationships can be understood in terms of relationships among and between the functional properties of the human visual system, and the spectral reflectance properties of surfaces under conditions of ambient illumination characteristic of natural human environments. Colors are real properties of the world, understood from the ecological perspective.

COVID-19 and the generation of novel scientific knowledge: Research questions, study designs, evidence-based decisions and data sharing, Lucie Perillat, University of Toronto

- Funding agencies often are faced with a trade-off between supporting novel research that may lead to breakthrough discoveries or conventional research that may lead to incremental scientific advances. The former is standardly portrayed in a quasi-Popperian fashion as research that has a higher risk of failure, whereas the latter is portrayed as having a lower risk of failure. Over the last half-century, there has been extensive philosophical discussion in the science policy literature about the relative merits of research that has the potential for impactful discoveries and research that is more likely

to maximize the volume of scientific discoveries. Novel science in the philosophical literature is standardly distinguished from conventional science in terms of levels of risk of failure, but this criterion glosses over the many challenges pursuant to the creation of novel science. Drawing on the recent experience of the COVID-19 pandemic, the objective of this presentation is to give an overview of four challenges pursuant to the creation of novel science, which contributed to the difficulty of creating novel science during this public health emergency. Specifically, the COVID-19 pandemic presented challenges in terms of (1) finding and prioritizing relevant research questions, (2) choosing study designs that are appropriate for a time of emergency, (3) evaluating evidence for the purpose of making evidence-based decisions and (4) sharing scientific findings with the rest of the scientific community. These four challenges have often compounded each other and have contributed to slowing down the creation of novel scientific knowledge during the COVID-19 pandemic.

"My dull brain was wrought with things forgotten:" Considering the Origins of Model Psychosis, Matthew Perkins-McVey, Dalhousie University

- The pharmacological arm of mental health treatment is in a state of crisis. The promises of the Prozac century have fallen short; the number of novel, therapeutically significant medications that successfully complete development shrinks with every passing year; and the demand for better treatments only grows. Answering these hardships is a renewed optimism concerning the efficacy of controlled psychedelic therapy, a renaissance which has seen the return of a familiar concept: intoxication as model psychosis. First appearing in the mid-19th century and featuring in an array of 20th century efforts in psychedelic research, model psychosis has, once more, come to the foreground of psychedelic research. And yet, little has been made of where this peculiar, perhaps even intoxicatingly mad, idea originates. Why did we come to liken psychosis to intoxication to begin with, and why is this an idea we find so hard to shake? This paper seeks to uncover the conceptual foundations underlying the early emergence of model psychosis. Starting with Moreau de Tours's introduction of the idea in 1845 and followed by Kraepelin's independent conception of model psychosis in the 1870s, this narrative will explore the conceptual foundations behind their independent development of the concept of model psychosis, considering their similarities and differences. In the course of this examination, it becomes apparent that the definition of endogenous psychosis which formed in the mid-19th century is the direct product of emerging understandings of exogenous psychosis, or model psychosis. Ultimately, the goal is not merely to understand how and why model psychosis became thinkable, but to examine how seemingly secondary concept changes can engender new ways of being a psychiatric subject.

Reciprocity and the Varieties of Epistemic Justice, Dhruv Raina, Jawaharlal Nehru University

- Since the 1980s, history of science has been struggling to replace its diffusionist model of knowledge circulation. Four decades later, it is clear that the main concern is not merely epistemological, but is a question of historical epistemology. One might certainly be warranted to ask how diffusionism itself, as a theory attempting to explain and

describe the circulation of knowledge gained so much traction over other approaches favouring a more transnational and transcultural account. This talk offers a reflection on these various alternatives and chronicles how one way of understanding knowledge transit led to the emergence of other competing theories, a story that emphasizes the associated context and geopolitics of knowledge.

Understanding LLMs: from benchmarks to cognitive ontologies, Charles Rathkopf, Jülich Research Centre; Dimitri Coelho Mollo, Umeå University

- The past two years have been witness to enormous improvement in Large Language Models (LLMs). The best evidence for this improvement comes from a variety of large benchmark tests, such as Google's BIG-Bench project. Benchmark tests provide a statistical profile of model performance on a diverse array of behavioral tasks. While benchmark tests are undoubtedly valuable for summarizing the behavioral competencies of LLMs, it is unclear what they tell us about the underlying cognitive competencies of LLMs. When a person demonstrates behavioral competence on a logic test, we are inclined to say that the person understands logic. That is, we readily infer a cognitive competence from a behavioral one. It is tempting to make analogous inferences in the case of LLMs, but that temptation should be resisted. Recent work on what has become known as 'cognitive ontology' has highlighted both methodological and conceptual difficulties with inferring cognitive competencies from a statistical summary of task performance. In this talk, we apply insights from cognitive ontology research to LLMs. We show that the challenges that arise in identifying cognitive competencies are analogous for biological and artificial systems. We argue, in addition, that conceptual tools developed within cognitive ontology research, such as the distinction between intrinsic and task-bound functions (Rathkopf, 2013), can help us to articulate the cognitive capacities of AI systems without relying on overly anthropomorphic reasoning. We illustrate the fruitfulness of our approach by examining the success of recent LLMs on the Conceptual Combinations benchmark (Coelho Mollo, Millière, Stinson, Rathkopf).

Critical Making and Wicked Problems in the Classroom, Isaac Record, Michigan State University

- This hands-on workshop explores “critical making” as a teaching method. Critical making combines traditional humanities and social science “critical thinking” research techniques with creative and constructive making (Ratto 2011). In my classroom, students use methods and lessons from philosophy of science and technology to respond to scientific concerns they identify. A significant component of their investigations is model-building, which helps students elaborate and apply concepts, test the limits of ideas and ideals, and put their tacit knowledge of science and technology to use. I organize classroom inquiry according to an iterative framework involving empathy, research, and revision. Organizing activities in this way helps me to model inquiry that centers humility and empathy, and also emphasizes research and high standards. Pragmatically, it’s also a helpful way of organizing activities for collaboration and reporting out at various stages of a complex project. It also provides

incredible insight into student thinking. By living the lesson, I hope you'll see how effective, fun, and relevant critical making can be.

Another Negative Program in Experimental Philosophy, Andrew Richmond, Western University

- Experimental philosophy (X-phi) has pursued a "negative program," arguing against the use of individual intuitions in philosophy. Better, X-phi has said, to use empirical measures of a broader population's intuitions, judgments, or categorizations as a basis for philosophical thought. This has been especially fruitful in experimental philosophy of science, with interesting results concerning scientific concepts like 'gene,' 'innateness' (Griffiths & Stotz, 2008), and 'representation' (Favela & Machery, 2022). I argue that there is a second pervasive tendency in philosophy for experimental philosophy to correct. This tendency isn't about the source of our insight into scientific concepts, but about the kind of insight we seek. In the work I just described, the goal is to uncover the meanings or extensions of scientific concepts, and how each vary between circumstances (Machery, 2016), as a way of understanding how those concepts serve scientific explanation. This is informative, but as long as we're using empirical methods to study scientific explanation, why not use the methods that cognitive psychology uses to study explanation? Cognitive psychologists do not just investigate which things belong in a category ('gene,' 'innate,' 'representation'); they prompt subjects with different kinds of explanation and examine those explanations' cognitive effects (Lombrozo, 2009; Lombrozo et al., 2007; Lombrozo & Carey, 2006; Lombrozo & Gwynne, 2014). They study how the concepts an explanation uses support abilities like prediction, causal understanding, and memory. In short, they treat explanation like any other cognitive phenomenon. And philosophers can use those methods to treat scientific explanation like any other cognitive phenomenon. I argue that this approach can be motivated by the original concerns of X-phi, by the cognitive approach to philosophy of science (e.g., Nersessian, 2002; Thagard, 2002), and by broader philosophical considerations. These methods would open new ground for the philosophical study of explanation, exploring new kinds of information about scientific explanation — not about the meanings and extension of concepts, but about their broader cognitive significance.

Think Like a Genius: History of Science for Middle School Students, Adam Richter, University of Toronto

- This paper chronicles my efforts to develop and deliver history of science programming for Brain Power Enrichment Programs, a company that provides supplemental education to high-achieving students. As an employee of Brain Power, I am currently developing a series of workshops entitled "Think Like a Genius" for students in Grades 6-8. Each workshop will focus on a prominent figure in the history of science, beginning with Isaac Newton and Albert Einstein. Students will be encouraged to "think like a genius" by recognizing the techniques that these figures applied to their scientific work. Activities include reading primary sources, replicating experiments, and analyzing cultural representations of the scientists (in plays, films, visual arts, etc.). Throughout

the workshops, the students will be encouraged to think critically about the concept of a "genius": What is it that qualifies Newton and Einstein as geniuses? Should aspiring scientists try to emulate them? What does the figure of a "genius" reveal about the values embedded in modern science? While the focus on "geniuses" is helping to generate interest from clients, it raises the concern that the workshops will resemble the field of history of science as it was decades ago, not as it is today. An ongoing challenge will be to ensure that the workshops reflect the richness, diversity, and historical sensitivity that currently characterize the field.

Peer Review, Innovation, and Predicting the Future of Science: The Scope of Lotteries in Science Funding Policy, Jamie Shaw, University of Toronto

- Recent science funding policy scholars and practitioners have advocated for the use of lotteries, or elements of random chance, as supplementations of traditional peer review for evaluating grant applications. One of the primary motivations for lotteries is their purported openness to innovative research. The purpose of this paper is to argue that current proponents of funding science by lottery overestimate the viability of peer review and thus unduly restrict the scope of lotteries in science funding practice. I further show how this analysis suggests a different way of introducing lotteries into science funding policy.

Embodied Memory in the Slime Mold, Emma Sigsworth, IHPST, University of Toronto

- The slime mold *Physarum polycephalum* can find the shortest path through a maze, solve the 'U-shaped trap problem' common in navigational tests for robots, and even construct models of public transport networks similar to those built by humans. This behavioural complexity has made it a popular model for studying minimal forms of decision-making. In this paper, I present a recent debate about memory functions in *Physarum* as a case study to inquire about the role of representations in nondeclarative memory. Kramer and Alim (2021) propose a mechanism for memory encoding based on the width of *Physarum's* tube network, but Noguera Júnior (2021) and Austin (2021) question whether their research supports evidence for memory. I argue that Kramer and Alim's research conclusions are weakened by their appeal to memory encoding: while *Physarum* does remember, I contend that it does not encode, store, nor retrieve remembered content. Drawing from Merleau-Ponty's work, I propose an enactivist theory of habituation that better captures the nature of memory in non-neural organisms like *Physarum*.

Space wheels and artificial worlds: megastructures in science and science fiction, Stephen D. Snobelen, King's College, Halifax

- In the opening sequence of the second act of Stanley Kubrick's *2001: A Space Odyssey* (1968), a slowly spinning double-wheel space station orbits the Earth accompanied by Strauss's waltz "The Blue Danube". This iconic orbital platform was patterned after earlier proposed artificial gravity space stations: von Braun's space wheel (1952), Noordung's space station habitat wheel (1929) and, earlier still, Tsiolkovsky's *Bublik City* (1903). The Gateway Foundation has plans to build a rotating space hotel reminiscent of

that in Kubrick's 2001. In his *The High Frontier* (1976), physicist Gerard K. O'Neill proposed the construction of large spinning cylinders as lifeboats for the human colonisation of space—an example of which appears in the science fiction film *Interstellar* (2014). The "inside-out planet" of the Bernal Sphere (1929) and NASA's Stanford Torus (1975) offer analogies. Added to these are the artificial worlds proposed in science and science fiction, including the Dyson Sphere and the Alderson Disk—assemblies so vast in scale that the term 'megastructure' becomes inadequate. Using the analytical tools of the history of science, this paper provides a brief survey of these imagined and often seemingly implausible large-scale engineering projects and locates the humanistic, utopian, scientific and ecological motivations behind them.

Adversarial Perception in Deep Neural Networks, Catherine Stinson, Queen's University

- Deep Learning (DL) has recently made impressive advances in areas like game playing, language processing and vision, leading to claims that general purpose artificial intelligence may be just around the corner. However, DL also regularly produces embarrassing failures. Focusing on visual object recognition, where the failures include being tricked by modified traffic signs, and being unable to detect Black faces, a cottage industry has emerged where researchers produce new kinds of "adversarial examples" that DL misclassifies. Here we look at research on adversarial examples from the perspective of scientific methodology, where it appears to be a haphazard game of gotcha. We draw on three sources to help sort out whether adversarial examples should be taken as a serious challenge to DL's apparent success. First we look at work in comparative psychology, which suggests fairer ways of comparing DL's susceptibility to adversarial examples to the human visual system's vulnerability to illusions. Second we draw connections to recent work on mechanistic explanation in computational sciences, where the pattern of successes and failures (not just the successes) is what one looks for as evidence that the same type of mechanism is at work. Third, we draw on criticism from AI Ethics pointing out how benchmark tasks are overemphasized in AI research, to draw more circumscribed conclusions about whether DL succeeds at human-like object recognition

Practical understanding and the genre conventions of scientific article writing, Michael T. Stuart, National Yang Ming Chiao Tung University; London School of Economics; University of York

- This paper sketches a preliminary account of what has been called pragmatic or practical understanding. The account characterizes practical understanding as a property of agents. The details are as follows: An agent has achieved practical understanding with respect to some system X iff the agent is responsible for gaining the ability to reliably and successfully manipulate X (or the parts/elements of X) to achieve their goals, and their ability produces an ensemble of related dispositions with respect to X which are present in the majority of close possible worlds. The agent has more practical understanding to the extent that their ability is more stable, it allows them to perform more successful relevant actions on X, and the actions they can perform are more successful. Some advantages of this account over its rivals are presented, including its

ability to explain discourse around scientific progress, education, and recent confusions about artificial intelligence in science. A new piece of evidence is then given in its favour: its ability to explain the form of modern scientific publications. Scientific journal articles do not present realistic narratives, but rather fictionally reconstructed accounts that are dense, multi-perspectival, and multimodal. The best explanation for this, it is claimed, is that writing conventions like these increase practical understanding, but not primarily about the phenomena described in the papers. Instead, these conventions facilitate practical understanding that is meant to be as general as possible, so that readers working on many different things, even in different fields, can use what is in the paper to add to their own abilities

An Unexpected Window: Platonic Thought Experiments in Chemistry, Michael T. Stuart, National Yang Ming Chiao Tung University; London School of Economics; University of York

- In *The Laboratory of the Mind*, Jim Brown points out that there do not appear to be any TEs in chemistry. This remark was followed up in a paper by R. J. Snooks that claimed that indeed, there aren't any ("Another scientific practice separating chemistry from physics: Thought experiments," *Foundations of Chemistry*, 2006). If true, this would be a shocking fact, since TEs are found in all the other natural sciences. Why should chemistry, the "central science," be any different? This contribution to the panel, first presents Snooks's reasons for thinking that chemistry does not employ TEs, and then identifies hundreds of TEs in chemistry. Understanding the kind of TEs used in chemistry, where we find them, and what their roles are, opens space for a more detailed understanding of chemical TEs, and chemistry itself. Finally, we consider an extraordinary finding: the existence of platonic TEs in chemistry. Their existence provides an unexpected (and unexpectedly powerful) resource in support of Brown's view about TEs. If chemists believe that chemistry is essentially in the business of the finding necessary relationships between Platonic entities, and this is done using TEs, those who are highly skeptical of Brown's Platonic theory of TEs have some explaining to do.

Does the biosphere have a demarcation mechanism? Banin Sukmono, University of Kansas

- In 'The Multiple Realizability of Biological Individuals' (2013), Clarke dismissed the possibility of the biosphere being a biological individual because of the biosphere's lack of demarcation mechanisms. Demarcation mechanisms are mechanisms that ground the capacity of an object to participate in between-object selection, which—according to Clarke—is essential to the existence of higher-level objects (as opposed to being merely collections of lower-level objects). Contra Clarke, I argue that the biosphere has a demarcation mechanism. In particular, since the biosphere is a collection of autotrophs and heterotrophs, the phosphorus weathering loop can be named as such a demarcation mechanism. The loop's negative feedback mechanism, partly determined by the number of autotrophs and heterotrophs, enables the atmospheric oxygen rate to be stable between 15% and 25% and the ozone layer to be created. Since the oxygen rate can reasonably be seen to be an essential trait for biosphere homeostasis, it can be counted as a trait that is selected for at the level of biospheres: different rates of oxygen

determine the differential fitnesses of different biospheres. An apparent objection to this proposal is that it assumes that there exists a population of biospheres with varying oxygen rates (or that one such has once existed) —which is false. However, this objection is met by reinterpreting the concept of selection through Doolittle's (2014) model. In that model, a population is not necessary for between-object selection, and immunity to extinction can be used to measure differential fitness. I show that Clarke's account of individuality and Dolittle's model of selection are entirely compatible: nothing in the principles of demarcation mechanism forbids interpreting fitness as immunity to extinction. In this way, the biosphere is worth reconsidering as a biological individual.

Portrait of the Artist as a Young Algorithm, Sofie Vlaad, Queen's University

- In 2022, a painting generated by the Artificial Intelligence (AI) Midjourney won first place in its category at the Colorado State Fair. This prompted a conversation as to whether AI-generated content could count as art proper. Further controversies surrounding the ethics of dataset curation in the case of LENSA have led to a broader rejection of AI-generated art by many artists. While there seem to be substantive ethical questions surrounding the inclusion of art in datasets without the artist's consent, this paper challenges the move to reject AI-generated content as art tout court. In order to determine whether AI-generated content can count as art, I provide an overview of three kinds of theory of art: exhibited features accounts, genetic features accounts, and the buck passing account articulated by Dominic Lopes (2014). I argue that these current trends in philosophy of art are ill-equipped to understand cases of AI-art. To combat this conceptual confusion, I suggest that we can understand AI-generated art as being a form of algorithmic art, along the same lines as aleatoric (chance) music and the French poetry movement Oulipo. While there might be ethical issues surrounding the use of AI to generate art, I argue that it is nonetheless art that is being generated.

Theory-Centrism and the Formal Study of Macro-Units, Bobby Vos, University of Cambridge

- In this presentation, I set out to do three things. First, I will argue for the claim that formal philosophy of science is excessively theory-centric. To this end, I will first clarify what I take both 'formal philosophy of science' and 'theory-centrism' to consist in. Following this, I argue that theory-centrism is problematic, as it places certain supra-theoretical aspects of scientific enquiry outside the scope of formal analysis. Second, I will explore one way in which this problem of theory-centrism may be overcome, i.e.: the adoption of a supra-theoretical unit of analysis (or macro-unit, for short) by formal philosophers of science. This leads us to a largely forgotten research programme, centred around the formal study of macro-units. I briefly discuss two instances of the formal study of macro-units — to wit: the formalization of Kuhn's notion of paradigm and the formalization of Laudan's notion of research tradition — and use these examples to illustrate how supra-theoretical aspects of science may be captured in formal terms. Finally, I will identify some ways in which the formal study of macro-units, as embodied in the two aforementioned examples, may be further improved upon, focusing in particular on the treatment of pragmatic concepts in these two accounts.

Mnemonics and Memory: A View from C S Peirce and Sussanne Langer, Joel West, University of Toronto

- Mnemonics are memory aids which allow us to remember things by remembering other things in a kind of concatenation of memories that point to other memories. For example, the letters FACE do mean the word that corresponds with visage but also serve as memory device to recall the notes of the spaces of the treble clef. In this talk I will explore the relationship between the mnemonic, its object and I relate these relationships to the works of C S Peirce and Sussanne Langer, the first of whom created a taxonomy of signs and the latter of whom, following Wittgenstein, separated the phenomena we perceive into discursive and presentational forms. I also relate these mnemonics to distribution of cognition, and I demonstrate that mnemonics are not just an aid to memory but are also cognitive artifacts in that they require prior memory of other artifacts to which they much be matched. I will complicate the relationship between semantics and semiotics.

Operational understanding: scientific understanding through method and meaning, Oscar Westerblad, Department of History and Philosophy of Science, University of Cambridge

- Percy Bridgman once wrote that the 'act of understanding is at the heart of all scientific activity; without it any ostensibly scientific activity is as sterile as that of a high school student substituting numbers into a formula'. However, most accounts of scientific understanding unwarrantedly focus on understanding as a theoretical product derived from scientific activities, rather than being found in the activities themselves. Inspired by Hasok Chang's recent revitalisation of Bridgman's philosophical ideas, this talk will take a further step in articulating an epistemology that fits Bridgman's so-called operational attitude. To do this, I will take Bridgman seriously when he writes that any scientific activity is sterile without the act of understanding. This requires taking a fresh look at current debates about scientific understanding, moving away from the much discussed notion of explanatory understanding, instead making sense of understanding in and of epistemic activities. Following Bridgman and Chang, I articulate and defend what I call operational understanding: scientific understanding arises out of the development and iterative improvement of methods and concepts in the process of inquiry. Like the seminal account of scientific understanding developed by Henk de Regt, operational understanding has two interdependent levels, but unlike de Regt, operational account is not being tied to intelligible explanations. Instead, scientists make phenomena intelligible through their conceptual articulation in methodically performed epistemic activities. By making understanding a matter of the relationship between method and meaning in epistemic activities, operational understanding puts the act of understanding at the heart of all scientific activity.

Modeling and Thought Experiments: Rebuilding the Distinction, Jennifer Whyte, University of Pittsburgh

- In this paper I argue against the description of thought experiments in science as a kind of mental modeling, a view articulated by Nercessian (1992, 2007) and Miscevic (1992), amongst others. Though thought experimentation and modeling are intimately

connected, as the bulk of contemporary literature agrees, I will that thought experimenting and modeling must be distinct practices from each other, despite their co-presence, because the two practices have different conditions of success and failure. Thus, identifying models and thought experiments is a category mistake, akin to the error of identifying an experiment with its hypothesis, or with the tools of the laboratory. In place of this identification, I will propose a new account of the relationship between models and thought experiments in which thought experiments are operational stress-tests performed on models to ensure their internal validity and coherence when used together, rather than sources of new empirical data. My account allows philosophers and historians to make key distinctions that a combined account could not, which I will illustrate with an example drawn from Descartes' *Optics*.

Was Darwin's "I think" diagram a tree, or is it now? The rights and wrongs of pure history, Mary P. Winsor, University of Toronto

- In celebration of the branching process without which nothing in biology makes sense, some enthusiasts tattoo on their skin a copy of the diagram Darwin drew in his private notebook, under the Cartesian words "I think." This was only a few pages after his contemplation of the usefulness of trees as a metaphor for his idea. In fact he rejected the comparison, and called the iconic image "Diagram." In the Origin of Species two decades later, he again called the fold-out illustration a diagram, and his discussion of whether trees make a good metaphor for evolution suggests that he still had reservations. Is this mere nitpicking, or is there a lesson to be learned from a careful analysis of one man's words? Quite aside from the popularity of "I think" as an icon, the importance of the metaphor today is displayed in the recent textbook *Tree Thinking: An Introduction to Phylogenetic Biology*. I will show that careful attention to words remains the sharpest tool in the historian's toolbox, and that means words as currently used as well as in the past.

Irreducible Complexity and Contemporary Darwinism, Yussif Yakubu, University of Guelph

- The challenge of irreducible complexity to natural selection was effectively thwarted by Darwin when he explained how certain seemingly irreducibly complex structures and instincts could be produced by gradual natural selection. Then, in the early twentieth century, population genetics, which adopted Mendelian genetics to explain natural selection, was developed and formed the kernel of the Modern Synthesis. Under this new synthesis, evolution came to be conceptualized and modeled as changes in gene frequencies. The modern modeling paradigm also assumes social behaviour to be a single nucleotide trait that emerges in a single mutation and then spreads in the population (see Alan Grafen's *Phenotypic Gambit*, 1984). I will argue that this contemporary genetical modeling of social evolution abandons Darwinian gradualism and are therefore susceptible to the challenge of irreducible complexity. Especially as it is used to model a complex trait such as social behavior. Effective modern explanations have been given to modern day challenges from irreducible complexity by way of Darwinian naturalism. Interestingly, none of those explanations make any allusions to gene frequency changes or Inclusive Fitness. Similarly, I will sketch a proposed

explanation of the evolution of social behaviour as a complex strait by away of genuine Darwinian gradualism. Darwin always pointed to evidence of intermediate versions of the complex trait in nature. I think we can do the same for social evolution that will leave no doubt that it evolve by gradual natural selection.

Operationalization of Scientific Realism/Anti-realism Accounts for Semi-Structured Interviews, Angella Yamamoto, University of Waterloo

- In this paper, I engage with the general philosophy of science realism/anti-realism debate and specifically Steven French's approach to structural realism for biology (2011; 2014) by adding a new source of data. Much of the debate relies on written works of scientists like published papers. Recently, this debate has been expanded with survey data thanks to philosophers like James R. Beebe and Finnur Dellsén (2020). The problem with survey data is that it is unclear if the respondents are interpreting the survey statements the same way as the philosophers and if they are answering based on their own beliefs, the beliefs their lab adheres to, or the beliefs the science supports. This paper will explain my operationalization of four philosophical accounts: entity realism, structural realism, instrumentalism, and structural empiricism for a semi-structured interview guide. My operationalization does the extensive work of turning the assertions in these philosophical accounts into a guide to what kinds of questions need to be asked and what answers to these questions indicate commitment to particular accounts of realism or anti-realism. With this operationalization, semi-structured interviews can be performed that will add qualitative data in the form of scientists' own explanations of what commitments they hold and what commitments their scientific work is meant to support.

Why is it (still) Difficult to Understand Black-Box Models? Explainable Artificial Intelligence and the Experimenter's Regress, Siyu Yao, Indiana University Bloomington

- Machine learning models, especially artificial neural networks, have been increasingly involved in science. However, these models are notorious for their opaqueness and uninterpretability. The explainable artificial intelligence (XAI) project endeavors to develop and promote the application of network interpretation strategies that reveal how those black-box models work. I describe and analyze the status quo of AI explanation practices: the proliferation of model interpretation strategies without agreed-upon standards. I offer a tentative response to this phenomenon with two problems I identify in the design and development of interpretation strategies: the multiple-operationalizability of semantic standards and the experimenter's regress. The former suggests that there are multiple ways to characterize a semantic requirement for interpretation using algorithms. The latter points to the fact that the validity of interpretation strategies and the correctness of black-box models cannot be secured without assuming the other, leading to a regress that undermines the possibility of finding a universal standard for evaluating interpretation strategies. These problems also complicate the application of the strategies in other sciences or for practical purposes. With two cases of applying XAI in science, I explain how the experimenter's

regress can and can only be broken using contextual information, highlighting the importance of local expertise.

Non-Epistemic Values For Epistemic Gaps, Kino Zhao, Simon Fraser University

- Much of the current literature on values in science is premised on the assumption that demarcating between appropriate versus inappropriate uses of values should help us increase appropriate uses and minimize inappropriate uses. In the present paper, I focus on what we should do after an instance of inappropriate usage. I look at cases where using values inappropriately is not a preventable mistake, but a necessary step in the normal functioning of science. I start by presenting what I will call the epistemic gaps problem, which occurs when a scientific decision needs to be made on the basis of some fact which is not currently available. This forces scientists to make the unjustified decision. Because of their arbitrary nature, these decisions are often affected by the socio-political assumptions of the scientists, sometimes consciously so. Using two case studies in the social sciences, I argue that researchers often prefer to view the epistemic gaps problem through the lens of methodological limitations instead of inadequacy. Instead of dismissing or retracting findings obtained through illegitimately-value-laden methods, researchers prefer to supplement them with calls to specify their scope and diversify methodology. I point out that this solution strategy is under-investigated by the current values in science literature because the latter often assumes a "doing it right the first-time round" attitude, which does not guide us when "doing it right" is not an option. Moreover, appreciating the scientific community's willingness, at least sometimes, to consider illegitimately values as epistemic limitations rather than flaws can help us better understand the interaction between epistemic and non-epistemic values in scientific decision making.