

# Chris Smeenk

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## Areas of Specialty

Philosophy of science, Philosophy of physics, History of physics.

## Areas of Competence

Early modern philosophy, Epistemology, History of philosophy of science.

## Academic Appointments

### Western University

- Professor, Philosophy, 2019 – Present.
- Western Research Chair in Leadership, Jan. 2022 - June 2023.
- Associate Professor, 2011– 2019.
- Assistant Professor, 2007 – 2011.
- Director, Rotman Institute of Philosophy, 2012 – 13 (*interim*), 2015 – June 2023 (except for sabbatical leave, 2019-20).
- Cross-appointment with Applied Mathematics, 2011 – 2021 (department closed).
- Graduate Faculty Membership, Institute for the History and Philosophy of Science of Technology, University of Toronto, 2021 – present.

### University of California, Los Angeles

- Assistant Professor, 2003 – 2007.

### Visiting Positions

- Member, Foundational Questions Institute, 2020–Present.
- Visiting Professor, McGill University (Philosophy), 2019 – 2020 (sabbatical leave).
- Visiting Fellow, Whitney Humanities Center at Yale University, 2014 – 2015 (sabbatical leave).
- Postdoctoral Fellow, 2002 – 2003, Dibner Institute for History of Science and Technology (MIT).

## Education

**PhD**, History and Philosophy of Science, *University of Pittsburgh*, 2003

“Approaching the Absolute Zero of Time: Theory Development in Early Universe Cosmology.” Supervisory committee: John Earman and John Norton (co-chairs), Al Janis, and Laura Ruetsche

**M.A.**, Philosophy, *University of Pittsburgh*, 2002

**M.S.**, Physics and Astronomy, *University of Pittsburgh*, 2001

**B.A.**, Physics and Philosophy, *Yale College*, 1995

*Cum laude*, with distinction in the major.

## Awards and Honors

- Faculty Scholar Award, 2020.
- USC Teaching Honour Roll, 2012-13, 2015-16
- Milton K. Munitz Prize in Philosophy, for the essay: “The Logic of Cosmology Revisited.” (Awarded July 2008; judged by Hilary Putnam and Richard Gale.)
- University of California Office of the President Research Fellowship in the Humanities (awarded for 2007-08, declined to move to UWO)
- NEH Summer Seminar in the Humanities fellowship: Leibniz, summer 2003
- Slater Fellowship in History of Physics, American Philosophical Society, 2001-02
- A. W. Mellon Pre-Doctoral Fellowship, University of Pittsburgh, 1995-96, 2000-1
- Pre-Doctoral Fellowship at the Max Planck Institute for the History of Science (Berlin), Summers 1997, 1998, 2000, and 2001
- Bergin Cup (for scholarship in the humanities, Timothy Dwight College), 1995
- DeForest Pioneers Prize for Physics, Yale University, 1995

## Grants

- Foundations of Quantum Field Theory (workshop held May 15-17, 2023), SSHRC Connection grant 611-2022-0454 (principal investigator) – \$ 18,000.
- New Directions in Philosophy of Cosmology (March 2018 – August 2021). John Templeton Foundation grant – \$ US 1,369,872. Co-Principal Investigators: Chris Smeenk and Jim Weatherall (UC Irvine), with collaborators Robert Brandenberger (McGill) and James Bullock (UC Irvine)
- Laws, Methods, and Minds in Cosmology (March 2016 - June 2018). John Templeton Foundation grant. Principal Investigator: Chris Smeenk, with co-Investigators John Manchak and Jim Weatherall (both University of California, Irvine; Logic and Philosophy of Science). Grant support (over 18 months): \$ US 205,834.
- Bridging Across Scales: Emergence and Effective Theories (2012 - 2015). John Templeton Foundation Grant, Physics of Emergence funding program. Principal Investigator: Bob Batterman (University of Pittsburgh); co-investigators – Chris Smeenk and Mark Wilson (University of Pittsburgh). Grant support: \$ US 489,739.
- Philosophy of Contemporary Cosmology (2010-2011): UWO Large ADF grant, \$ 25,000.
- Integrating Complexity: Environment and History Workshop (Oct. 7 - 10, 2010), with Gillian Barker and Eric Desjardins. SSHRC 646-2010-0116 (co-investigator) – \$ 19,260.
- Philosophy of Quantum Field Theory Workshop (April 24-26, 2009): SSHRC 646-2008-1136 (principal investigator) – \$ 14,355; Fields Institute (co-investigator with W. Myrvold) – \$ 3,000.

## Publications

### Books and Edited Collections

- B3. PSA 2014: *Contributed Papers* - link (Volume 82, Dec. 2015) and *Symposia* - link (Volume 83, Dec. 2016). Two special issues of *Philosophy of Science*, roughly 500 pages each, based on contributions to the Philosophy of Science Association Biennial meeting (2014). As Program Chair for the meeting, I was also editor of the proceedings volumes.
- B2. “Philosophy of Quantum Field Theory,” special issue of *Studies in the History and Philosophy of Modern Physics* 42 (2011). Co-edited with Wayne Myrvold, with an editorial introduction, pp. 77-80.
- B1. *The Genesis of General Relativity*, assistant editor, with J. Renn, M. Schemmel, and C. Martin. Vol. III, *Theories of Gravitation in the Twilight of Classical Physics*; Vol. IV, *Alternative Approaches to General Relativity*. Boston Studies in the Philosophy of Science, Vol. 250. Dordrecht: Springer, 2007. (2 volumes, 1,152 pages.)

## Articles and Book Chapters

- A29. “Contemporary Philosophical Perspectives on the Cosmological Constant,” with Adam Koberinski and Bridget Falk. *Universe* **9** (2023): 134. DOI: doi.org/10.3390/universe9030134. Preprint: arXiv:2212.04335, 31 pages.
- A28. “What’s In a Survey? Simulation-Induced Selection Effects in Astronomy,” with Sarah Gallagher. In *Philosophy of Astrophysics: Stars, Simulations, and the Struggle to Determine What is Out There*, edited by Nora Boyd, Siska de Baerdemaeker, Kevin Heng, and Vera Matarese. Cham: Springer (2023). Preprint – arXiv:2302.10774.
- A27. “ $\Lambda$  and the limits of Effective Field Theory,” with Adam Koberinski. *Philosophy of Science* **90** (2023): 454–474. DOI: doi.org/10.1017/psa.2022.16), Preprint – Phil-sci: 20585.
- A26. “Noether’s first theorem and the energy-momentum tensor ambiguity problem,” with Mark Baker and Niels Linnemann. In *The Philosophy and Physics of Noether’s Theorems*, edited by James Read and Nicholas Teh. Cambridge: Cambridge University Press (2022), pp. 169-196. Preprint – arXiv:2107.10329.
- A25. “The Trouble with Hubble: Status of the Big Bang Models.” *Philosophy of Science* **89**, 1265–1274. DOI: doi.org/10.1017/psa.2022.40.
- A24. “Determinism and General Relativity,” with Christian Wüthrich. *Philosophy of Science* **88** (2021): 638-664. Preprint – arXiv:2009.07555.
- A23. “Validating the Universe in a Box,” with Sarah Gallagher. *Philosophy of Science* **87** (2020): 1221–1233. Preprint – arXiv:2001.09101.
- A22. “Some Reflections on the Structure of Cosmological Knowledge.” *Studies in the History and Philosophy of Modern Physics* **71** (2020): 220-231.
- A21. “Q.E.D., QED,” with Adam Koberinski. *Studies in the History and Philosophy of Modern Physics* **71** (2020): 1-13.
- A20. “Gaining Access to the Early Universe,” in *Why Trust Theory? Epistemology of Fundamental Physics*, edited by R. Dawid, K. Thebault, and R. Dardashti. Cambridge: Cambridge University Press (2019), pp. 315-338.
- A19. “Philosophical Aspects of Cosmology,” in *Oxford Handbook of the History of Modern Cosmology*, edited by H. Kragh and M.S. Longair. Oxford: Oxford University Press (2019), pp. 497-530.
- A18. “Inflation, Dark Matter, and Dark Energy,” with Malcolm Longair, in *Oxford Handbook of the History of Modern Cosmology*, edited by H. Kragh and M.S. Longair. Oxford: Oxford University Press (2019), pp. 426-464.
- A17. “Inflation and the Origins of Structure,” in *Beyond Einstein: Perspectives on Geometry, Gravitation, and Cosmology in the Twentieth Century*, edited by D. Rowe, T. Sauer, and S. Walter. *Einstein Studies* (Volume 14), Boston: Springer (2018): pp. 205-241.
- A16. “The Cosmos As Involving Local Laws and Inconceivable without Them”, with Yann Benétreau-Dupin. *The Monist* (2017) **100** (3): 357-372.
- A15. “Testing Inflation,” in *Philosophy of Cosmology*, edited by K. Chamcham, J. D. Barrow, J. Silk and S. Saunders. Cambridge: Cambridge University Press (2017), pp. 206-227.
- A14. “Philosophy of the Physical Sciences,” with Carl Hoefer. In *Oxford Handbook of the Philosophy of Science*, ed. by Paul Humphreys. Oxford: Oxford University Press (published online 2015; in print Sept. 2016).
- A13. “Philosophical Geometers and Geometrical Philosophers,” in *The Language of Nature: Reassessing the Mathematization of Natural Philosophy in the Seventeenth Century*, edited by B. Hill, G. Gorham, and E. Slowik. Minneapolis: University of Minnesota Press (2016), pp. 308-338.
- A12. “Predictability crisis in early universe cosmology.” *Studies in the History and Philosophy of Modern Physics* **46** (2014): 122-133.

- A11. "Newton's *Principia*," with Eric Schliesser. In *Oxford Handbook for the History of Physics*, edited by J. Buchwald and R. Fox. Oxford: Oxford University Press (2014), pp. 109-165.
- A10. "Einstein's Role in the Creation of Relativistic Cosmology." In *The Cambridge Companion to Einstein*, edited by M. Janssen and C. Lehner. Cambridge University Press (2014), pp. 228-269.
- A9. "Time in Cosmology," in *The Blackwell Companion to the Philosophy of Time*, ed. by A. Bardon and H. Dyke. Oxford: Blackwell (2013), pp. 201-219.
- A8. "Philosophy of Cosmology," in *Oxford Handbook for the Philosophy of Physics*, edited by R. Batterman. Oxford: Oxford University Press (2013), pp. 607-652.
- A7. "Cotes' Queries: Newton's Empiricism and Conceptions of Matter," with Z. Biener. In *Interpreting Newton: Critical Essays*, edited by A. Janiak and E. Schliesser. Cambridge: Cambridge University Press (2012), pp. 105-137.
- A6. "Time Travel and Time Machines," with C. Wüthrich. In *Oxford Handbook on Time*, edited by C. Callender. Oxford: Oxford University Press (2011), pp. 577-630.
- A5. "Mie's Theories of Matter and Gravitation," with C. Martin. In *The Genesis of General Relativity*, pp. 623-632.
- A4. "Do the Laws of Physics Forbid the Operation of Time Machines?" (with J. Earman and C. Wüthrich). *Synthese* **169** (2009): 91-124.
- A3. "The Elusive Higgs Mechanism." *Philosophy of Science* **73** (2006): 487-499.
- A2. "False Vacuum: Early Universe Cosmology and the Development of Inflation," in *The Universe of General Relativity*, edited by J. Eisenstaedt and A. J. Kox, *Einstein Studies* Vol. 11, Boston: Birkhauser (2005), pp. 223-257.
- A1. "Pendulums, Pedagogy, and Matter: Lessons from the editing of Newton's *Principia*," with Zvi Biener, *Science and Education* **13** (2004): 309-320. Reprinted in Matthews, M., Gauld, C., and Stinner A. (eds.), *The Pendulum: Scientific, Historical, Philosophical, and Educational Perspectives* (2005), Dordrecht: Springer.

#### **Book Reviews**

- R8. Essay Review of *Kant's Construction of Nature*, by Michael Friedman. *Philosophy of Science* **82** (2015): 718-726.
- R7. Review of *Newton and the Origin of Civilization*, by Jed Buchwald and Mordechai Feingold. *HOPOS* **4** (2014): 383-387.
- R6. Review of *Geometric Possibility*, by Gordon Belot. *Philosophia Mathematica* **21** (2013): 416-421.
- R5. Essay Review of Richard Healey, *Gauging What's Real*, *Metascience* **18** (2009): 11-22.
- R4. "Tools without Theories," review of *Drawing Theories Apart: The Dispersion of Feynman Diagrams in Postwar Physics*, by D. Kaiser. *Metascience* **15** (2006): 333-337.
- R3. Review of *Reading Natural Philosophy*, edited by D. Malament, *Studies in the History and Philosophy of Modern Physics* **36** (2005): 194-199.
- R2. Review of *The Future of Spacetime*, Stephen Hawking et al., *Studies in the History and Philosophy of Modern Physics* **34** (2003): 680-683.
- R1. Essay review of *The Cambridge Companion to Newton*, with Zvi Biener. *Notre Dame Philosophical Review* 2003.01.04, published online at <http://ndpr.nd.edu>.

### Other Publications

- O4. “Time Travel and Modern Physics,” with Tim Maudlin and Frank Arntzenius. *Stanford Encyclopedia of Philosophy* ([link](#)).
- O3. “Philosophy of Cosmology,” with George Ellis. *Stanford Encyclopedia of Philosophy* ([link](#)).
- O2. “Cosmology,” entry in the *Routledge Companion to the Philosophy of Science*, second edition, edited by S. Psillos and M. Curd. New York: Routledge, 2013, pp. 609-620.
- O1. Entry on Dennis Sciama, for *New Dictionary of Scientific Biography*, ed. by N. Koertge et al. New York: Scribner’s.

## Selected Works in Progress

### Books and Edited Collections

- WP8. *Oxford Handbook of Newton*, co-editor with Eric Schliesser. Roughly three quarters of chapters now published online (at Oxford Handbooks Online).
- WP7. *Time and Again: On the Logical, Metaphysical, and Physical Possibility of Time Travel*, with J. B. Manchak and C. Wüthrich. Proposal accepted by Oxford University Press (Oxford, UK).
- WP6. *The Aim and Structure of Cosmological Theory*, with Jim Weatherall. Book proposal accepted by Oxford University Press (Oxford, UK) as of July 2018.
- WP5. *Turning Data into Evidence: Festschrift for George E. Smith* (working title), edited volume, co-editor with Marius Stan. Proposal accepted as part of *Boston Studies in the Philosophy and History of Science*, Springer.

### Articles and Book Chapters

- WP4. “Cosmology and Physical Astronomy in the General Scholium,” in *Newton’s General Scholium*, edited by S. Snobelen, S. Ducheyne, and S. Mandelbrote. Refereed and accepted, draft posted online on personal webpage.
- WP3. “GR as a classical spin-2 theory?” with Niels Linnemann and Mark Baker. (Accepted for publication in *Philosophy of Science*, contributed paper for PSA 2022.)
- WP2. “Dark energy or modified gravity?” with Jim Weatherall. (Accepted for publication at *Philosophy of Science*, symposium paper for PSA 2022.) Preprint: [arXiv:2304.14591](#).
- WP1. “Philosophical Issues in Early Universe Cosmology,” with Adam Koberinski.

## Invited Talks

- IT75. “In Search of Lost Spacetime,” invited colloquium speaker at the Perimeter Institute (May 10, 2023, [link](#)).
- IT74. “Opacity and Understanding,” invited speaker at the Japanese - Canadian Frontiers of Science meeting, Banff (March 2023).
- IT73. “Closing the Loop in Early Universe Cosmology?” University of Toronto, Astronomy Colloquium (March 2023).
- IT72. “Fuzzy Modularity and Crucial Simulations,” with Marie Gueguen. Invited speaker at Bergen Annual Conference in Philosophy of Science, Bergen, Norway (Sept. 20-21, 2022).
- IT71. “Aim and Structure of Cosmological Theory: The Early Universe,” Invited speaker at History and Philosophy of Cosmology conference (Milan, Italy; Sept. 13-17, 2022).
- IT70. “Inflation: Beyond Semi-Classical Quantum Gravity,” invited speaker at Global Structure in Semi-Classical Gravity workshop, Munich (July 21, 2022).
- IT69. “Gravitational Energy and Background Structure,” invited colloquium in the Lichtenberg History and Philosophy of Science Seminar, Bonn (July 5, 2022).

- IT68. Invited lecturer at Beyond Spacetime Summer School, Morzine (June 2022).
- IT67. "Observational Cosmology in the 1960's," invited symposium at the American Physical Society, History of Physics Forum. Organized by Smeenk; co-symposiasts Jim Peebles and Dennis Lehmkuhl. New York City (April 9, 2022).
- IT66. "Eliminative Reasoning and its Limits," philosophy departmental colloquium, Western (April 30, 2021); CU Boulder, Committee on History and Philosophy of Science, invited colloquium (March 11, 2022); Stockholm, Workshop on Theory Confirmation (May 5, 2022).
- IT65. "Cosmological Constants," Kinds of Constants virtual workshop organized by Alistair Isaac, University of Edinburgh (April 9, 2021).
- IT64. "Decoupling from the Initial State?," in the Cosmology Beyond Spacetime virtual seminar series, University of Pittsburgh Center for Philosophy of Science (March 3, 2021).
- IT63. "Censorship and the Limits of GR," Black Hole Institute, Harvard, colloquium (Feb. 25, 2020).
- IT62. "Explaining the Initial State?" NYU Abu Dhabi Conference on Foundations of Cosmology and Quantum Gravity, invited speaker (Jan. 18, 2020).
- IT61. "General Relativity Stands Alone?" McGill Space Institute, colloquium (Oct. 1, 2019).
- IT60. "How Scientific Theories get their Content: (Replacing) A Just-So Story," Fifth Annual HPSC Lecture, McGill (Sept. 16, 2019).
- IT59. "Two Challenges to Cosmological Probabilities," invited speaker at Probabilities in Cosmology, Gröningen (June 22-23, 2019).
- IT58. Invited keynote speaker at Urbino Summer School in Philosophy of Physics (series of four talks, June 17-20, 2019).
- IT57. "Newton and Phenomenalism," invited speaker at 2019 Du Châtelet Prize Workshop, Duke University (April 4-5, 2019; presented remotely due to scheduling conflicts).
- IT56. "Q.E.D., QED," Invited speaker at Deutsche Physikalische Gesellschaft, spring meeting in Munich (March 20, 2019).
- IT55. "Fine Tuning and the Scope of Physical Laws," invited speaker at Understanding Our Place in the Universe symposium, Jerusalem (March 17-19, 2019).
- IT54. "Spacetime Geometry of the Universe," invited speaker at The Origins and Evolution of Space-Time, Pontifical Lateran University, Rome (November 27-28, 2018).
- IT53. Panelist in "Shedding Light on Dark Matter," Presidential Symposium at the Philosophy of Science Association meeting, Seattle (November 2, 2018).
- IT52. "Reflections on the Newtonian Style," invited speaker at "On the Question of Evidence" (conference in honor of G.E. Smith), Tufts University (May 2018).
- IT51. "Philosophical Views on Evidence in Cosmology," invited participant and speaker at Seven Pines Symposium, Minnesota (May 2018).
- IT50. "Eliminative Reasoning in Cosmology," invited speaker at "Scientific Theory Construction: Measurement and Empirical Constraints" (Montreal, UQAM, May 2018) and at the International Summer School: Particle Physics at the Crossroads (Wuppertal, July 2018).
- IT49. "Shifting Status of the Expanding Universe Models," invited speaker at Thinking about Space and Time: 100 Years of Applying and Interpreting General Relativity, Bern, Switzerland (September 2017).
- IT48. "Underdetermination in the Early Universe," invited speaker at Probing the spacetime fabric: from concepts to phenomenology conference in Trieste, Italy (July 2017).
- IT47. "Some Reflections on the Structure of Cosmological Knowledge," invited speaker at The Philosophy of Howard Stein, University of Chicago (June 2017).
- IT46. "Confirming QED," Symposium: The Relationship Between Quantum Field Theory And High-Energy Particle Physics, Canadian Society for the History and Philosophy of Science (May 2017).

- IT45. "Newtonian Time," Annual Conference in the History of Metaphysics: Time. University of Toronto (April 2017).
- IT44. "Explaining the Initial State," Foundations of Cosmology Workshop, University of Michigan (April 2017).
- IT43. "Explaining the Origin of the Universe," Invited Symposium: Philosophy of Physics and Cosmology in Practice, APA Pacific Division Meeting in Seattle, WA (April 2017).
- IT42. "Challenges to Primordial Cosmology," Methodology and Epistemology in Cosmology conference, UC Irvine, Irvine, CA (February 2017).
- IT41. "Newton's Empiricism," Annual Colloquium Series, Institute for the History and Philosophy of Science and Technology at the University of Toronto, (February 2017).
- IT40. "Einstein's General Theory of Relativity," at the Royal Astronomical Society of Canada London Centre monthly meeting at the Cronyn Observatory (January 2017).
- IT39. "Measurement and Content," at the University of Cincinnati (January 2017).
- IT38. "Measurement and Empirical Content," Annual Lecture Series (invited), University of Pittsburgh Center for Philosophy of Science (February 2016).
- IT37. "All Roads Lead to General Relativity," Centenary Conference on the History of General Relativity, Berlin (Dec. 2015).
- IT36. "Gaining Access to the Early Universe," Philosophy of Science conference at Inter-University Centre, Dubrovnik (April 2015), LMU Munich (Dec. 2015), Stanford History and Philosophy of Science Colloquium (March 2016).
- IT35. "Predictions in Eternal Inflation," invited speaker at the Rutgers Workshop on Philosophy of Cosmology. Rutgers, New Brunswick NJ (April 2014).
- IT34. "Three Positions on Gauge Symmetry," invited speaker at the UC Irvine workshop on Foundations of Gauge Theories. UC Irvine (March 2014).
- IT33. "Bayesian Anthropolitics" and "Predictions in Eternal Inflation," invited speaker at the Fourth Oxford Mini-course: Anthropolitics, Selection Effects, and Fine-Tuning in Cosmology. St. Anne's College, Oxford (December 2013).
- IT32. "Reflections on the Cosmological Constant," invited speaker at Relativity Meets Quantum Theory. LSE, London (Nov. 2013).
- IT31. "Cosmology and Physical Astronomy," invited speaker at "Newton's General Scholium to the *Principia*." King's College, Halifax (Oct. 2013).
- IT30. "Cosmological Laws without Real Time," invited speaker at Boston University Colloquium on the Philosophy of Science, "Time in Cosmology." Boston University (Oct. 2013).
- IT29. "Time's Arrow in Cosmology," invited talk at Time and Matter conference, Venice, Italy (March 2013).
- IT28. "Philosophical Geometers and Geometrical Philosophers," paper presented at Mathematization of Nature workshop, London, ON (Oct. 2012).
- IT27. "Measurement and Underdetermination," Institute for the History and Philosophy of Science and Technology, University of Toronto, Colloquium talk (January 2012); Canadian Society for the History and Philosophy of Science meeting (Waterloo, May 2012).
- IT26. "Multiverse Theories in Cosmology," Philosophy of Science conference at Inter-University Centre, Dubrovnik (April 2012).
- IT25. "Predictability Crisis in Early Universe Cosmology," paper given at Philosophy of Cosmology workshop, Granada, Spain, September 2011.
- IT24. "Determinism in General Relativity," invited talk at Universitat Autònoma de Barcelona, September 2011.

- IT23. "Time Travel and Determinism in General Relativity," talk at philosophy of time workshop, North Carolina State, April 2011.
- IT22. "Philosophical Aspects of Black Holes." Invited plenary talk at the Deutsche Physikalische Gesellschaft, Bonn. March 2010.
- IT21. "From the H-Bomb to the Big Bang." Department of Physics and Astronomy Colloquium, UWO. December 2009.
- IT20. "Time Travel and Time Machines." (Based on paper with Christian Wüthrich.) Southern California Philosophy of Physics Reading Group. University of California, Irvine. May 2009.
- IT19. "The Effectiveness of Group Theory in Quantum Mechanics." Southwest Ontario Philosophy of Physics Group. Perimeter Institute. March 2009.
- IT18. "The Epistemology of Cosmology." Tufts University, Philosophy Department Colloquium. October 2008.
- IT17. "Inflation as a Theory of Structure Formation." Invited speaker at Beyond Einstein: Perspectives on Geometry, Gravitation, and Cosmology in the 20th Century. Johannes Gutenberg Universität, Mainz, Germany. September 2008.
- IT16. "The Cosmological Constant Problem." Alumni Lecture, Department of History and Philosophy of Science, University of Pittsburgh. March 2008.
- IT15. Philosopher in Residence, Oklahoma State University. (Public lecture and departmental colloquium). March 2007.
- IT14. "The Limits of Evidential Reasoning in Newton's Argument for Universal Gravitation," with Zvi Biener. Invited speaker at Newton as/and Philosophy. Leiden, Netherlands, June 2007.
- IT13. "From the H-Bomb to the Big Bang" (invited speaker). UCLA History of Science Colloquium Series, April 2007.
- IT12. "Confirming Inflation?" Deutsche Physikalische Gesellschaft (invited speaker), Heidelberg, March 2007; Utrecht University Institute for the History and Foundations of Science (invited speaker), June 2007.
- IT11. "Fine-Tuning Problems and Early Universe Cosmology," UWO and Caltech. January 2007.
- IT10. "Gravitational Energy and Substantivalism." Second Conference on the Ontology of Spacetime. Montreal, June 2006.
- IT9. "Einstein and the Birth of Relativistic Cosmology." UCSD Science Studies Colloquium, April 2006.
- IT8. "Theory and Evidence in Early Universe Cosmology." Indiana University History and Philosophy of Science Colloquium, Feb. 2006.
- IT7. "Newton on Constrained Motion: Methodological Morals from Section X of the *Principia*" (based on paper with George Smith). Stanford History and Philosophy of Science Colloquium, Nov. 2005; Indiana University History and Philosophy of Science, Feb. 2006; Newton as / and Philosophy, Leiden, June 2007.
- IT6. "Realism and Newton's Invisible Realm." Invited speaker at Second German-American Frontiers of the Humanities conference, sponsored by the American Philosophical Society and Humboldt Foundation. Hamburg, Oct. 2005.
- IT5. "Fine Tuning Problems in Cosmology." University of California, Irvine, Department of Logic and Philosophy of Science Colloquium Series, Dec. 2004.
- IT4. "Pursuit and Persuasion in Inflationary Cosmology." University of Minnesota, History of Science and Technology Colloquium, Dec. 2002; History of Science Society, Nov. 2002.
- IT3. "Physics and Philosophy at the Absolute Zero of Time." University of Chicago, Committee on the Conceptual and Historical Studies of Science and UCLA Department of Philosophy, Feb. 2002.
- IT2. "An Inflationary Field: Two Decades of Early Universe Cosmology." Yale University Department of History, Feb. 2002.



IT1. “False Vacuum: Early Universe Cosmology and the Discovery of Inflation,” invited speaker at Sixth International Conference on the History of General Relativity, Amsterdam. June 2002.

## Academic Talks

- AT30. “Dark Energy or Modified Gravity?,” with Jim Weatherall. Symposium presentation at the Philosophy of Science Association, Pittsburgh (Nov. 13, 2022).
- AT29. “GR as a Classical Spin-2 Theory?,” with Niels Linnemann and Mark Baker. Contributed paper presented at the Philosophy of Science Association, Pittsburgh (Nov. 11, 2022).
- AT28. “Trouble with Hubble: Status of the Big Bang Models,” Philosophy of Science Association (virtual; Nov. 14, 2021).
- AT27. “Epistemology of Structure Formation Simulations,” with Sarah Gallagher. Symposium presentation at the Philosophy of Science Association meeting, Seattle (November 3, 2018).
- AT26. “Analysis of Singular Spacetimes,” presentation at the Rotman Summer Institute on Philosophy of Cosmology (June 2018).
- AT25. “Mechanical Explanations and the Direction of Time,” Franke Program in Science and the Humanities (Yale). Organizer, moderator of discussion, featuring talks by David Albert and Tim Maudlin. (April 2015.)
- AT24. “Spacetime and Dualities,” with Keizo Matsubara. Beyond Spacetime Conference, UC San Diego (March 2015).
- AT23. Author meets critics session for *Kant’s Construction of Nature*, by M. Friedman. Central Division of the American Philosophical Association, St. Louis (February 2015).
- AT22. “Physics Meets Philosophy in the Early Universe,” Whitney Humanities Center, Yale University, Fellow’s luncheon talk. (October 2014.)
- AT21. Invited participant and speaker, Summer School in Philosophy of Cosmology. Santa Cruz (July 2013).
- AT20. “Confirming Inflation?,” *Philosophy of Science Association meeting* contributed paper, San Diego (Nov. 2012).
- AT19. “Higgs and Confinement,” paper given in a symposium, co-organized with Michael Stöltzner, at *Philosophy of Science Association Meeting*. Montreal, November 2010.
- AT18. “Determinism and General Relativity,” contributed paper, with Christian Wüthrich, given at *Philosophy of Science Association Meeting*. Montreal, November 2010.
- AT17. “Cosmological Laws,” paper given at *Laws of Nature: Their Nature and Knowability*. Perimeter Institute. May 2010.
- AT16. “Quantitative Empiricism,” paper given at *Newton and Empiricism*. University of Pittsburgh, Center for the Philosophy of Science, April 2010.
- AT15. “What is a Higgs Boson?,” paper given in symposium “The Higgs, Goldstone, and the LHC,” at the European Philosophy of Science Association Conference. Vrije Universiteit, Amsterdam. October 2009.
- AT14. Invited Commentator, “Philosophy of Cosmology 2009: Characterising Science and Beyond,” University of Oxford. September 2009.
- AT13. “Two Aspects of Group Theory and Quantum Mechanics.” History of Quantum Physics 2. Utrecht University, Utrecht, Holland. July 2008.
- AT12. “Measurements and Limits in Section 10 of Newton’s *Principia*,” (based on paper with George Smith). & HPS Conference in Integrated History and Philosophy of Science, Pittsburgh. October 2007.
- AT11. Invited Commentator, Symposium on Time and Relativity. Institute for Advanced Study, University of Minnesota. October 2007.

- AT10. Invited Commentator on Physical Relativity by Harvey Brown. American Philosophical Association, Pacific Division meeting. San Francisco, April 2007.
- AT9. "Alternatives in Early Universe Cosmology." Seventh International Conference on the History of General Relativity. Tenerife, March 2005.
- AT8. "The Elusive Higgs Mechanism." Philosophy of Science Association Annual Meeting, Nov. 2004. Session organizer.
- AT7. "Causation and Gravitation." UCLA conference in History and Philosophy of Science, Nov. 2004. Conference co-chair.
- AT6. "The Poor Man's Accelerator." Dibner Institute Colloquium. March 2003.
- AT5. "Does Gravity Feign? Newton, Cotes, and the Essential Properties of Matter," with Zvi Biener. HOPOS fourth biennial Congress, Montreal. June 2002.
- AT4. "Is Gravity at the Heart of the Matter? Mathematics and Philosophy in the Newton-Cotes Correspondence," with Zvi Biener. CSHPS Annual Meeting, Toronto. May 2002.
- AT3. "Evolving Laws?" University of Western Ontario Graduate Conference in Logic, Math, and Physics. London, Ontario. May 2001.
- AT2. "Predicting Isotropy: Chaotic Cosmology and the Horizon Problem." Joint Atlantic Seminar in the History of the Physical Sciences, George Washington University. Sep. 1999.
- AT1. "Observational Indistinguishability and Global Structure." Graduate Conference in Logic and Philosophy of Science, Carnegie Mellon University. Mar. 1999.

### **Public Talks (selected)**

- OT9. CBC Ideas, *The Year 1600: The Birth of the Modern?* ([link](#)). Panel discussion with Jyotsna Singh and Amitava Chowdhury, moderated by Nahlah Ayed. (Stratford, July 2022; broadcast Oct. 31, 2022.)
- OT8. CBC Ideas, *The Relativity Revolution: Albert Einstein and the making of the modern world* ([link](#)). Panel discussion with Doreen Fraser and Bianca Dittrich, moderated by Nahlah Ayed. (Stratford, August 2019; broadcast Dec. 2019.)
- OT7. Panelist for Forest City Film Festival, discussion of *The Truth is in the Stars*, London (October 2017).
- OT6. "How is Scientific Cosmology Possible?" O'Hara Lecture in Philosophy of Physics, University of Washington, Seattle (October 2017).
- OT5. "Does Science Make Progress?," Philosophy of Science Cafe in Robarts Research Institute, UWO (July 2016).
- OT4. "Why Mercury made Einstein's Heart Flutter," UWO Astronomy, public event for transit of Mercury (May 2016).
- OT3. "Einstein's Universe," Classes without Quizzes, UWO (November 2015); Royal Astronomical Society of Canada (January 2017).
- OT2. "Einstein's Path to a New Theory," London Public Library, Einstein Centenary (October 2015).
- OT1. "Is Cosmology Possible as a Science?," invited public talk at the Royal Institute, London, UK (June 2013).

### **Courses Taught**

### **Western University**

- Philosophy 226: Philosophy of Science
- Philosophy 1022: Advanced Introduction to Philosophy (2011 G, 2012G)
- Philosophy 2032: Einstein for Everyone (2010 G, 2011 G, 2015 G, 2020 G – online, 2021 F – online, 2022 G – online)
- Philosophy 2320: Philosophy for Integrated Science (2017G, 2018G)
- Philosophy 2500: Introduction to Theory of Knowledge (2008 G, 2009 F, 2010 G)
- Philosophy 329 / 3320: Philosophy of Quantum Mechanics (2007 G, 2008 G)
- Philosophy 3330: Philosophy of Space and Time
- Philosophy 419: Seventeenth Century Natural Philosophy
- Philosophy 754: Foundations of Relativity Theory
- Philosophy 9203: Explanation and Evidence
- Philosophy 9209: Empiricism and the Philosophy of Science
- Philosophy 9224: Philosophy of Cosmology (2016, 2020)
- Philosophy 9227: Philosophy of Space and Time
- Philosophy 9229: Symmetry in Philosophy and Physics
- Philosophy 9232: Ethical and Societal Implications of AI (2019 F – co-taught with Mike Katchabaw; 2023 G)
- Philosophy 9250: Philosophy of Physics
- Philosophy 9284: Effective Field Theories
- Philosophy 9620: Empiricism and the Structure of Theories
- Philosophy 9635: Proseminar (2011 – co-taught with Tracy Isaacs, 2013 F)
- Directed Reading Course: Foundations of Classical Field Theory
- Directed Reading Course: Newton's *Principia* (overseeing student taking G.E. Smith's course at Tufts remotely, two terms)

### **University of California, Los Angeles**

- Philosophy 8: Introduction to Philosophy of Science (lower level undergraduate)
- Philosophy 119: Seventeenth Century Natural Philosophy (upper level undergraduate)
- Philosophy 124: Historical Introduction to the Philosophy of Science (upper level undergraduate)
- Philosophy 130: Philosophy of Space and Time (upper level undergraduate)
- Philosophy 131: Science and Metaphysics (upper level undergraduate)
- Philosophy 225: Confirmation Theory (graduate seminar)
- Philosophy 232: Kant's *Metaphysical Foundations of Natural Science* (graduate seminar)
- Philosophy 232: Scientific Realism (graduate seminar)
- Philosophy 224: Philosophy of Space and Time (graduate seminar)

## Graduate Supervision

### Master's thesis:

- Ari Meadow, Dawn Starr (UCLA, 2006)
- Melissa Jacquart (2012)
- Roger Wilkinson (2018)

### PhD committee member:

- Ioan Muntean (UCSD, Department of Philosophy), defended August 2009.
- Alex Manafu (UWO, Philosophy), thesis: "Emergence and Reduction in Science. A Case Study." Degree conferred Dec. 2011.
- Morgan Tait (UWO, Philosophy), thesis: "The Case for Quantum State Realism." Degree conferred May 2012.
- James Overton (UWO, Philosophy), thesis: "Explanation in *Science*." Degree conferred August 2012.
- Nicolas Fillion (UWO, Philosophy), thesis: "The Reasonable Effectiveness of Mathematics in the Natural Sciences." Degree conferred December 2012.
- Robert Moir (UWO, Philosophy), thesis: "Structures in Real Theory Application: A Study in Feasible Epistemology." Defended August 2013.
- Amy Wuest (UWO, Philosophy), thesis: "Science in the Social Context: Philipp Frank on Pragmatism, Theory Acceptance, Sociology, and the Unity of Science." Degree conferred August 2015.
- Molly Kao (UWO, Philosophy), thesis: "Evaluating the Quantum Postulate in the Context of Pursuit." Degree conferred May 2016.
- Nora Boyd (University of Pittsburgh, History and Philosophy of Science), thesis: "Scientific Progress at the Boundaries of Experience" (John Norton, supervisor). Prospectus defended June 2015, thesis successfully defended April 2018.
- Jamie Shaw (UWO, Philosophy), thesis: "Feyerabend and Pluralism." Prospectus defended July 2016, thesis successfully defended July 2018.
- Job Morales (UWO, Philosophy), thesis: "Dispositional Causal Realism." Prospectus defended December 2017.
- Adam Koberinski (UWO, Philosophy), thesis: "Theory construction in high-energy particle physics." Defended successfully August 2019.
- Elliott Chen (UC Irvine, Logic and Philosophy of Science), thesis: "On Metaphysical Foundations of Physics: Body, Laws of Motion, and Essential Gravity." Defended successfully August 17, 2021.
- Toby Reid (IHPST, Toronto), thesis on the history of modern cosmology. (In progress, supervised by Craig Fraser.)

### PhD examiner:

- Dylan Gault (UWO, Philosophy), thesis: "Contemporary Cosmology as a Case Study in Scientific Methodology." Degree conferred December 2009.
- Spencer Hey (UWO, Philosophy), thesis: "Meta-heuristic Strategies in Scientific Judgment." Defended on Sept. 28, 2011.
- Michael Cuffaro (UWO, Philosophy), thesis: "On the Physical Explanation for Quantum Computational Speedup." Defended on March 11, 2012.
- Ryan Samaroo (UWO, Philosophy), thesis: "Some disputed aspects of inertia, with particular reference to the equivalence principle." Defended on August 28, 2013.
- Aaron Sidney Wright (University of Toronto, IHPST), thesis "More than Nothing: Histories of the Vacuum in Theoretical Physics, 1927-1981." Defended on July 31, 2014.
- Joshua Luczak (UWO, Philosophy), thesis: "On Non-equilibrium Statistical Mechanics." Defended on August 17, 2015.

- Matthew Ivanowich (UWO, Philosophy), thesis: “Representationalism About Sensory Phenomenology.” Defended on Nov. 5, 2015.
- Fereshhte Rajabi (UWO, Physics and Astronomy), thesis: “Dicke’s Super-radiance in Astrophysics.” Completed on Sept. 3, 2016.
- Justin Bzovy (UWO, Philosophy), thesis: “Species Pluralism.” Defended August 2016.
- Feraz Azhar (Cambridge University, Philosophy), thesis: “Probabilistic Reasoning in the Inflationary Multiverse.” Defended successfully June 21, 2017.
- Robert Moir (Western, Applied Mathematics), thesis: “Feasible Computation in Symbolic and Numeric Integration.” Defended successfully Dec. 15, 2017.
- John Lehmann (UWO, Philosophy), thesis: “Theories: Reconsidering Ramsey in the Philosophy of Science.” Defended successfully April 27, 2021.

**PhD supervision** (all UWO, Philosophy):

- Yann Benétreau-Dupin, *Probabilistic Reasoning in Cosmology*, completed on Nov. 2, 2015.
- Melissa Jacquart, *Similarity, Adequacy, and Purpose: Understanding the Success of Scientific Models*, completed on Oct. 12, 2016.
- Saad Anis, *On the Role of Mathematics in Scientific Representation*, completed on March 21, 2016.
- Nathaniel Moore, *Rethinking Individuality in Quantum Mechanics*, completed on Sept. 3, 2019.
- Marie Gueguen, *On Separating the Wheat from the Chaff: Surplus Structure and Artifacts in Scientific Theories*, completed on Sept. 3, 2019.
- Craig Fox, *Back to the Beginning: An Empiricist Defense of Scientific Stories About the Past*, completed on April 30, 2021.
- Dimitrios Athanasiou, *Effective Field Theories: A Philosophical Appraisal*, completed on April 27, 2022.

**Postdoctoral Supervision**

- Erik Curiel (July 2010 - August 2013)
- Giovanni Macchia (Sept. 2012 - Sept. 2013), funded by Government of Canada Post-Doctoral Research Fellowships for International Scholars
- Keizo Matsubara (Sept. 2013 - August 2015).
- Marc Holman (Aug. 2016 - July 2018), funded by John Templeton Foundation Grant.
- Michael Cuffaro (July 2017 - June 2019), funded by FQXi grant (PI: Markus Müller).
- Klodian Coko (August 2017 - July 2019), Rotman Institute postdoctoral fellow.
- Adam Koberinski (Nov. 2019 - July 2020), funded by John Templeton Foundation grant.
- Niels Linnemann (July 2020 - Dec. 2020), funded by John Templeton Foundation grant.
- Matt Parker, research associate (Oct. 2020 - August 2021), funded by John Templeton Foundation grant.
- Marie Gueguen, research associate (January 2021 - August 2021), funded by John Templeton Foundation grant.
- Emily Adlam (Sept. 2021 - present), Rotman Institute postdoctoral fellow, co-supervisor with Francesca Vidotto.

## Professional Service

### Editorial Work

- Associate editor, *Philosophy of Science*, May 2012 — July 2016; Dec. 2022 — present.
- Member of Editorial Board, *Philosophy of Science*, October 2018 — present.
- Member of Editorial Board, *Foundations of Physics*, December 2019 — present.

### Conference and Workshop Organizing (selected)

- Foundations of Quantum Field Theory (held at UWO, May 15-17, 2023; link): chair of organizing committee (including Doreen Fraser and Mike Miller), funded through SSHRC Connection grant (PI: Smeenk, \$ 18,000).
- Quantum Spacetime and the Cosmos: from Conception to Reality (held at the Perimeter Institute, May 8-12, 2023, link): member of organizing committee, chaired by Niayesh Afshordi.
- Foundations of Quantum Field Theory Workshop (held at UWO, June 12-14, 2019): chair of organizing committee (including Doreen Fraser, Wayne Myrvold, and Mike Miller).
- Understanding Replication Across the Sciences (held at UWO, Oct. 12-14, 2018): member of organizing committee (including Klodian Coko and Mike Anderson), funded through SSHRC Connection grant.
- Cosmology and the Future of Spacetime (held at UWO, June 12-14, 2017): chair of organizing committee (including Jim Weatherall), funded through JTF grant.
- Computationally Assisted Mathematical Discovery and Experimental Mathematics: ACMES 2 (held at UWO, May 12-15, 2016): member of organizing committee (chaired by Rob Corless), funded through Fields Institute grant.
- Algorithms and Complexity in Mathematics, Epistemology and Science (held at UWO, May 6-8, 2015): member of organizing committee (chaired by Rob Corless), funded through SSHRC and Fields Institute grants.
- Program chair for *Philosophy of Science Association* meeting (Nov. 2014).

I chaired a committee of 20 colleagues, charged with vetting symposium proposals and contributed papers (55 symposia proposals and 340 contributed papers, of which we selected 30 symposia and 146 contributed papers). I also worked with the PSA president and executive secretary on various aspects of planning the meeting (held Nov. 6-9, 2014). Following the meeting, I edited two special issues of *Philosophy of Science*. The PSA funded two course buy-outs to support my work.

- Science and Reality (held at UWO, Oct. 5-6, 2013): organizer.
- Program Committee, Philosophy of Science Biennial Meeting (2012); Chair: Andrea Woody
- Quantum and Geometric Possibility: Belot - Ruetsche Book Bash (held at UWO, Sept. 15, 2012): organizer.
- Emergence and Effective Field Theory workshop (held at the Perimeter Institute, Oct. 26-28, 2011): co-organizer (with Bob Batterman, Leo Kadanoff, and Lee Smolin) of international workshop, with 18 speakers and approx. 60 registered participants.
- Philosophy of Cosmology workshop (held at UWO, May 6-7, 2011): chair of organizing committee (including Erik Curiel, Dylan Gault, and Bill Harper) for two-day workshop featuring 8 international speakers from physics and philosophy.
- Philosophy of Quantum Field Theory Workshop (held at UWO, April 24-26, 2009): chair of organizing committee (including Wayne Myrvold and Doreen Fraser), international workshop funded by SSHRC and Fields Institute grants

## Departmental Committees

- Promotion and Tenure Committee, July 2015 – June 2019, July 2020 - present.

- Appointments Committee: July 2009 – June 30, 2013, July 2016 – July 2018.
- Search Committee for senior CRC: July 2016 – June 2017.
- Search Committee for Junior CRC (joint with Applied Mathematics): July 2012 – June 2013, Sept. 2017 – July 2018.
- Rotman Institute Steering Committee: Jan. 2009 – June 2014.
- Graduate Admissions Committee: Jan. 2010 – June 2013; Jan. 2018- June 2019.
- Philosophy of Science Area Committee Chair: July 2009 – July 2011.
- Speaker's Committee, 2007-08, Chairman: Charles Weijer.
- Outreach Committee, 2007-08, Chairman: Devin Henry.
- Advisor, Undergraduate Philosophy Club. 2008-2009

### **Other University Service**

- Faculty of Arts and Humanities representative to Faculty of Science Council: May 2009 – June 2012.
- CFI Innovation Fund Adjudication Panel (2021 - present).
- Faculty Scholar Selection Committee (2021 - present).

### **Consulting and Refereeing**

- Journal Referee for: *Philosophy of Science*, *Studies in the History and Philosophy of Modern Physics*, *Noûs*, *Journal of the History of Philosophy*, *Social Studies of Science*, *Synthese*, *International Studies in the Philosophy of Science*, *British Journal for the Philosophy of Science*, *Erkenntnis*, *Foundations of Physics*, *Canadian Philosophical Association*, *HOPOS*, *Journal for General Philosophy of Science*, *Southern Journal of Philosophy*, *Monthly Notices of the Royal Astronomical Society*, *Journal of Philosophy*, *Analysis*, *Philosophies*, *Annals of Science*, *Studies in the History and Philosophy of Science*, *European Journal of Physics*, *Einstein Studies*, *Historical Studies in the Natural Sciences*, *Philosophical Studies*, *Almagest*
- Member of award committee for Du Châtelet Prize in Philosophy of Physics (2018)
- Referee for book manuscripts: Oxford University Press, Cambridge University Press, Routledge.
- External assessor for tenure; promotion to full professor; Habilitation
- Reviewer for grant proposals: Netherlands Organization for Scientific Research, Austrian Science Foundation, US National Science Foundation, SSHRC, NSERC, John Templeton Foundation, Guggenheim Foundation, Humboldt Foundation

### **Professional Societies**

- Philosophy of Science Association, History of Science Society, History of Philosophy of Science Society, American Physical Society

Date: October 23, 2023