

# Erik Curiel

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## EDUCATION

**Ludwig-Maximilians-Universität** Dekanat der Fakultät für Philosophie, Wissenschaftstheorie und Religionswissenschaft: Habilitation, admitted 2018, expected 2020

**University of Chicago** Department of Philosophy: Ph.D., June, 2005  
Joint Ph.D. Advisors: Prof. David Malament and Prof. Howard Stein

**Harvard University** Physics and Philosophy (double major): A.B., June, 1990.

## AREAS OF SPECIALIZATION

**Philosophy of Physics** Spacetime Theories; Quantum Field Theory on Curved Spacetime; Cosmology; Thermodynamics and Statistical Mechanics; Classical Mechanics; Quantum Gravity

**Philosophy of Science** Semantics of Theories; Methodology, Models, and Experiment; Scientific Reasoning and Epistemology; Ontology; Realism and Instrumentalism; Causality

## AREAS OF COMPETENCE

**Ancient Greek Philosophy** (including the ancient Greek texts)

**History of 20th Century Analytic Philosophy**

**Moral Psychology/Action Theory**

**History of Physics**

## ACADEMIC APPOINTMENTS

**Munich Center for Mathematical Philosophy** Assistant Professor, LMU Munich, May 2016 (ongoing, 8 months a year), fully funded by competitive Eigene Stelle (Single PI) grant from the Deutsche Forschungsgemeinschaft (German Research Foundation); Postdoctoral Research Fellow, Sep. 2013–Apr. 2016

**Black Hole Initiative** Senior Research Fellow, Harvard University, Sep. 2016–Aug. 2019 (4 months a year), by invitation

**Rotman Institute for Philosophy** Assistant Professor/Postdoctoral Fellow, University of Western Ontario, Sep. 2010–Aug. 2013

**London School of Economics** Tutorial Fellow, Department of Philosophy, Logic and Scientific Method, Sep. 2009–Aug. 2010

**Center for Philosophy of Science** Postdoctoral Fellow, University of Pittsburgh, Sep. 2008–Aug. 2009

**Stanford University** Lecturer, Philosophy Department, Sep. 1998–Aug. 1999; Humanities Fellow, Sep. 1999–Aug. 2000

**University of Chicago** Lecturer, Philosophy Department, Winter Term 1997

## VISITING FELLOWSHIPS

**University of California, Irvine** Visiting Scholar, Department of Logic and Philosophy of Science: May–Jun. 2019

**Smithsonian Astrophysical Observatory** Senior Research Fellow, Radio and Geoastronomy Division (Cambridge, MA): Feb.–May 2018; Feb.–May 2019

**University of Florence** Erasmus Fellow, Department of Letters and Philosophy: Mar. 2017; Mar. 2018

**Trinity College** Visiting Scholar, University of Cambridge, Jun.–Aug. 2010

## PUBLICATIONS

“Schematizing the Observer and the Epistemic Content of Theories”, *Studies in History and Philosophy of Modern Physics*, forthcoming 2019

“What Is a Black Hole?”, *American Scientist*, forthcoming 2019

“Measurement and Coordination: Reichenbachian Themes” (with F. Padovani), *Neo-Kantian Perspectives on the Exact Sciences*, F. Biagioli and M. Giovanelli (eds.), Routledge, forthcoming 2019

“The Many Definitions of a Black Hole”, *Nature Astronomy*, forthcoming 2018 (preprint: [arXiv:1808.01507 \[gr-qc\]](https://arxiv.org/abs/1808.01507)). Reviewed in Mark Buchanan’s monthly column in *Nature Physics*, <https://www.nature.com/articles/s41567-018-0299-1>.

“What Is a Black Hole?”, *Chinese Journal of Physics*, Chinese translation of “The Many Definitions of a Black Hole” in *Nature Astronomy*, forthcoming 2018

“The Problem of Approximate Symmetries in General Relativity”, *Synthese*, forthcoming 2018

“Newtonian Abduction as Framework Confirmation”, *Synthese*, forthcoming 2018 (preprint: [arXiv:1804.07414 \[physics.hist-ph\]](https://arxiv.org/abs/1804.07414))

“Space”, *Internet Encyclopedia of Philosophy* (<<http://www.iep.utm.edu/>>), B. Dowden (general ed.), forthcoming 2018

“Singularities, Black Holes, and Thermodynamics in Relativistic Spacetimes”, *The Stanford Encyclopedia of Philosophy* (On-Line), Edward N. Zalta (ed.), forthcoming 2018

“On Geometric Objects, the Non-Existence of a Gravitational Stress-Energy Tensor, and the Uniqueness of the Einstein Field Equation”, *Studies in History and Philosophy of Modern Physics*, forthcoming 2018 (preprint: [arXiv:0908.3322v3 \[gr-qc\]](https://arxiv.org/abs/0908.3322v3))

- “A Primer on Energy Conditions”, in *Towards a Theory of Spacetime Theories*, D. Lehmkuhl, G. Schiemann, and E. Scholz (eds.), Einstein Studies, Birkhäuser, 2017, doi:10.1007/978-1-4939-3210-8 (preprint: arXiv:1405.0403 [gr-qc])
- “On the Existence of Spacetime Structure”, *The British Journal for the Philosophy of Science*, 2016, doi:10.1093/bjps/axw014 (preprint: arXiv:1503.03413 [physics.hist-ph]). A manuscript containing technical appendices for the constructions and arguments, and further discussion, is available at <<http://strangebeautiful.com/papers/curiel-exist-st-struct-tech-apdx.pdf>>.
- “Classical Mechanics Is Lagrangian; It Is Not Hamiltonian”, *The British Journal for the Philosophy of Science*, 2014, 65(2):269–321, doi:10.1093/bjps/axs034
- “General Relativity Needs No Interpretation”, *Philosophy of Science*, 2009, 76(1):44–72, doi:10.1086/599277
- HIATUS IN ACADEMIC CAREER FOR PERSONAL REASONS, 2001–2008 (see section “Additional Information” at end of CV)
- “Singularities and Black Holes in Relativistic Spacetimes” (with co-author P. Bokulich), 2009, *The Stanford Encyclopædia of Philosophy* (Fall 2012 Edition), Edward N. Zalta (ed.), URL = <<http://plato.stanford.edu/archives/fall2012/entries/spacetime-singularities/>>
- “Against the Excesses of Quantum Gravity: A Plea for Modesty”, *Philosophy of Science*, 2001, 68(3):S424–S441, doi:10.1086/392926
- “The Constraints General Relativity Places on Physicalist Accounts of Causality”, *Theoria*, 2000, 15(1):33–58, URL = <<http://www.jstor.org/stable/23918569>>
- “The Analysis of Singular Spacetimes”, *Philosophy of Science*, 1999, 66(S1):S119–S146, URL = <<http://www.jstor.org/stable/188766>>; a revised and extended version is available at <<http://strangebeautiful.com/phil-phys.html>>
- “ $\alpha_1$ -Antitrypsin Deficiency Caused by the  $\alpha_1$ -Antitrypsin Null<sub>Mattawa</sub> Gene”, with D. Curiel, M. Brantly, L. Stier and R. Crystal, *Journal of Clinical Investigation*, 1989, 83(4):1144–1152, doi:10.1172/JCI113994

## MANUSCRIPTS SUBMITTED FOR PUBLICATION

- “Numerical Evolution of Shocks in the Interior of Kerr Black Holes” (jointly with Paul Chesler and Ramesh Narayan), submitted to *Physical Review Letters*, Oct. 2018 (arXiv:1808.07502 [gr-qc]); the subject of an interview and article by S. Nadis in the popular science magazine *Discover* (forthcoming 2019)
- “Classical Black Holes Are Hot”, submitted to *European Journal of Physics*, Oct. 2018 (arXiv:1408.3691 [gr-qc])
- “A Simple Proof of the Uniqueness of the Einstein Field Equation in All Dimensions”, submitted to *General Relativity and Gravitation*, Aug. 2018 (arXiv:1601.03032 [gr-qc])
- “Kinematics, Dynamics, and the Structure of Physical Theory”, submitted to *Philosophy of Science*, Mar. 2018
- “If Metrical Structure Were Not Dynamical, Counterfactuals in General Relativity Would Be Easy”, submitted to *Erkenntnis*, Mar. 2018 (arXiv:1509.03866 [physics.hist-ph])
- “Are Classical Black Holes Hot or Cold?”, submitted to *Foundations of Physics*, Feb. 2018 (arXiv:1408.3691 [gr-qc])

“Measure, Topology and Probabilistic Reasoning in Cosmology”, submitted to *The British Journal of Philosophy of Science*, Dec. 2017 (arXiv:1509.01878 [gr-qc])

“On the Structure of Phronēsis and the Nature of Practical Truth in *Nicomachean Ethics*”, submitted to *Oxford Studies in Ancient Philosophy*, Jun. 2017

“On the Challenges the Sons of Ariston Pose to Socrates, and Socrates’ Confounding Responses”, submitted to *Apeiron*, Jun. 2017

“On the Propriety of Physical Theories as a Basis for Their Semantics”, submitted to *Noûs*, Jun. 2017

“Why Rigid Designation Cannot Stand on Scientific Ground”, submitted to *Mind*, May 2017

## EDITED VOLUMES

*Studies in History and Philosophy of Modern Physics* special issue, proceedings of the conference “The Philosophy of Howard Stein”, forthcoming 2019 (co-editors Thomas Pashby and James Weatherall)

## RESEARCH GRANTS

**Deutsche Forschungsgemeinschaft (German Research Foundation)** Eigene Stelle Grant (sole PI) for €283,260, Munich Center for Mathematical Philosophy (LMU Munich), May 2016–Apr. 2019, full funding for research project “Gravitation, Quantum Theory, and Thermodynamics: The Crossroads of Physics and Philosophy” (<http://gepris.dfg.de/gepris/projekt/312032894>)

**Erasmus Foundation** International Academic Mobility Grant for €2,000 (Mar. 2017; Mar. 2018), to spend one week every year at the University of Florence, Dept. of Letters and Philosophy, as an Erasmus Fellow

## RESEARCH AFFILIATIONS

**Event Horizon Telescope** (<https://eventhorizontelescope.org/>, global network of physics and astrophysics departments and radio telescopes), Associate Member, Mar. 2018–present

**Yau Mathematical Sciences Center, Tsinghua University (Beijing)** Associate Member, Mar. 2018–present

“**Category Theory in Philosophy of Science**” Deutsche Forschungsgemeinschaft Research Group, Associate Member, Munich Center for Mathematical Philosophy, Nov. 2017–present

**Irvine-Munich-PoliMi-Salzburg Scientific Network for Foundations of Physics** MCMP Representative on Steering Committee, Sep. 2017–present

“**Time in Quantum Gravity and Cosmology**” Arts and Humanities Research Council (UK) Research Group, Associate Member, University of Bristol, Jun. 2017–present

## SUMMER SCHOOLS

**Munich and Lausanne International Summer School in Philosophy of Physics VI** “The Nature of Entropy”: Lectures on black hole entropy (Lenzkirch-Saig, Germany, Jul. 2019)

**Urbino International School in Philosophy of Physics XXII** “Philosophy of Cosmology”: Lectures on cosmological singularities (Urbino, Jun. 2019)

## **Munich and Lausanne International Summer School in Philosophy of Physics II**

“Probabilities in Physics”: Lectures on probabilistic reasoning in cosmology and fine-tuning (Lenzkirch-Saig, Germany, Jul. 2014)

### **PHILOSOPHY OF PHYSICS TALKS**

#### **“On the Mathematical, Physical, and Conceptual Cogency of Quantum Field Theory On Curved Spacetime”**

- Max-Planck-Institut für Wissenschaftsgeschichte, colloquium (Berlin, Jul. 2019)
- Center for Philosophy of Science, Conference “Foundations of Quantum Field Theory” (Pittsburgh, Apr. 2019)
- Foundations of Physics 2016, The 18th UK and European Conference on Foundations of Physics (London, Jul. 2016)
- British Society for Philosophy of Science, Annual Conference (Cardiff, Jul. 2016)
- Deutsche Physikalische Gesellschaft (German Physics Society), Annual Conference (Hamburg, Mar. 2016)

#### **“What It Means to Say There Is Something Rather Than Nothing”**

- Templeton Foundation Symposium “Understanding Our Place in the Cosmos: Beyond the Legacy of Stephen Hawking” (Mishkenot Sha’ananim Conference Center, Jerusalem, Mar. 2019)

#### **“What Is the Einstein Field Equation, and Why Does It Matter for Quantum Gravity?”**

- University of Bonn, Institute für Philosophie Colloquium (Dec. 2018)

#### **“The Many Failures of Determinism in General Relativity and Semi-Classical Gravity”**

- Black Hole Initiative, Harvard University, Workshop “Determinism and Indeterminism in Spacetime” (Nov. 2018)

#### **“Irreversibility in Thermodynamics and in Statistical Mechanics”**

- The 19th European and UK Conference on Foundations of Physics (Utrecht, Jul. 2018)

#### **“Entropy is Modal—What’s Up with That?”**

- British Society for Philosophy of Science, Annual Conference (Oxford, Jul. 2018)

#### **“Interaction and Evolution in Quantum Mechanics”**

- Munich Center for Mathematical Philosophy, “Workshop on the Foundations of Quantum Mechanics” (LMU Munich, Jun. 2018)

#### **“Two Paths to the Einstein Field Equation from Horizon Thermodynamics”**

- Colloquium for “Space and Time After Quantum Gravity” Project (University of Illinois, Chicago, Mar. 2018)
- First Annual Bristol-MCMP Workshop on Foundations of Physics, “Causal Horizons” (Bristol, Jan. 2017)

#### **“Continuum Spacetime as the Limit of Discrete Structure”**

- Institut des Hautes Études Scientifiques, Conference “Quantum Gravity: Physics and Philosophy” (Paris, Oct. 2017)

### **“Thermodynamical Irreversibility Has Nothing to Do With Temporal Asymmetry”**

- Munich Center For Mathematical Philosophy, Workshop “Second Annual Joint Bristol-MCMP Workshop on the Foundations of Physics” (LMU Munich, Jan. 2018)

### **“The Problem of Approximate Symmetries in General Relativity”**

- Leibniz Universität, Institut für Philosophie Conference “Symmetries in Physics” (Hannover, Jul. 2017)
- Laboratoire des Recherches sur les Sciences de la Matière (CEA-Saclay), Conference “Symmetries in Physics” (Paris, Dec. 2016)

### **“Classical Black Holes Are Hot”**

- Max Planck Institute for Radio Astronomy, Deutsche Physikalische Gesellschaft (German Physics Society) Conference “Do Black Holes Exist?—Physics and Philosophy of Black Holes” (Bad Honnef, Germany, Apr. 2017)
- Philosophy of Science Association, Biennial Conference (Chicago, Nov. 2014)
- University of Oxford, Philosophy of Cosmology Programme Conference “Philosophy of Cosmology” (Tenerife, Sep. 2014)
- British Society for Philosophy of Science, Annual Conference (Cambridge, Jul. 2014)
- California Technical Institute, Division of the Humanities Colloquium (Jan. 2016)
- Italian Society for Logic and Philosophy of Sciences, Triennial Conference (Rome, Jun. 2014)
- NYU/Columbia/Rutgers Philosophy of Physics Group, Colloquium (New York City, Mar. 2014)
- Munich Center for Mathematical Philosophy, Colloquium (Dec. 2013)
- Southern California Group on the Philosophy of Physics, Colloquium, University of California (Irvine, Nov. 2011)
- European Philosophy of Science Association, Biennial Conference (Athens, Oct. 2011)

### **“Why the Four-Dimensional Einstein Field Equation Is Not Equivalent to the $3+1$ Canonical Representation, Plus a Few (Mostly Dismissive) Remarks about the Hole Argument”**

- London School of Economics, Dept. of Philosophy, Logic and Scientific Method Workshop “The Hole Shebang: New Perspectives on the Hole Argument” (Jul. 2016)

### **“What Is Generic and What Is Special about the Universe?”**

- Hebrew University, Joint MCMP/Edelstein Center Conference “Probabilities in Science and Philosophy” (Jerusalem, May 2016)
- 15th Congress of Logic, Methodology and Philosophy of Science, Triennial Conference (Helsinki, Aug. 2015)

### **“Black Holes Really Are Thermodynamical Objects”**

- Trinity College (University of Cambridge), Colloquium (May 2016)
- University of Bristol, Depts. of Philosophy and Physics Joint Colloquium (Apr. 2016)

### **“On the Physical and Thermodynamical Character of Cosmological Singularities”**

- Philosophy of Science Association, Biennial Conference (San Diego, Nov. 2012)

**“On the Principle of Equivalence and the Speciation of Physical Systems”**

- University of Western Ontario, Philosophy Dept., Annual Philosophy of Physics Conference (Jun. 2015)

**“The Physical and Philosophical Significance of Energy Conditions in Spacetime Theories”**

- University of Oxford, Faculty of Philosophy Colloquium (Oxford, Feb. 2015)

**“Some Puzzles and Theorems about Newtonian Gravitational Energy”**

- Rotman Institute of Philosophy, Colloquium (London, ON, Mar. 2014)

**“On the Existence of Spacetime Structure”**

- University of Western Ontario, Philosophy Dept. Annual Philosophy of Physics Conference (May 2013)
- Carnegie Mellon University, Philosophy Dept. Colloquium (Jan. 2009)
- Third International Conference on the Nature and Ontology of Spacetime (Montreal, Jun. 2008)

**“Singularities and the Cosmological Arrow of Time”**

- Foundational Questions Institute (FQXi), Conference “On Time in Physics” (University of California, San Diego, May 2012)

**“On the Status and Role of the Principle of Equivalence in General Relativity”**

- Stanford University, Suppes Center for History and Philosophy of Science Colloquium (May 2012)

**“Classical Mechanics Is Lagrangian; It Is Not Hamiltonian”**

- Perimeter Institute of Theoretical Physics, Colloquium, Southwestern Ontario Group on the Foundations of Physics (Waterloo, ON, Mar. 2012)
- University of Bristol, Colloquium, Dept. of Philosophy (Mar. 2011)
- University of Pittsburgh, Center for the Philosophy of Science Colloquium (Sep. 2008)

**“There Is No Gravitational Stress-Energy Tensor”**

- Perimeter Institute of Theoretical Physics, Southwestern Ontario Group on the Foundations of Physics Colloquium (Oct. 2010)
- British Society for the Philosophy of Science, Annual Conference (Dublin, July. 2010)
- University of Oxford, Faculty of Philosophy Colloquium (Nov. 2009)
- The Joint Session of the Aristotelian Society and the Mind Association, Annual Conference (Norwich, Jul. 2009)

**“Questions about Laplacian Determinism in Newtonian Mechanics”**

- Bucknell University, Dept. of Philosophy Colloquium (Feb. 2009)

**“Does General Relativity Need an Interpretation?”**

- Philosophy of Science Association, Biennial Conference (Pittsburgh, Nov. 2008)

**“Against the Current Excesses of Quantum Gravity: A Plea for Modesty”**

- Philosophy of Science Association, Biennial Conference (Vancouver, Nov. 2000)

**“The Analysis of Singular Spacetimes”**

- Philosophy of Science Association, Biennial Conference (Kansas City, MO, Oct. 1998)

- University of Pittsburgh, Dept. of the History and Philosophy of Science Colloquium (Sep. 1998)

**“Bell’s Theorem and the Delicacy of Causal Ascription”**

- Tufts University, Philosophy Dept. Colloquium (Jan. 1999)
- American Philosophical Association, Eastern Division Annual Conference (Atlanta, Dec. 1996)
- Midwest Workshop on the Foundations of Physics, Colloquium (Chicago, Mar. 1996)

**“Defining Gravitational Energy in Newtonian Theory and in General Relativity”**

- Midwest Workshop on the Foundations of Physics, Colloquium (Chicago, Feb. 1998):

**PHILOSOPHY OF SCIENCE TALKS**

**“The Categories of Physical Systems and Theories”**

- Munich Center for Mathematical Philosophy, Conference “Categorical Equivalence in Philosophy of Science” (LMU Munich, Jul. 2018)

**“Semantics of Theories: Epistemology, Yes; Ontology, No”**

- University of Florence, Dept. of Philosophy Colloquium (Mar. 2018)
- European Philosophy of Science Association, Biennial Conference (Exeter, UK, Sep. 2017)

**“Why Rigid Designation Cannot Stand on Scientific Ground”**

- Ninth European Congress of Analytic Philosophy, Triennial Conference (LMU, Munich, Aug. 2017)
- Philosophical Society of South Africa, Annual Conference (Grahamstown, SA, Jan. 2017)
- University of Pittsburgh, Center for the Philosophy of Science Colloquium (Feb. 2009)

**“Schematizing the Observer and the Epistemic Content of Theories”**

- University of Chicago, Conference “The Philosophy of Howard Stein” (Jun. 2017)
- Munich Center for Mathematical Philosophy, Conference “Making and Breaking Theories: Applying Physical Models” (LMU Munich, Jun. 2017)

**“How Can Physics Bear on Ontology? Or, The Dialectical Dance of Realism and Instrumentalism”**

- University of Florence, Dept. of Philosophy Colloquium (Mar. 2019)
- Munich Center for Mathematical Philosophy Colloquium (LMU Munich, Nov. 2018)
- University of Barcelona, Department of Philosophy Colloquium (Nov. 2018)
- 5th Bi-Annual South African Philosophy of Science and Logic Conference, Keynote Speaker (Rhodes University, Grahamstown, South Africa, Jan. 2017)

**“Newtonian Abduction (Not IBE!) as Framework Confirmation”**

- Center for Advanced Studies, Conference “Reasoning in Physics” (LMU Munich, Dec. 2016)

**“Animadversions on the Semantic View of Theories”**

- Universidad Complutense, Methods of Causal Inference and Scientific Representation Group Colloquium (Madrid, Dec. 2016)
- Canadian Society for the History and Philosophy of Science, Annual Conference (Waterloo, ON, May 2012)

**“Kinematics, Dynamics, and the Structure of Physical Theory”**

- Philosophy of Science Association, Biennial Conference (Atlanta, Nov. 2016)



- University of Pittsburgh Center for Philosophy of Science, Quadrennial Fellows Conference, Plenary Session (Lund, Sweden, Jul. 2016)
- Munich Center for Mathematical Philosophy, Conference “The Semantics of Physical Theories” (Jun. 2016)

**“Aggregating Scientific Judgements in the Absence of Empirical Data”**

- Venice International University, Conference “Social Choice and its Philosophical Applications” (Oct. 2016)

**“Kinematical Constraints as Constitutive *A Priori* Components of Physical Theory”**

- University of Konstanz, Philosophy Faculty Conference “Neo-Kantian Perspectives on Contemporary Philosophy of Science”, (Jan. 2016)

**“If the Metric Were Not Dynamical, Counterfactuals in General Relativity Would Be Easy”**

- European Philosophy of Science Association, Biennial Conference (Düsseldorf, Sep. 2015)
- British Society for Philosophy of Science, Annual Conference (Manchester, Jul. 2015)

**“On Newton’s Third Rule of Reasoning in Philosophy, ‘The Universal Qualities of Bodies’, and the Speciation of Physical Systems”**

- HOPOS, Annual Conference (Ghent, Jul. 2014)
- University of Pittsburgh Center for the Philosophy of Science, Conference “Newton and Empiricism” (Apr. 2010)

**“On the Propriety of Representation as a New Basis for the Semantics of Physical Theories”**

- University of Western Ontario, Colloquium, Dept. of Philosophy (London, ON, Jan. 2012)
- University of Leeds, Colloquium, Dept. of Philosophy (Mar. 2011)
- London School of Economics, The Dept. of Philosophy, Logic and Scientific Method Colloquium (Nov. 2009)
- The Sigma Club, Colloquium (London, Oct. 2009)

## PHYSICS AND MATHEMATICS TALKS

**“How to Decide between Dark Matter and Alternative Theories of Gravity”**

- Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen University, Conference “Dark Matter and Modified Gravity” (Aachen, Germany, Feb. 2019)

**“The Problem of the Interior for Holographic Black Holes”**

- Tsinghua University, Yau Mathematical Sciences Center, Tsinghua Sanya International Mathematics Forum Conference “Black Holes and Holography” (Sanya, Hainan Province, China, Jan. 2019)

**“On the Existence of Translation-Invariant Borel Measures on Infinite Dimensional Fréchet Manifolds”**

- Hong Kong University of Science and Technology, Institute for Advanced Study Conference “Black Holes, Inflation, and Gravitational Waves” (Hong Kong, Jan. 2019)

### **“On the Mathematical, Physical, and Conceptual Cogency of Quantum Field Theory On Curved Spacetime”**

- Tsinghua University, Yau Mathematical Sciences Center Colloquium (Beijing, Jan. 2019)
- Max Planck Institute for Mathematics in the Sciences, Conference “Progress and Visions in Quantum Theory in View of Gravity: Bridging Foundations of Physics and Mathematics” (Leipzig, Sep. 2018)

### **“Measure, Topology and Probabilistic Reasoning in Cosmology”**

- City University of Dublin, Centre for Astrophysics and Relativity Seminar (Dec. 2018)
- Erwin Schrödinger International Institute for Mathematics and Physics, Conference “Concepts of Probability in the Sciences” (Vienna, Oct. 2018)
- University of Oxford, Dept. of Physics Workshop “Fine-Tuning in Cosmology” (Oxford, Oct. 2017)

### **“Energy Conditions in Spacetime Theories”**

- University of York, Dept. of Physics, Conference “Energy Conditions in Quantum Theory and Gravity” (Sep. 2018)

### **“A Strengthened Zeroth Law for Black-Hole Thermodynamics”**

- Black Hole Initiative, Colloquium (Harvard University, Mar. 2018)
- NEB-17: Recent Developments in Gravity, Hellenic Society for Relativity, Gravitation and Cosmology Annual Conference (Mykonos, Sep. 2016)
- Radboud University, High Energy Physics Group, Colloquium (May 2016)

### **“A Weyl-Type Theorem in Geometrized Newtonian Gravity, and How It May Bear on Shape Dynamics”**

- Perimeter Institute of Theoretical Physics, Conference “Shape Dynamics Workshop” (Waterloo, ON, May 2017):

### **“48 Years of Cosmic Censorship, and Still We Do Not Know What It Is”**

- Deutsche Physikalische Gesellschaft (German Physics Society) Annual Conference, Plenary Speaker (Bremen, Mar. 2017)

### **“What Is the Einstein Field Equation, and Why Does It Matter for Quantum Gravity?”**

- Center for Astrophysics, Institute for Theory and Computation Colloquium (Harvard University, Mar. 2017)
- Max Planck Institute for Gravitational Physics, Albert Einstein Institute Conference “Dashed Hopes: What Hasn't Worked in Quantum Gravity (and Why)?” (Berlin, Jul. 2016)
- Radboud University, High Energy Physics Group, Colloquium (May 2016)

### **“Black Holes Really Are Thermodynamical Objects”**

- University of Oldenburg, Institute of Physics, Mathematical Physics Colloquium (Nov. 2016)

### **“Foundational Problems in Black-Hole Thermodynamics”**

- University of Florence, Dept. of Physics and Astronomy Workshop “Black Holes and Thermodynamics” (Apr. 2016)

### **“A Thermodynamical Classification of Cosmological Singularities”**

- Radboud University, High Energy Physics Group Colloquium (Oct. 2015)

### **“Generalizations of Lagrangian Mechanics Based on Generalizations of Tangent-Bundle Geometry”**

- Munich Center for Mathematical Philosophy, Conference “Foundations of Classical Field Theory”, (Dec. 2014)

### **“The Geometry of the Euler-Lagrange Equation”**

- University of Western Ontario, Dept. of Applied Mathematics Colloquium (Mar. 2012)
- Deutsche Physikalische Gesellschaft (German Physics Society), Annual Conference (Bonn, Mar. 2010)
- University of Chicago, Physics Dept., Relativity Group Colloquium (Oct. 1997)

### **“Classical Black Holes Are Hot”**

- Black Hole Initiative, Conference “First Annual BHI Conference on Black Holes” (Harvard University, May 2017)
- University of Western Ontario, Dept. of Physics and Astrophysics Colloquium, (Mar. 2012)

### **“An Invariant Characterization of the Intrinsic Geometry of the Tangent Bundle”**

- Queen Mary College, Dept. of Physics Colloquium (Jan. 2010)
- Rutgers University, Dept. of Mathematics, Mathematical Physics Colloquium (Sep. 1998)

### **“The Role of Configuration Space in Classical and in Quantum Mechanics”**

- Pennsylvania State University, Dept. of Physics, Center for Gravitational Physics and Geometry Colloquium (PA, Sep. 1998)

## **ANCIENT PHILOSOPHY TALKS**

### **“The Structure of Phronēsis in *Ethica Nicomachea*, Book VI”**

- University Of Western Ontario, Classics Dept. Colloquium (Feb. 2012)
- University of California, Berkeley, Committee on Ancient Philosophy Colloquium (May 2000)

### **“On the Challenges the Sons of Ariston Pose to Socrates in the *Republic*, Socrates’s Confounding Responses to Them, and the Character of Justice”**

- University Of Western Ontario, Working Group on Ancient Philosophy Colloquium, (Jan. 2011)

### **“Taking ‘Pleasure’ in Plato’s *Republic*”**

- University of California, Berkeley, Committee on Ancient Philosophy Colloquium (Feb. 1999)

### **“On the Translation and Interpretation of Aristotle’s *Generation and Corruption*, Book II, Chapter 6”**

- Midwest Ancient Philosophy Workshop (Chicago, Feb. 1998)

### **“On the Translation and Interpretation of Aristotle’s *Generation and Corruption*, Book II, Chapter 5”**

- Midwest Ancient Philosophy Workshop (Chicago, Nov. 1996)

## GENERAL PHILOSOPHY TALKS

### “On the Possibility of Progress in Philosophy”

- Ludwig-Maximilians-Universität, Philosophy Faculty colloquium (Nov. 2016)

### “On the Use and Abuse of Scientific Examples in Philosophy”

- University of Ghent, Sarton Center for History of Science Colloquium (Mar. 2015)

### “On Learning, Reading, and Writing Philosophy”

- University of Kent, Dept. of Philosophy Colloquium (Sep. 2009)

## TEACHING EXPERIENCE

### Ludwig-Maximilians-Universität

**Foundations of Thermodynamics and Statistical Mechanics** Winter 2017, Fakultät für Philosophie, Wissenschaftstheorie und Religionswissenschaft, graduate seminar

**The Structure and Semantics of Scientific Theories** Winter 2016, Fakultät für Philosophie, Wissenschaftstheorie und Religionswissenschaft, graduate seminar

**The Philosophy of Space, Time and Spacetime** Winter 2015, Fakultät für Philosophie, Wissenschaftstheorie und Religionswissenschaft, graduate seminar

**The Semantics of Scientific Theories** Summer 2015, Fakultät für Philosophie, Wissenschaftstheorie und Religionswissenschaft, graduate seminar

**Kant and the Philosophy of Science** Winter 2014, Fakultät für Philosophie, Wissenschaftstheorie und Religionswissenschaft, graduate seminar

**Singularities and Black Holes in Relativistic Spacetimes** Summer 2014, Fakultät für Physik (cross-listed, Fakultät für Philosophie, Wissenschaftstheorie und Religionswissenschaft), graduate seminar

**Einstein for Everyone** Summer 2014, Fakultät für Philosophie, Wissenschaftstheorie und Religionswissenschaft, undergraduate course

### University of Western Ontario

**Einstein for Everyone** Spring 2013, Dept. of Philosophy, undergraduate course

**Introduction to Ancient Philosophy** Fall 2012, Dept. of Philosophy, undergraduate course

**General Relativity** Fall 2011–Spring 2012, Dept. of Physics and Astronomy (cross-listed with Dept. of Philosophy), two-term graduate course

**Contemporary Metaphysics** Spring 2011, Dept. of Philosophy, advanced undergraduate course

**Philosophy of Quantum Mechanics** Fall 2010, Dept. of Philosophy, advanced undergraduate course

### London School of Economics

**Survey of the Philosophy of Science** Spring 2010, Dept. of Philosophy, Logic and Scientific Method, graduate course

**Morality and Values** (lectures on Aristotle's *Nicomachean Ethics*) Spring 2010, Dept. of Philosophy, Logic and Scientific Method, graduate course

**Fundamental Maths for Philosophy of the Special Sciences** Spring 2010, Dept. of Philosophy, Logic and Scientific Method, informal graduate lectures (volunteer course)

**The Philosophical Foundations of Physics** Fall 2009, Dept. of Philosophy, Logic and Scientific Method, graduate course

**The History and Philosophy of Scientific Revolutions** Fall 2009, Dept. of Philosophy, Logic and Scientific Method, advanced undergraduate course

## Stanford University

**Introduction to the Humanities** Fall 1999–Spring 2000, Core Freshman Curriculum

**Philosophy of Space, Time and Spacetime** Spring 1999, Philosophy Dept., graduate and upper-level undergraduate course

**Determinism in Physics** Winter 1999, Philosophy Dept., graduate seminar (co-taught with Prof. Patrick Suppes)

**Central Topics in Philosophy of Science** Winter 1999, Philosophy Dept., upper-level undergraduate course

**Survey of Early 20th Century Analytic Philosophy** Fall 1998, Philosophy Dept., graduate and upper-level undergraduate course

## University of Chicago

**Philosophical and Scientific Understandings of Causation** Winter, 1997, Committee on the Conceptual Foundations of Science, honors upper-level undergraduate seminar

## STUDENT SUPERVISION

### PhD Theses

**Alex Mathie** (expected 2021) TITLE TBD, Associate Advisor (primary supervisor Prof. Dr. Stephan Hartmann), Munich Center For Mathematical Philosophy (LMU Munich)

**Jamee Elder** (expected 2020) TITLE TBD, Associate Advisor (primary supervisor Prof. Don Howard), Philosophy Dept., University of Notre Dame

**Martin Lesourd** (expected 2019) TITLE TBD, External Reader (primary supervisor Dr. Chris Timpson), Faculty of Philosophy, University of Oxford

**Marina Baldiserra-Pacchetti** (2018) *Modeling, Uncertainty and Target Systems in Complex Sciences*, External Reader (primary supervisor Prof. Robert Batterman), Dept. of History and Philosophy of Science, University of Pittsburgh

**Saad Anis** (2016) *On the Role of Mathematics in Scientific Reasoning*, External Reader (primary supervisor Prof. Chris Smeenk), Philosophy Dept., University of Western Ontario

**Amy Wuest** (2015) *Philipp Frank: Philosophy of Science, Pragmatism, and Social Engagement*, External Reader (primary supervisor Prof. Kathleen Okruhlik), Philosophy Dept., University of Western Ontario

**Jonathon Everett** (2014) *Constitutive or Regulative Principles? The Kantian Legacy for Contemporary Philosophy of Science*, Associate Advisor (primary supervisor Prof. Michela Massimi), Dept. of Science and Technology Studies, University College (London)

## MA Theses

- Alfredo García Cid** (expected 2019) *The Role of Probability in Classical and Quantum Statistical Mechanics*, Primary Supervisor, Munich Center for Mathematical Philosophy, Ludwig-Maximilians-Universität
- Augusto Clot** (expected 2019) *Philosophical Problems of Inflationary Cosmology*, Joint Primary Supervisor, Faculty of Philosophy, University of Florence
- Giovanni Buonocore** (expected 2018) *A Unified Account of Realism and Anti-Realism in Physics and Biology*, Joint Primary Supervisor, Faculty of Philosophy, University of Padua
- Marina Baldiserra-Pacchetti** (2010) *Einstein on Locality in Quantum Mechanics*, Primary Supervisor, Dept. of Philosophy, Logic and Scientific Method, London School of Economics

## MEMBERSHIP IN PROFESSIONAL SOCIETIES

**Foundational Questions Institute (FQXi)** by invitation (Mar. 2016)

## CONFERENCE GRANTS

- META, Politecnico di Milano** €3,000 for international conference “Analogical Reasoning in Science”, Munich Center for Mathematical Philosophy (LMU Munich), Oct. 2018
- Deutsche Forschungsgemeinschaft (German Physics Society)** €5,000, for international conference “The Second Law of Thermodynamics”, Munich Center for Mathematical Philosophy (LMU Munich), Sep. 2017
- The Franke Institute for the Humanities (University of Chicago)** \$10,000, for international conference “The Philosophy of Howard Stein”, The University of Chicago, Jun. 2017, primary applicant
- Foundational Questions Institute (FQXi)** \$4,500, for international conference “The Philosophy of Howard Stein”, The University of Chicago, Jun. 2017, primary applicant
- British Society for the Philosophy of Science** £300, for First Annual Bristol-MCMP Workshop on Foundations of Physics “Causal Horizons”, University of Bristol and Munich Center For Mathematical Philosophy (Bristol), Jan. 2017, primary applicant
- Deutsche Forschungsgemeinschaft (German Physics Society)** €9,000, for international conference “The Semantics of Scientific Theories”, Munich Center for Mathematical Philosophy (LMU Munich), Jun. 2016, primary applicant

## ORGANIZATION OF INTERNATIONAL CONFERENCES AND SYMPOSIA

- Ontological Problems in Quantum Field Theory** Second Annual Irvine-LSE-Munich-PoliMi-Salzburg Network Conference for Senior Researchers (Salzburg, Sep. 2019, 1.5 days, co-organizer)
- Philosophy and Foundations of Physics** Second Annual Irvine-LSE-Munich-PoliMi-Salzburg Conference for Junior Researchers (Salzburg, Sep. 2019, 1.5 days, co-organizer)
- The Philosophy of Hans Reichenbach** Munich Center for Mathematical Philosophy (Jul. 2019, 3 days, co-organizer)

**Black Holes and Holography** Yau Mathematical Sciences Center, Tsinghua University (Tsinghua Sanya International Mathematics Forum, Hainan Province, China, Jan. 2019, 5 days, co-organizer); ongoing, one conference a year, indefinitely

**Black Holes, Inflation and Gravitational Waves** Institute for Advanced Study, Hong Kong University of Science and Technology (Hong Kong, Jan. 2019, 3 days, co-organizer)

**Foundational Problems of Black Holes and Gravitational Radiation** Munich Center for Mathematical Philosophy (LMU Munich, Oct. 2018, 2 days, head organizer)

**Analogical Reasoning in Science** Munich Center for Mathematical Philosophy (LMU Munich, Oct. 2018, 3 days, co-organizer)

**Problems of Time** First Annual Irvine-Munich-PoliMi-Salzburg Network Conference for Senior Researchers (Salzburg, Sep. 2018, 1.5 days, co-organizer)

**Philosophy and Foundations of Physics** First Annual First Irvine-Munich-PoliMi-Salzburg Conference for Junior Researchers (Salzburg, Sep. 2018, 1.5 days, co-organizer)

**The Second Annual Black Hole Initiative Conference** Harvard University (May 2018, 3 days, co-organizer)

**Second Annual Bristol/MCMP Foundations of Physics Conference** Munich Center For Mathematical Philosophy (LMU Munich, Jan. 2018, 1 day, head organizer)

**The Second Law of Thermodynamics** Munich Center for Mathematical Philosophy (LMU Munich, Sep. 2017, 2 days, head organizer)

**Symmetries and Symmetry Breaking II** Munich Center for Mathematical Philosophy (LMU Munich, Jun. 2017, 1 day, co-organizer)

**The Philosophy of Howard Stein** University of Chicago (Jun. 2017, 2 days, head organizer)

**The First Annual Black Hole Initiative Conference** Harvard University (May 2017, 3 days, co-organizer)

**First Annual Bristol/MCMP Foundations of Physics Conference** “Causal Horizons”, University of Bristol (Jan. 2017, 1 day, co-organizer)

**The Semantics of Scientific Theories** Munich Center for Mathematical Philosophy (LMU Munich, Jun. 2016, 3 days, head organizer)

**The Foundations of Classical Field Theories** Munich Center for Mathematical Philosophy (LMU Munich, Dec. 2014, 1 day, co-organizer)

**Foundations of Gravity and Thermodynamics** Symposium, Philosophy of Science Association Biennial Conference (Chicago, Nov. 2014)

**New Horizons for Singularities in Classical Spacetime Theories** Symposium, Philosophy of Science Association Biennial Conference (San Diego, Nov. 2012)

**The Foundations of Physics** Philosophy Dept. and The Rotman Institute, University of Western Ontario (May 2011, 2 days, co-organizer)

## SERVICE TO THE PROFESSION

**External Grant Reviewer** Austrian Federal Ministry of Education, Science and Research (Bun-

desministerium für Bildung, Wissenschaft und Forschung); French National Research Agency (Agence Nationale de la Recherche); Polish National Science Centre (Narodowe Centrum Nauki); John Templeton Foundation

**Referee for Philosophy, Physics, and Mathematics Publishing Houses** The Fields Institute for Research in Mathematical Sciences; Springer-Verlag

**Referee for Philosophy Publications** *Analysis; Australasian Journal of Philosophy; The British Journal for the Philosophy of Science; Dialogue; Erkenntnis; European Journal for Philosophy of Science; HOPOS; International Studies in the Philosophy of Science; Mind; Philosophical Review; Philosophies; Philosophy of Science; South African Journal of Philosophy; Studies in History and Philosophy of Modern Physics; Studies in History and Philosophy of Science; Synthese; Theoria*

**Referee for Physics Publications** *Classical and Quantum Gravity; Entropy; European Journal of Physics; Foundations of Physics; General Relativity and Gravitation; Physica Scripta*

**Program Committee (Major Conferences)** British Society for Philosophy of Science Annual Conference, 2017; The 19th UK and European Conference on Foundations of Physics, 2018

**Philosophy of Science Association** chief architect and webmaster (volunteer) for the PSA's new website, <http://www.philsci.org>, Jan. 2008–Jun. 2009

## SERVICE TO THE DEPARTMENT

**Munich Center For Mathematical Philosophy (LMU, Munich)**

- Faculty Search Committees, 2014–2018
- Visiting Fellows Committees, 2014–2018
- Colloquiums Coordinator, 2013–2015

**Black Hole Initiative (Harvard University)**

- Colloquiums Coordinator, 2017–2018
- Philosophy Workshop Coordinator, 2017–2018

**Rotman Institute of Philosophy (University of Western Ontario)**

- Post-Doctoral Search Committees, 2012–2013

## SERVICE TO THE LOCAL COMMUNITY

**Black Hole Initiative (Harvard University)** chair of the colloquium committee; conferences committee; visiting fellows committee; organized and led philosophy reading group

**Munich Center For Mathematical Philosophy (LMU, Munich)** appointments committees for faculty positions, post-doctoral fellows, and visiting fellows; organized bi-weekly philosophy of physics reading group; program committee for many conferences hosted by the MCMP; fostering active collaborations with mathematics and physics departments

**Rotman Institute of Philosophy (University of Western Ontario)** organized bi-weekly philosophy of physics reading group; organized bi-weekly general philosophy of science reading group; organized weekly reading group on James Clerk Maxwell; program committee for every conference organized by the Rotman Institute; fostered active collaborations with mathematics and physics departments



**London School of Economics** organized weekly reading group on Plato's **Statesman** (one in English, and a subsidiary group for Greek readers); delivered weekly informal graduate lecture series on the fundamentals of topology and real analysis

**Stanford University** organized weekly reading groups on Russell's **The Analysis of Matter** and Carnap's **Meaning and Necessity**; fostered active collaborations with mathematics and physics departments

## PUBLIC OUTREACH AND EDUCATION

*Discover* an interview and article in the popular science magazine about my paper "Numerical Evolution of Shocks in the Interior of Kerr Black Holes" ([arXiv:1808.07502 \[gr-qc\]](https://arxiv.org/abs/1808.07502)) jointly written Paul Chesler and Ramesh Narayan (forthcoming 2019)

*American Scientist* survey essay "What Is a Black Hole?" for a general audience (forthcoming 2019)

*Nature Astronomy Online Community* blogger for a general audience (ongoing from Oct. 2018)

**University of Western Ontario** public lecture "Black Holes" (Mar. 2012)

**London School of Economics** public lecture "Singularities in General Relativity" (Oct. 2009)

## LANGUAGES

**Ancient Greek** reading (fluent)

**German** reading (fluent), speaking (adequate)

**Spanish** reading and speaking (fluent)

## RECOMMENDERS

**Prof. David Malament (Emeritus)**, University of California, Irvine, Dept. of Logic and Philosophy of Science, [dmalamen@uci.edu](mailto:dmalamen@uci.edu), +1 949-824-7374

**Prof. Howard Stein (Emeritus)**, University of Chicago, Philosophy Dept., [hstein@uchicago.edu](mailto:hstein@uchicago.edu), +1 773-702-8513

**Prof. Michael Friedman**, Stanford University, Philosophy Dept., [mfriedman@stanford.edu](mailto:mfriedman@stanford.edu), +1 650-723-2547

**Prof. Harvey Brown**, Oxford University, Faculty of Philosophy, [harvey.brown@philosophy.ox.ac.uk](mailto:harvey.brown@philosophy.ox.ac.uk), +44 1865 276926

**Prof. Dr. Stephan Hartmann**, Ludwig-Maximilians-Universität, Munich Center for Mathematical Philosophy, Chair, [S.Hartmann@lmu.de](mailto:S.Hartmann@lmu.de), +49 189 2180 3320

**Prof. William Harper (Emeritus)**, University of Western Ontario, Philosophy Dept., [wlharp@uwo.ca](mailto:wlharp@uwo.ca), +1 519-661-2111

## FURTHER REFERENCES

**Prof. John Earman (Emeritus)**, University of Pittsburgh, History and Philosophy of Science Dept., [jeerman@pitt.edu](mailto:jeerman@pitt.edu), +1 412-624-1052

**Dr. Jeremy Butterfield**, Senior Research Fellow, Trinity College, University of Cambridge, [jb56@cam.ac.uk](mailto:jb56@cam.ac.uk)

**Prof. Carlo Rovelli**, Centre de Physique Theorique de Luminy, Université de Marseille, [rovelli@cpt.univ-mrs.fr](mailto:rovelli@cpt.univ-mrs.fr), +33 (0) 6 14 59 38 85

## ADDITIONAL INFORMATION

From June of 2000 to August of 2008 I did not hold an academic position. During that time, my mother was chronically and acutely ill, and she had neither health insurance nor any other means to pay her medical bills. My academic position in 2000 at Stanford University did not pay enough for me to pay her medical bills. I therefore left Stanford and took employment in the computer industry in order to earn enough to pay her medical bills and otherwise support her. When I no longer had that obligation in 2008, I returned immediately to academia.

That also explains why I held a lectureship in 1998-1999 and a post-doctoral position in 1999-2000, both at Stanford, but did not receive my Ph.D. until 2005: when I was hired for the positions at Stanford, it was with the agreement that I would finish my Ph.D. in 1999. My mother's illness prevented me from completing it then. I worked on it afterward when I could, while I held positions in software.