






# IAN A. MORRISON

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## RESEARCH INTERESTS

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Quantum field theory in curved spacetime, gravitational aspects of the AdS/CFT correspondence, quantum effects in cosmology, perturbative quantum gravity, quantum entanglement, conformal field theory, algebraic quantum field theory, 3D gravity.

## EDUCATION

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- JUNE 2011 Ph. D. in Physics, University of California, Santa Barbara (UCSB).  
Advisor: [Donald Marolf](#).  
JUNE 2008 M. A. in Physics, UCSB.  
MAY 2005 A. B. in Physics and Astronomy, Bowdoin College.  
(*High Honors, Magna Cum Laude, Minor in English Literature.*)

## APPOINTMENTS

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- AUG. 2016 – Assistant Professor, Department of Physics, West Chester University.  
2015 – 2016 Postdoctoral Fellow, Department of Physics, McGill University.  
2013 – 2015 [Institute for Particle Physics Theory](#) Fellow, Department of Physics,  
McGill University.  
2011 – 2013 [Simons](#) Postdoctoral Fellow, Department of Applied Mathematics and  
Theoretical Physics (DAMTP), University of Cambridge.

## SELECTED FELLOWSHIPS, HONORS, AND AWARDS

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- JAN. 2017 [KITP Scholar](#), 2017–2019.  
SEPT. 2016 [S. Chandrasekhar Post-doctoral Award](#), International Society of General Relativity and Gravitation. Awarded for best post-doctoral presentations at the *21st International Conference on General Relativity and Gravitation*, New York City.  
JAN. 2013 [Institute for Particle Physics Theory Postdoctoral Fellowship](#) (national).  
Amount: CAD 20,000. per year for two years.  
JAN. 2013 Fellowship of the Lorne Trottier Chair in Astrophysics, McGill.  
Amount: CAD 25,000. per year for two years.  
NOV. 2012 Selection in *Classical and Quantum Gravity* ‘[Highlights of 2011-12](#)’ collection.  
AUG. 2011 [Simons](#) Postdoctoral Fellowship. Amount: GBP 37,184. per year for three years.

OCT. 2010 [James B. Hartle Award](#), International Society of General Relativity and Gravitation. Awarded for best graduate student presentations at the *19th International Conference on General Relativity and Gravitation*, Conference, Mexico City.

## TEACHING EXPERIENCE

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### Instructor of Record, West Chester University

SPRING 2017 [Elements of Physical Science](#) (undergraduate)  
*(Introductory physics course for non-science majors. Enrollment: 21)*  
[General Physics I](#) (undergraduate)  
*(Algebra-based introductory physics. Enrollment: 89.)*  
 General Physics I Laboratory (undergraduate)

FALL 2016 [Destiation: Alpha Centauri](#) (undergraduate)  
*(Introductory physics course for non-science majors themed around interstellar travel. Course of my design. Enrollment: 42)*  
 General Physics I (undergraduate)  
*(Algebra-based introductory physics. Enrollment: 99.)*  
 General Physics I Laboratory (undergraduate)

### Instructor of Record, McGill University

WINTER 2016 [General Relativity](#) (undergraduate/graduate)  
*(Enrollment: 43)*

FALL 2014 [Advanced General Relativity and QFT in curved spacetime](#) (graduate)  
*(Seminar course of my design. Enrollment: 11.)*

### Supervision Leader, DAMTP, University of Cambridge

*(Supervisions are problem-solving sessions with one leader and approximately ten students. For each course below I led 6 hours supervision per student, with approximately 50 total students.)*

LENT 2012 [Advanced Quantum Field Theory](#) (graduate). Instructor: H. Osborn.  
 MICHAELMAS 2011 [General Relativity](#) (graduate). H. Reall.

### Teaching Assistant, University of California, Santa Barbara, 2006–2008

*(4 quarters of introductory laboratory supervision, 3 quarters graduate course assistance.)*

### Head Teaching Assistant, University of California, Santa Barbara, 2006–2007.

*(Assigned and supervised approximately 40 graduate and adjunct teaching assistants for the Physics Department.)*

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## STUDENT MENTORING

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I have been a research advisor for 5 undergraduates, 1 master's student, and 3 Ph. D. candidates.

8. Matthew Muscat (B. S. '17, McGill). Honors Research Project: "Holography of information for black hole spacetimes." Presented at McGill undergraduate research poster competition. Undergraduate Thesis filed Sept. 2016. May 2016 –.
7. Theodore Tomalty (B. S. '17, McGill). Topic: integrable QFTs in de Sitter space. Undergraduate Research Project filed April 2016. Jan. 2016 –.
6. Guilherme Franzmann (Ph. D. '18, McGill). Topic: perturbative quantum gravity in de Sitter space. June 2015 –.
5. Elisa Ferreira (Ph. D. '17, McGill). Topics: cosmological singularities in AdS/CFT, bulk reconstruction in AdS/CFT. **Co-authored [article](#)**. Aug. 2014 – Jan. 2016.
4. Alex Laguë and Daixi Xia (B.S. '17, McGill). Topic: cosmic strings. Presented at McGill undergraduate research poster competition. **Co-authored [article](#)**. June – Sept. 2015.
3. Renato Costa (Ph. D. '16, IFT, U. São Paulo). Topic: Higher spin symmetries in de Sitter QFTs. **Co-authored [article](#)**. Mar. – Aug. 2015. Now a Postdoctoral Fellow at University of Cape Town.
2. Madeleine Anthonisen (M. S. '15, McGill). Topics: bulk reconstruction in AdS/CFT, cosmic strings. Master's Thesis filed Aug. 2015. **Co-authored [article](#)**. 2013–2015. Now a Ph. D. student at McGill.
1. Alexander Rovinov (B.A. '08, UCSB), under supervision of D. Marolf. Topic: linearization instabilities in General Relativity. Senior Thesis filed June 2008. 2007–2008.

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## PAPERS

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- In my career I have at least 607 citations and an h-index of 12 ([Google Scholar](#)).
- Student collaborators under my advisement are underlined.

### Refereed Publications

- 2016
16. R. H. Brandenberger, Y-F. Cai, S. R. Das, E. G. M. Ferreira, I. A. Morrison, and Y. Wang, "Fluctuations in a Cosmology with a Space-Like Singularity and their Gauge Theory Dual Description," *Phys. Rev. D* **94**, 083508 (2016). [[arXiv:1601.00231 \[hep-th\]](#)]
  15. R. Costa and I. A. Morrison, "On higher-spin symmetries in de Sitter QFTs," *JHEP* **3** 056 (2016). NSF-KITP-15-135. [[arXiv:1511.06753 \[hep-th\]](#)]
  14. M. Anthonisen, R. Brandenberger, A. Laguë, I. A. Morrison, and D. Xia, "Cosmic Microwave Background Spectral Distortions from Cosmic String Loops," *JCAP* **2** 047 (2016). [[arXiv:1509.07998 \[astro-ph.CO\]](#)]

- 2014 13. I. A. Morrison, “Boundary-to-bulk maps for AdS causal wedges and the Reeh-Schlieder property in holography,” *JHEP* **5** 053 (2014). [[arXiv:1403.3426 \[hep-th\]](#)]
- 2013 12. I. A. Morrison and M. Roberts, “Mutual information between thermo-field doubles and disconnected holographic boundaries,” *JHEP* **7** 1 (2013). [[arXiv:1211.2887 \[hep-th\]](#)]
11. D. Marolf, I. A. Morrison, and M. Srednicki, “Perturbative S-matrix for massive scalar fields in global de Sitter space,” *Class. Quant. Grav.* **30** 155023 (2013). [[arXiv:1209.6039 \[hep-th\]](#)]
- 2011 10. A. Higuchi, D. Marolf, and I. A. Morrison, “de Sitter invariance of the dS graviton vacuum,” *Class. Quant. Grav.* **28**, 245012 (2011). Selected for the *Class. Quant. Grav.* ‘Highlights of 2011-12’ collection. [[arXiv:1107.2712 \[hep-th\]](#)]
9. I. A. Morrison, “The Infrared Stability of de Sitter Quantum Field Theory,” Ph. D. thesis, University of California, Santa Barbara (2011). [[ISBN 9781124885629](#)]
8. D. Marolf and I. A. Morrison, “The IR stability of de Sitter QFT: Physical initial conditions,” *Gen. Rel. Grav.* **43** 3497 (2011). [[arXiv:1104.4343 \[gr-qc\]](#)]
7. A. Higuchi, D. Marolf, and I. A. Morrison, “On the equivalence between Euclidean and In-In formalisms in de Sitter QFT,” *Phys. Rev. D* **83**, 84029 (2011). [[arXiv:1012.3415 \[gr-qc\]](#)]
6. D. Marolf and I. A. Morrison, “The IR stability of de Sitter QFT: results at all orders,” *Phys. Rev. D* **84**, 044040 (2011). [[arXiv:1010.5327 \[gr-qc\]](#)]
- 2010 5. D. Marolf and I. A. Morrison, “The IR stability of de Sitter: Loop corrections to scalar propagators,” *Phys. Rev. D* **82**, 105032 (2010). [[arXiv:1006.0035 \[gr-qc\]](#)]
- 2009 4. D. Marolf and I. A. Morrison, “Group Averaging for de Sitter free fields,” *Class. Quant. Grav.* **26**, 235003 (2009). [[arXiv:0810.5163 \[gr-qc\]](#)]
3. D. Marolf and I. A. Morrison, “Group Averaging of massless scalar fields in 1+1 de Sitter,” *Class. Quant. Grav.* **26**, 035001 (2009). [[arXiv:0808.2174 \[gr-qc\]](#)]
- 2004 2. I. A. Morrison, T. W. Baumgarte, S. L. Shapiro and V. R. Pandharipande, “The Moment of Inertia of the Binary Pulsar J0737-3039A: Constraining the Nuclear Equation of State,” *Astrophys. J.* **617**, L135 (2004). [[arXiv:astro-ph/0411353](#)]
1. I. A. Morrison, T. W. Baumgarte, and S. L. Shapiro, “Effect of Differential Rotation on the Maximum Mass of Neutron Stars: Realistic Nuclear Equations of State,” *Astrophys. J.* **610**, 941 (2004) [[arXiv:astro-ph/0401581](#)]

### Pre-prints

1. I. A. Morrison, “On cosmic hair and ‘de Sitter breaking’ in linearized quantum gravity.” [[arXiv:1302.1860 \[gr-qc\]](#)]

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## PROFESSIONAL SERVICE AND ACTIVITIES

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**Referee for journals:** 28 manuscripts for *Journal of Cosmology and Astroparticle Physics*, *Physical Review Letters*, *Journal of High Energy Physics*, *Physical Review D*, *General Relativity and Gravitation*, *Journal of Mathematical Physics*, *Classical and Quantum Gravity*, *Annales Henri Poincaré*, *European Journal of Physics Plus*.

**Member of professional societies:** [International Society of General Relativity and Gravitation](#); American Physical Society, including the Division of Particles and Fields and the Topical Group on Gravitation; ; Full Member, [Association of Pennsylvania State College & University Faculties](#); [LGBT+Physicists Ally List](#); [Anacapa Society](#).

### Presentations on pedagogy:

JUNE 2016 *Montréal Physics Education Group Meeting*, Vanier College, “Making waves in the classroom: gravity waves and CEGEP physics.” [[KEYNOTE](#)] [[PDF](#)]

### Recent professional development:

SEPT. 2016 – WCU New Faculty Mentoring Program. Mentor: [Monica Joshi](#)  
 SEPT. 2016 [WCU LGBTQA Ally](#) Training (2 hours)  
 AUG. 2016 New Faculty Orientation, West Chester University (28 hours).  
 JUNE 2016 Participant and speaker, *Montréal Physics Education Group Meeting* (6.5 hour workshop).  
 2014 – 2016 Participant in pedagogy workshops offered by McGill Teaching and Learning Services, McGill Writing Centre, and McGill Social Equity and Diversity Education Office (22.5 hours).  
 NOV. 2015 [Certificate of completion, Safer Spaces Workshop Suite](#) (15 hour course).  
 2015 – 2016 Member, McGill Space Institute Education and Outreach discussion group.

### Teaching Honors and Awards:

FALL 2016 WCU Honors College Outstanding Faculty

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## CAMPUS AND DEPARTMENTAL SERVICE

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### West Chester University:

SEPT. 2016 – [WCU LGBTQA Ally](#)  
 SEPT. 2016 – WCU Academic Integrity and Grade Appeal Board volunteer  
 OCT. 2016 Admissions Fall Preview Day

### McGill University:

2015 – 2016 [McGill Safe Spaces Ally](#)

- 2014 – 2016 Student Mentor, McGill Graduate Association of Physics Students [Mentorship Program](#)
- 2014 – 2016 Co-organizer, Center for High Energy Physics seminar series
- JAN. 2016 Organizer, McGill Space Institute diversity discussion “Being gay in astrophysics: one persons perspective on issues faced by LGBT astrophysicists in academia,” by Omer Blaes (UCSB)
- SEPT. 2015 Judge for McGill Undergraduate Student Research Poster Competition
- AUG. 2014 Co-organizer, workshop on “[Applications of AdS/CFT to cosmology and black hole physics](#)”

### Previous Institutions:

- 2011 – 2012 Co-organizer, weekly GR Seminar, DAMTP
- 2009 – 2010 Co-organizer, graduate student high-energy physics journal club, UCSB

### POST-GRADUATE PRESENTATIONS

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In my career I have given 24 invited talks, 11 contributed talks, and 5 department talks.

- NOV. 2016 WCU Research Day, “Forbidden symmetries in cosmological inflation.”
- JULY 2016 *21st International Conference on General Relativity and Gravitation*, New York, “Conserved charges for integrable QFTs in inflation.”
- APRIL 2016 Seminar, Reed College, “Bringing precision to our description of the early quantum universe.”
- FEB. 2016 Colloquium, West Chester University, “Bringing precision to our description of the early quantum universe.”
- FEB. 2016 Colloquium, Transylvania University, “Bringing precision to our description of the early quantum universe.”
- FEB. 2016 Seminar, University of Kentucky, “Bulk reconstruction in AdS/CFT.”
- SEPT. 2015 *AdS/CFT and Quantum Gravity*, Centre de Recherches Mathématiques, Université de Montréal, “Constraints from higher-spin symmetry in de Sitter QFTs.”
- JULY 2015 *Quantum fields and IR Issues in de Sitter Space*, International Institute of Physics, Federal University of Rio Grande do Norte, Natal, Brazil, “Constraints from higher-spin symmetry in de Sitter QFTs.”
- JULY 2015 *AdS/CFT, self-adjoint extension and the resolution of cosmological singularities*, Centre de Recherches Mathématiques, Université de Montréal, “Constraints from higher-spin symmetry in de Sitter QFTs.”
- JULY 2015 *AdS/CFT, self-adjoint extension and the resolution of cosmological singularities*, Centre de Recherches Mathématiques, Université de Montréal, “Boundary-to-bulk maps and the Reeh-Schlieder property in holography.”

- APRIL 2015 *Entanglement in Strongly-Correlated Quantum Matter*, Kavli Institute for Theoretical Physics, Santa Barbara, “Recent results in holographic entanglement entropy.”
- FEB. 2015 Seminar, McGill University, “Behind the horizon without analyticity.”
- DEC. 2014 Colloquium, Chapman University, “Controlling the early quantum universe.”
- AUG. 2014 *Applications of AdS/CFT for cosmology and black hole physics*, McGill University, “How to probe your wormhole.”
- MAR. 2014 Seminar, McGill University, “Boundary-to-bulk maps and the Reeh-Schlieder property in holography.”
- OCT. 2013 Seminar, Centre de Recherches Mathématiques, Université de Montréal, “Towards exact scattering matrices in de Sitter space.”
- SEPT. 2013 Seminar, McGill University, “Toward exact de Sitter S-matrices.”
- JULY 2013 *20th International Conference on General Relativity and Gravitation*, Warsaw, “The exact de Sitter S-matrix of Principal Chiral Models.”
- MAY 2013 Seminar, University of Cambridge, “The exact de Sitter S-matrix of Principal Chiral Models.”
- FEB. 2013 Joint ULB-VUB-KUL-UMons-Solvay Seminar, KU Leuven, “Recent progress on the de Sitter S-matrix.”
- JAN. 2013 Seminar, Durham University, “On cosmic hair and “de Sitter breaking” in quantum gravity.”
- NOV. 2012 Seminar, Perimeter Institute, “Recent progress on the de Sitter S-matrix.”
- NOV. 2012 Seminar, McGill University, “Recent progress on the de Sitter S-matrix.”
- OCT. 2012 Seminar, University of Nottingham, “A cosmic no-hair theorem for linearized quantum gravity in de Sitter space.”
- SEPT. 2012 *The Physics of de Sitter Spacetime*, Albert Einstein Institute, Hannover, “Bulk unitarity and the global de Sitter S-matrix.”
- SEPT. 2012 Seminar, Albert Einstein Institute, Potsdam-Golm, “Unitarity in dS/CFT.”
- APRIL 2012 *Simons Postdoctoral Fellows Meeting*, Simons Center for Geometry and Physics, SUNY Stony Brook, “Asymptotic states in de Sitter space.”
- OCT. 2011 Seminar, University of York, “The de Sitter S-matrix.”
- OCT. 2011 Seminar, University of Cambridge, “The de Sitter S-matrix.”
- JUNE 2011 *Peyresq 16*, Peyresq, France, “Gauge artifacts and the IR stability of perturbative quantum gravity in dS.”