

Evan McDonough

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Academic Appointments

January 2023 - :	Director, Winnipeg Institute of Theoretical Physics
Fall 2021 - :	University of Winnipeg Assistant Professor of Physics
2020 -2021 :	University of Chicago Kavli Fellow , Enrico Fermi Fellow Faculty contact: Wayne Hu, Rocky Kolb
2020:	Massachusetts Institute of Technology Banting Fellow Faculty contact: Alan Guth, David Kaiser
2017-2020:	Brown University Post-Doctoral Research Associate, Presidential Scholar Post-doctoral Researcher Faculty contact: Stephon Alexander, Jim Gates

Education

2012-2017:	McGill University Ph.D. Physics, Advisor: Robert Brandenberger and Keshav Dasgupta
2008-2012:	McGill University Hon. B.Sc. Physics

Grants

NSERC Discovery Grant. 2022-2026

Proposal: *Dark Matter in Extreme Environments*

Amount: \$205,000 (\$41k/yr, 5 years).

Arthur B. McDonald Canadian Astroparticle Physics Research Institute, HQP Shared Resources Grant. 2022-2023.

Proposal: *Ultralight Dark Matter*

Amount: \$40,000 (\$20k/yr, 2 years).

Publications

Summary statistics as of 03/28/2023:

h-index: 22,

published papers: 38; including preprints: 44

39.8 cites per published paper.

2023:

44. M. Cicoli, M. Licheri, R. Mahanta, E. McDonough, F. G. Pedro and M. Scalisi, *Early Dark Energy in Type IIB String Theory*, Preprint available at [[arXiv:2303.03414](https://arxiv.org/abs/2303.03414)].
43. W. Qin, S. R. Geller, S. Balaji, E. McDonough and D. I. Kaiser, *Planck Constraints and Gravitational Wave Forecasts for Primordial Black Hole Dark Matter Seeded by Multifield Inflation*, Preprint available at [[arXiv:2303.02168](https://arxiv.org/abs/2303.02168)].

2022:

42. M. X. Lin, E. McDonough, J. C. Hill and W. Hu, *A Dark Matter Trigger for Early Dark Energy Coincidence*, Preprint available at [[arXiv:2212.08098](https://arxiv.org/abs/2212.08098)].
41. L. Jenks, K. Koutrolikos, E. McDonough, S. Alexander and S. J. Gates, *Towards A Direct Detection of the Spin of Dark Matter*, Preprint available at [[arXiv:2212.07442](https://arxiv.org/abs/2212.07442)].
40. E. W. Kolb, A. J. Long, E. McDonough and G. Payeur, *Completely Dark Matter from Rapid-Turn Multifield Inflation*, Preprint available at [[arXiv:2211.14323](https://arxiv.org/abs/2211.14323)].
39. E. McDonough and M. Scalisi, *Towards Early Dark Energy in String Theory*, Preprint available at [[arXiv:2209.00011](https://arxiv.org/abs/2209.00011)].
38. A. Maleknejad and E. McDonough, *Ultra-Light Pion (ULP) and Baryon WIMPzilla Dark Matter*. Phys.Rev.D 106 (2022) 9, 095011 [[arXiv:2205.12983](https://arxiv.org/abs/2205.12983)].
37. S. Geller, W. Qin. E. McDonough, and D. I. Kaiser, *Primordial Black Holes from Multifield Inflation with Nonminimal Couplings*. Phys.Rev.D 106 (2022) 6, 063535 [[arXiv:2205.04471](https://arxiv.org/abs/2205.04471)].

2021:

36. E. McDonough, M. X. Lin, J. C. Hill, W. Hu and S. Zhou, *The Early Dark Sector, the Hubble Tension, and the Swampland*. Phys.Rev.D 106 (2022) 4, 043525 [[arXiv:2112.09128](https://arxiv.org/abs/2112.09128)].
35. S. Alexander, C. Capanelli, E. G. M. Ferreira, and E. McDonough, *Cosmic Filament Spin from Dark Matter Vortices*. Phys.Lett.B 833 (2022) 137298 [[arXiv:2111.03061](https://arxiv.org/abs/2111.03061)].

34. K. Inomata, E. McDonough and W. Hu, *Amplification of Primordial Perturbations from the Rise or Fall of the Inflaton*. JCAP 02 (2022) 02, 031 [[arXiv:2110.14641](#)].
33. K. Inomata, E. McDonough, and W. Hu, *Primordial Black Holes Arise When The Inflaton Falls*. Phys.Rev.D 104 (2021) 12, 123553. [[arXiv:2104.03972](#)].
32. E. W. Kolb, A. J. Long and E. McDonough, *The Gravitino Swampland Conjecture*. Phys. Rev. Lett. 127 (2021) 13, 131603 [[arXiv:2103.10437](#)].
31. E. W. Kolb, A. J. Long, and E. McDonough, *Catastrophic Production of Slow Gravitinos*. Phys. Rev. D 104 (2021) 7 [[arXiv:2102.10113](#)].

2020:

30. S. Alexander, E. McDonough, and David N. Spergel, *Strongly-Interacting Ultralight Millicharged Particles*. Phys. Lett. B, 822, 2021, 136653. [[arXiv:2011.06589](#)].
29. S. Alexander, L. Jenks and E. McDonough, *Higher Spin Dark Matter*. Phys. Lett. B 819, 2021,136436. [[arXiv:2010.15125](#)].
28. E. McDonough, A. H. Guth, D. I. Kaiser, *Nonminimal Couplings and the Forgotten Field of Axion Inflation*. Preprint available at [[arXiv:2010.04179](#)].
27. M. M. Ivanov, E. McDonough, J. C. Hill, M. Simonović, M. W. Toomey, S. Alexander, and M. Zaldarriaga, *Constraining Early Dark Energy with Large-Scale Structure*. Phys. Rev. D 102 (2020) 103502 . [[arXiv:2006.11235](#)].
26. J. C. Hill, E. McDonough, M. W. Toomey and S. Alexander, *Early Dark Energy Does Not Restore Cosmological Concordance*. Editors suggestion, Phys. Rev. D 102 (2020) 4, 043507 . [[arXiv:2003.07355](#)].
25. S. Alexander, G. Herczeg, J. Liu and E. McDonough, *Chiral Symmetry and the Cosmological Constant*. Phys. Rev. D 102 (2020) 8, 083526. [[arXiv:2003.08416](#)].
24. E. McDonough, *The Cosmological Heavy Ion Collider: Fast Thermalization after Cosmic Inflation*. Phys. Lett. B 809 (2020) 135755. [[arXiv:2001.03633](#)].

2019:

23. S. Alexander, E. McDonough, A. Pullen and B. Shapiro, *Physics Beyond The Standard Model with Circular Polarization in the CMB and CMB-21cm Cross-Correlation*. JCAP **2001**, no. 01, 032 (2020) [[arXiv:1911.01418](#)].
22. S. Alexander, S. Gleyzer, E. McDonough, M. W. Toomey and E. Usai, *Deep Learning the Morphology of Dark Matter Substructure*. Ap. J. 15 **893** (2020) [[arXiv:1909.07346](#)].
21. S. Alexander, S. J. Gates Jr. , L. Jenks, K. Koutrolikos, and E. McDonough, *Higher Spin Supersymmetry at the Cosmological Collider: Sculpting SUSY Rilles in the CMB*. JHEP **1910**, 156 (2019) [[arXiv:1907.05829](#)].

20. S. Alexander and E. McDonough, *Axion-Dilaton Destabilization and the Hubble Tension*. Phys. Lett. B797 (2019) [[arXiv:1904.08912](#)].
19. R. Kallosh, A. Linde, E. McDonough, and M. Scalisi, *dS vacua and the Swampland*. JHEP 1903 (2019) 134 [[arXiv:1901.02022](#)].
18. S. Alexander, J. Bramburger, and E. McDonough, *Dark Disk Substructure and Superfluid Dark Matter*. Phys. Lett. B797 (2019) [[arXiv:1901.03694](#)].

2018:

17. S. Alexander and E. McDonough, *Primordial Circular Polarization in the Cosmic Microwave Background*. Phys. Lett. B 0370 (2018) 2693 [[arXiv:1811.05953](#)].
16. R. Kallosh, A. Linde, E. McDonough and M. Scalisi, *4d models of dS uplift in KKLT*. Phys.Rev. D99 (2019) no.4, 046006 [[arXiv:1809.09018](#)].
15. S. Alexander, E. McDonough, R. Sims and N. Yunes, *Hidden-Sector Modifications to Gravitational Waves From Binary Inspirals*, Class. Quant. Grav. 35, no. 23, 235012 (2018) [[arXiv:1808.05286](#)].
14. R. Kallosh, A. Linde, E. McDonough and M. Scalisi, *de Sitter Vacua with a Nilpotent Superfield*. Fortschr. Phys. 2018, 1800068 [[arXiv:1808.09428](#)].
13. K. Dasgupta, M. Emelin, E. McDonough, and R. Tatar, *Quantum Corrections and the de Sitter Swampland Conjecture*. JHEP **1901**, 145 (2019) [[arXiv:1808.07498](#)].
12. S. Alexander and E. McDonough, *Observable Chiral Gravitational Waves from Inflation in String Theory*. JCAP 1811, no. 11, 030 (2018) [[arXiv:1806.05684](#)].
11. S. Alexander, E. McDonough, and D. N. Spergel, *Chiral Gravitational Waves and Baryon Superfluid Dark Matter*, JCAP 1805, no. 05, 003 (2018) [[arXiv:1801.07255](#)].

2013-2017:

10. H. Bazrafshan Moghaddam, E. McDonough, R. Namba, and R. H. Brandenberger, *Inflationary magneto-(non)genesis, increasing kinetic couplings, and the strong coupling problem*, Class. Quant. Grav. 35, no. 10, 105015 (2018) [[arXiv:1707.05820](#)].
9. S. Alexander, E. McDonough, and R. Sims, *V-mode Polarization in Axion Inflation and Preheating*, Phys. Rev. D 96, no. 6, 063506 (2017) [[arXiv:1704.00838](#)].
8. E. McDonough and M. Scalisi, *Inflation from Nilpotent Kähler Corrections*, JCAP 1611, no. 11, 028 (2016) [[arXiv:1609.00364](#)].
7. K. Dasgupta, M. Emelin, and E. McDonough, *Fermions on the Anti-Brane: Higher Order Interactions and Spontaneously Broken Supersymmetry*, Phys. Rev. D 95, 026003 [[arXiv:1601.03409](#)].
6. E. McDonough, H. B. Moghaddam, and R. H. Brandenberger, *Preheating and Entropy Perturbations in Axion Monodromy Inflation*, JCAP 1605 (2016) 012 [[arXiv:1601.07749](#)].

5. K. Dasgupta, M. Emelin, and E. McDonough, *Non-Kahler Resolved Conifold, Localized Fluxes in M-Theory and Supersymmetry*, JHEP 1502 (2015) 179 [[arXiv:1412.3123](#)].
4. L. P. Levasseur and E. McDonough, *Backreaction and Stochastic Effects in Single Field Inflation*, Phys.Rev. D91 (2015) 063513 [[arXiv:1409.7399](#)].
3. K. Dasgupta, R. Gwyn, E. McDonough, M. Mia, and R. Tatar. *de Sitter Vacua in Type IIB String Theory: Classical Solutions and Quantum Corrections*, JHEP 1407, 054 (2014) [[arXiv:1402.5112](#)].
2. Y. -F. Cai, E. McDonough, F. Duplessis and R. H. Brandenberger, *Two Field Matter Bounce Cosmology*, JCAP 1310, 024 (2013) [[arXiv:1305.5259](#)].
1. E. McDonough and R. H. Brandenberger, *Searching for Signatures of Cosmic String Wakes in 21cm Redshift Surveys using Minkowski Functionals*, JCAP 1302, 045 (2013) [[arXiv:1109.2627](#)].

Student Mentoring and Research Supervision

Research Supervision as Faculty:

Undergraduate: two summer undergraduate researchers, 2022.

Graduate: PhD candidate, McGill University, Sept. 2022 -

High School: Maples Met Internship. Student won provincial science fair competition, CAP medal, and silver medal in Canada-Wide Science Fair

Research Supervision as Postdoc (via informal co-supervision arrangement):

Density Perturbations Group, MIT: Mentor and informal research co-supervisor to five (5) undergraduate students in the Density Perturbations Group (DPG) at the MIT, led by Alan Guth and David Kaiser.

Presidential Scholars Program, Brown University: Mentor, tutor, and advisor to undergraduate [Presidential Scholars](#) at Brown University.

Brown University, Research Supervision: co-supervision of six (6) undergraduate research projects, and nine (9) graduate theses.

Awards and Honours

Selected awards and prizes totaling \$311,000 .

Banting Fellowship, Government of Canada.

2020. \$140,000. *National Prize Postdoctoral Fellowship*

Post-Doctoral Fellowship (PDF), Natural Sciences and Engineering Research Council (NSERC)

2017-2019, \$90,000. *National Award.*

P. R. Wallace Thesis Prize, Canadian Association of Physicists,

2019. *National award for best Doctoral thesis.*

Prix Meilleur Etudiant, Centre de Recherches Mathematiques (CRM)

2017, \$1,000. *National award for Doctoral research.*

Post-Graduate Scholar Doctoral fellowship (PGS D), Natural Sciences and Engineering Research Council (NSERC).

2014-2017, \$63,000. *National award.*

Lorne Trottier Science Accelerator Fellowship, McGill University

2014, \$5,000. *Award from McGill University.*

Wolfe Fellowship in Scientific and Technological Literacy, McGill University

2015, \$12,000. *Award from McGill University.*

Teaching

Course Instructor

PHYS 2106: Math Physics II

Winter 2022 & Winter 2023, University of Winnipeg

Enrolment: 13 students.

Mathematical methods for undergraduate physics students. Sole instructor, responsible for all teaching and assessment.

Course Instructor

PHYS 4201: Electrodynamics

Fall & Winter 2021-2022 & 2022-2023, University of Winnipeg

Enrolment: 6 students.

Advanced electromagnetism for upper-year undergraduates. Sole instructor, responsible for all teaching and assessment.

Guest Lecturer

PHYS 0150: The Jazz of Physics

Fall 2017, Fall 2018, Fall 2019. Brown University

Enrolment: 40 students.

Designed and gave 6 lectures per term.

Course Co-Instructor

PHYS 743: Very Early Universe
Fall 2016, McGill University
Enrolment: 11 students.

Designed and organized the course, gave four lectures, and assessed student performance. Utilized the 'just in time' teaching method.

Course Organizer

PHYS 731: Mathematical Methods of High Energy Physics (Special Topics Course)
Winter 2013, McGill University
Enrollment: 4 students.

Organized and led a reading course on mathematical aspects of higher energy physics, for graduate students at McGill University.

Lecturer:

Summer Lectures on Topological Defects and Cosmology
May-June 2012, McGill University.

Lecture series (8 lectures) on topological defects (e.g. cosmic strings, monopoles) and their observational signatures to undergraduate and graduate students at McGill University.

Professional Service and Activities

Scientific Council Member, Institute of Particle Physics

Director, Winnipeg Institute for Theoretical Physics

Chair, Departmental Colloquium Committee, University of Winnipeg Physics department.

Chair, Graduate Program Committee, University of Winnipeg Physics department.

Diversity and Inclusion Committee: Serving member and post-doc representative on the Departmental Diversity and Inclusion Action Plan (DDIAP) committee, Brown University Physics department.

Referee for journals: Referee for *Physical Review Letters*, *Journal of High Energy Physics*, *Physical Review D*, and *European Physics Journal C*.

Conference Co-organizer: *String Theory and Cosmology*, June 15 - 16, 2019. Gordon Research Seminar, Barcelona, Spain.

Workshop Co-organizer: *Northeast Cosmology Workshop*, March 16-18, 2018. Workshop at McGill University.

Seminar Series Organizer: *Brown Physics Post-Doc Journal Club*, 2018-2019, Brown University.

Session Chair: “Quantum Gravity and Gravitational Waves”, *Theory Canada 13* June 7-10, 2018. National conference at St. Francis-Xavier University.

Seminar Series Organizer: *High Energy Theory Journal Club*, 2015-2017, McGill University.

Webmaster for the High Energy Physics Seminars Listing Website: Fall 2015 - 2017.

Seminars and Invited Talks

Recordings of talks at Stanford University, at the Institute for Advanced Study, and at the Perimeter Institute, can be found on my website here: www.evanmcdonoughphysics.com.

Talks in order of date:

55. Invited colloquium speaker, Prairie University Physics Speaker Series (PUPSS), University of Regina, *Cosmological Condensed Matter Physics*, Feb 10, 2023.
54. Invited colloquium speaker, Prairie University Physics Speaker Series (PUPSS), University of Saskatoon, *Cosmological Condensed Matter Physics*, Feb 9, 2023.
53. WITP Colloquium, Brandon University, January 16, *Cosmological Condensed Matter Physics*, Feb 9, 2023.
52. Invited colloquium speaker at the University of Manitoba, *Ultralight Dark Matter and Cosmological Condensed Matter Physics*, November 25, 2022.
51. Invited colloquium speaker at the University of North Dakota, *Ultralight Dark Matter and Cosmological Condensed Matter Physics*, October 28, 2022.
50. Invited talk at McGill University, *Ultralight Dark Matter from A(LPs) to U(LPs)*, October 12, 2022.
49. Keynote talk at Canadian Association of Physicists (CAP) Congress 2022, McMaster University, Hamilton ON. *Ultralight Dark Matter and Cosmological Condensed Matter Physics*, June 9, 2022.
48. Invited talk at the Institute for Advanced Study, Princeton, NJ, *Ultralight Dark Matter and Cosmological Condensed Matter Physics*, April 21st, 2022.
47. Invited talk at the University of Calgary, *The Light and Fuzzy Side of Dark Matter*, February 17th, 2022.
46. Invited talk at the University of Lethbridge, *The Light and Fuzzy Side of Dark Matter*, February 1st, 2022.
45. Invited talk at CITA National Jamboree, *Strongly Interacting Millicharged Particles*, October 8th, 2021.

44. Invited talk at Peebles Symposium, Canadian Association of Physicists Congress 2021, *New Directions for Dark Matter*, June 8th, 2021.
43. Invited talk at Stanford, *Catastrophic Production of Slow Gravitinos*. May 14, 2021.
42. Invited talk at CERN, *Catastrophic Production of Slow Gravitinos*. May 12, 2021.
41. Invited talk at Ben Gurion University, *Catastrophic Production of Slow Gravitinos*. May 10, 2021.
40. Invited talk at McGill University, *The Gravitino Swampland Conjecture*. Apr. 26, 2021.
39. Invited talk at University of Illinois at Urbana-Champaign, *Catastrophic Production of Slow Gravitinos*. Apr. 23, 2021.
38. Invited talk at String Pheno Webinar, *The Gravitino Swampland Conjecture*. Apr. 13, 2021.
37. Invited talk at the University of Chicago, Kadanoff Center for Theoretical Physics, *The Gravitino Swampland Conjecture*. Apr. 7, 2021.
36. Invited talk at Queen's University, *Constraining Early Dark Energy with Large Scale Structure*. Mar. 16, 2021.
35. Invited talk at Higher Spin Gravity Webinar, *Higher Spin Dark Matter*. Mar. 2, 2021.
34. Invited talk at the Perimeter Institute for Theoretical Physics, *Constraining Early Dark Energy with Large Scale Structure*. Feb. 16, 2021.
33. Invited talk at the University of New Brunswick, *Higher Spin Dark Matter*. Feb. 9, 2021.
32. Invited talk at Newton 1665 seminar, *STUMP Dark Matter*. Jan. 26, 2021.
31. Invited talk at the Massachusetts Institute of Technology, Joint MIT/Tufts cosmology seminar, *Constraining Early Dark Energy with Large Scale Structure*. Oct. 20, 2020.
30. Invited talk at MPA Garching, *Constraining Early Dark Energy with Large Scale Structure*. Oct. 20, 2020.
29. Invited talk at PACMAN (Particle Astro/Cosmo Meeting Around NYC) seminar, *Ultra-light Fermionic Dark Matter: Halo Cores as Dark Neutron Stars*. Oct. 13, 2020.
28. Invited talk at Copernicus Webinar Series, *Constraining Early Dark Energy with Large Scale Structure*. July 23, 2020.
27. Invited talk at the Theoretical Cosmology, Gravity and Fields Workshop, Dartmouth College. *Constraining Early Dark Energy with Large Scale Structure*. July 21, 2020.
26. Invited talk at University of Illinois Urbana-Champaign, *Gravitational Lamp Posts for Dark Matter Physics*. Dec. 6, 2019.
25. Invited talk at Northeastern University, *The Chirality of Primordial Gravitational Waves*. Sept. 30, 2019.

24. Invited talk at Theory Canada 14, *New (Old) Gravitational Probes of Dark Matter*. May 31, 2019.
23. Invited Lecture at Atlantic General Relativity 2019, *Primordial Cosmology and High Energy Physics*. May 27, 2019.
22. Seminar at the Flatiron Institute, Center for Computational Astrophysics, *Strong Gravity Probes of Dark Matter*. May 1, 2019
21. Seminar at the ETH Zurich, *The Chirality of Primordial Gravitational Waves*. March 22, 2019
20. Seminar at the Max Planck Institute for Astrophysics (MPA) Garching, *The Chirality of Primordial Gravitational Waves*. March 19, 2019
19. Seminar at the Syracuse University, *The Chirality of Primordial Gravitational Waves*, Dec 11, 2018.
18. Seminar at the Massachusetts Institute of Technology, *The Chirality of Primordial Gravitational Waves*, Dec 11, 2018.
17. Invited Speaker at [Canadian Association of Physicists \(CAP\) Congress 2018](#), June 11-15, 2018. Dalhousie University, Halifax, Nova Scotia.
16. Session Chair and contributed talk at the [Theory Canada 13](#), June 7-9, 2018. St. Francis Xavier University, Antigonish, Nova Scotia.
15. Invited speaker at conference [New England Cosmology Workshop](#), October 13-14, 2018. Massachusetts Institute of Technology.
14. Seminar at the Dartmouth College, *Chiral Gravitational Waves and Baryon Superfluid Dark Matter*, May 2, 2018.
13. Seminar at the University of Pennsylvania, *Chiral Gravitational Waves and Baryon Superfluid Dark Matter*, April 26, 2018.
12. Seminar at the New York University, *Chiral Gravitational Waves and Baryon Superfluid Dark Matter*, April 17, 2018.
11. Seminar at the Institute for Advance Study, Princeton, *Chiral Gravitational Waves and Baryon Superfluid Dark Matter*, March 12, 2018.
10. Seminar at Harvard University, Dvorkin-Finkbeiner-Kovacs journal club, *Chiral Gravitational Waves and Baryon Superfluid Dark Matter*, February 20, 2018.
9. Seminar at Tufts University, *Anti-Brane Induced Inflation*, November 14, 2017.
8. Invited speaker at conference [String Theory and Cosmology: Cosmic Origin and Cosmic Fate, From Big Bang to Dark Energy](#) May 27-28, 2017, Italy.
7. Seminar at Brown University, *Primordial Black Holes and Preheating in Axion Inflation*, April 26, 2016.

6. Contributed talk, *Fermions on the Antibrane*, at the workshop [Northeast Gravity Workshop](#), April 22-24, 2016, hosted by UMass Amherst.
5. Seminar at the Massachusetts Institute of Technology, *Preheating in Axion Inflation Models*, April 12, 2016.
4. Seminar at the University of California at Berkeley, *Fermions on the Anti-Brane: Higher Order Interactions and Spontaneously Broken Supersymmetry*, March 1, 2016.
3. Seminar at the University of Chicago, *de Sitter in String Theory: A story of branes, planes, and quantum corrections*, June 12, 2014.
2. Seminar at Ecole Physique Les Houches, *Pour some SUGRA on me: Supergravity and Superconformal Gauge Theory*, while attending summer school *Post-Planck Cosmology*, July 3 - August 3, 2013.
1. Contributed talk, *Two Field Matter Bounce Cosmology*, at the conference [Theory Canada 8](#), May 24-26, 2013, hosted by Bishop's University.