



REBECCA K. LEANE

MIT Center for Theoretical Physics
77 Massachusetts Avenue, 6C-405
Cambridge, MA 02139, USA

+1 (617) 256 6262
rleane@mit.edu
rebeccaleane.com

RESEARCH INTERESTS	Dark Matter Phenomenology, Particle Astrophysics and Cosmology, Neutron Stars, Galactic Center Excess, Physics Beyond the Standard Model	
ACADEMIC APPOINTMENTS	Massachusetts Institute of Technology <i>MIT Center for Theoretical Physics</i> Postdoctoral Research Associate	2017–Present
EDUCATION	University of Melbourne <i>Centre of Excellence for Particle Physics at the Terascale (CoEPP)</i> Ph.D. in Theoretical Particle Physics Thesis Advisor: Prof. Nicole Bell	2013–2017
	University of Cambridge <i>Department of Applied Mathematics and Theoretical Physics (DAMTP)</i> Master of Advanced Study in Mathematics (Part III of the Mathematical Tripos) Essay Advisor: Prof. Ben Allanach	2012–2013
	Monash University Bachelor of Science Advanced with Honours Majors: Physics and Mathematics. High Distinction. Thesis Advisor: Prof. Csaba Balazs	2008–2011
FUNDED GRANTS	NASA Fermi Guest Investigator Program, Cycle 12, \$70,000 USD Grant No. 80NSSC19K1515, Slatyer and Leane	2019–2020
PRIZES, AWARDS & SCHOLARSHIPS	Chancellor’s Prize for Excellence in the PhD Thesis, U. Melbourne Dean’s Award for Excellence in Graduate Research, U. Melbourne Australian Government Research Training Program Scholarship Royal Society of Victoria Young Scientist Research Prize Science Abroad Travelling Scholarship Laby Foundation Early Career Researcher Travel Scholarship Australian Postgraduate Award (APA) Monash Jubilee Honours Scholarship J. L. William Honours Scholarship	2018 2018 2017 2016 2016 2015 2012–2016 2011 2011

Asterisk indicates alphabetical order list (as per convention in theoretical particle physics).

18. **R. K. Leane** 2020
 Indirect Detection of Dark Matter in the Galaxy
 MIT-CTP/5199, [arXiv:[2006.00513](#) [hep-ph]]

17. **R. K. Leane** and T. R. Slatyer 2020
 The Enigmatic Galactic Center Excess:
 Spurious Point Sources and Signal Mismodeling
 Submitted to PRD, MIT-CTP/5178, [arXiv:[2002.12371](#) [astro-ph.HE]]

16. **R. K. Leane** and T. R. Slatyer 2020
 Spurious Point Source Signals in the Galactic Center Excess
 Submitted to PRL, MIT-CTP/5170, [arXiv:[2002.12370](#) [astro-ph.HE]]

15. D. Hooper, **R. K. Leane***, Y. Tsai, S. Wegsman, S. Witte 2019
 A Systematic Study of Hidden Sector Dark Matter:
 Application to the Gamma-Ray and Antiproton Excesses
 Submitted to JHEP, MIT-CTP/5157, [arXiv:[1912.08821](#) [hep-ph]]

14. J. Acevedo, J. Bramante, **R. K. Leane***, N. Raj 2019
 Cooking Pasta with Dark Matter:
 Kinetic and Annihilation Heating of Neutron Star Crusts
 JCAP 03 (2020) 038, MIT-CTP/5152, [arXiv:[1911.06334](#) [hep-ph]]

13. **R. K. Leane** and T. R. Slatyer 2019
 Dark Matter Strikes Back at the Galactic Center
 Phys. Rev. Lett. 123 (2019) 241101, MIT-CTP/5104,
 [arXiv:[1904.08430](#) [astro-ph.HE]]
Selected as PRL Editor's Suggestion, Featured in Physics

12. M. Un Nisa, J. F. Beacom, S. Y. BenZvi, 2019
R. K. Leane, T. Linden, K. C.Y. Ng, A. H.G. Peter, B. Zhou
 The Sun at GeV-TeV Energies: A New Laboratory for Astroparticle Physics
 Astro2020 Science White Paper (2019) [arXiv:[1903.06349](#) [astro-ph.HE]]

11. HAWC Collaboration and 2018
 J.F. Beacom, **R. K. Leane***, T. Linden, K. C.Y. Ng, A. Peter, B. Zhou
 Constraints on Spin-Dependent Dark Matter Scattering
 with Long-Lived Mediators from TeV Observations of the Sun with HAWC
 Phys. Rev. D 98 (2018), 123012, MIT-CTP/5038, [arXiv:[1808.05624](#) [hep-ph]].

10. HAWC Collaboration and 2018
 J.F. Beacom, **R. K. Leane***, T. Linden, K. C.Y. Ng, A. Peter, B. Zhou
 First HAWC Observations of the Sun Constrain Steady TeV Gamma-Ray Emission
 Phys. Rev. D 98 (2018), 123011, MIT-CTP/5037, [arXiv:[1808.05620](#) [astro-ph.HE]]

9. **R. K. Leane**, T. R. Slatyer, J. F. Beacom, K. C.Y. Ng 2018
GeV-Scale Thermal WIMPs: Not Even Slightly Dead
MIT-CTP/5020, Phys. Rev. D98 (2018), 023016 [arXiv:[1805.10305](#) [hep-ph]]
8. N. F. Bell, Y. Cai, J. B. Dent, **R. K. Leane***, T. J. Weiler 2017
Enhancing Dark Matter Annihilation Rates with Dark Bremsstrahlung
Phys. Rev. D96 (2017), 023011 [arXiv:[1705.01105](#) [hep-ph]]
7. **R. K. Leane**, K. C.Y. Ng, J. F. Beacom 2017
Powerful Solar Signatures of Long-Lived Dark Mediators
Phys. Rev. D95 (2017), 123016 [arXiv:[1703.04629](#) [astro-ph.HE]]
6. N. F. Bell, Y. Cai, **R. K. Leane*** 2016
Impact of Mass Generation for Spin-1 Mediator Simplified Models
JCAP 01 (2017) 039 [arXiv:[1610.03063](#) [hep-ph]]
5. N. F. Bell, Y. Cai, **R. K. Leane*** 2016
Dark Forces in the Sky: Signals from Z' and the Dark Higgs
JCAP 08 (2016) 001 [arXiv:[1605.09382](#) [hep-ph]]
4. N. F. Bell, Y. Cai, **R. K. Leane*** 2015
Mono- W Dark Matter Signals at the LHC: Simplified Model Analysis
JCAP 01 (2016) 051 [arXiv:[1512.00476](#) [hep-ph]]
3. N. F. Bell, Y. Cai, J. B. Dent, **R. K. Leane***, T. J. Weiler 2015
Dark matter at the LHC: Effective field theories and gauge invariance
Phys. Rev. D92, 053008 (2015) [arXiv:[1503.07874](#) [hep-ph]]
2. N. F. Bell, Y. Cai, **R. K. Leane***, A. D. Medina 2014
Leptophilic dark matter with Z' interactions
Phys. Rev. D 90, 035027 (2014) [arXiv:[1407.3001](#) [hep-ph]]
1. G. Brooijmans et al (incl **R. K. Leane***) 2012
Les Houches 2011: Physics at TeV Colliders New Physics Working Group Report
FERMILAB-CONF-12-924-T (2012) [arXiv:[1203.1488](#) [hep-ph]]
(*Note:* Contribution 1, “DLHA: Dark Matter Les Houches Agreement”, is heavily based on my bachelor thesis.)

TEACHING

- | | |
|--|-----------|
| Guest Lecturer for MIT graduate level course <i>8.811: Particle Physics II</i> | 2017 |
| Lecture Title: “Dark Matter Model Building” | |
| ATLAS International Masterclass Tutor, U. Melbourne | 2015 |
| Physics Teaching Assistant (Tutorials, Grading, Office Hours), U. Melbourne | 2014 |
| Physics Teaching Assistant (Lab Demonstrator, Grading), U. Melbourne | 2012 |
| Physics Teaching Assistant (Lab Demonstrator, Grading), Monash U. | 2011 |
| High School Senior Tutoring, Physics and Mathematics | 2008–2010 |

Invited Plenary/Overview Talks, and Colloquia:

- 57. Invited Plenary Talk, Identification of DM 2020, Vienna, Austria Jul 2020
- 56. Invited Overview Talk, Dark Matter 2020, Santander, Spain Jun 2020
(*postponed to 2021 due to covid-19*)
- 55. Invited Plenary Talk, 3rd World Summit on EDSU, Guadeloupe Mar 2020
- 54. Invited Colloquium, MIT, Cambridge MA, USA Feb 2020
- 53. Invited Plenary Talk, DM@LHC 2019, Seattle WA, USA Aug 2019
- 52. Invited Colloquium, University of Melbourne, Melbourne VIC, Australia Dec 2018
- 51. Invited Overview Talk, CAASTRO-CoEPP Joint Workshop, Australia Jan 2017

Invited Seminars and Other Conference Talks:

- 50. Invited Seminar, Kavli IPMU, Tokyo, Japan (remote) May 2020
- 49. Parallel Talk, Pheno 2020, Pittsburgh PA, USA (remote) May 2020
- 48. Invited Talk, Astrophysical Signatures of DM Workshop, MI, USA May 2020
(*postponed due to covid-19*)
- 47. Invited Talk, Aspen Winter Conf. on Particle Physics, Aspen CO, USA Mar 2020
(*postponed due to covid-19*)
- 46. Invited Seminar, U. Mass Amherst, Amherst MA, USA Feb 2020
- 45. Invited Seminar, Tufts University, Medford MA, USA Feb 2020
- 44. Invited Seminar, Boston University, Boston MA, USA Nov 2019
- 43. Invited Seminar, SLAC, Menlo Park CA, USA Oct 2019
- 42. Invited Seminar, Texas A&M University, College Station TX, USA Oct 2019
- 41. Invited Seminar, MIT Center for Theoretical Physics, Camb. MA, USA Sep 2019
- 40. Invited Seminar, Perimeter Institute, Waterloo ON, Canada Jun 2019
- 39. Invited Talk, Aspen Center for Physics, Aspen CO, USA Jun 2019
- 38. Invited Seminar, KICP, University of Chicago, Chicago IL, USA Apr 2019
- 37. Invited Seminar, Brown University, Providence RI, USA Apr 2019
- 36. Invited Seminar, Fermilab, Batavia IL, USA Mar 2019
- 35. Invited Seminar, Brandeis University, Boston MA, USA Mar 2019
- 34. Invited Seminar, Princeton University, Princeton NJ, USA Feb 2019
- 33. Invited Talk, TRIUMF Dark Matter Workshop, Vancouver BC, Canada Feb 2019
- 32. Parallel Talk, DESY Theory Workshop, Hamburg, Germany Sep 2018
- 31. Invited Seminar, University of Melbourne, Melbourne VIC, Australia Sep 2018
- 30. Parallel Talk, IDM 2018, Providence RI, USA Jul 2018
- 29. Parallel Talk, IDM 2018, Providence RI, USA Jul 2018
- 28. Invited Parallel Talk, PASCOS 2018, Cleveland OH, USA Jun 2018

27. Parallel Talk, Pheno 2018 Symposium, Pittsburgh PA, USA	May 2018
26. Invited Seminar, California Institute of Technology, Pasadena CA, USA	Apr 2018
25. Invited Seminar, LBNL, Berkeley CA, USA	Apr 2018
24. Invited Seminar, University of Michigan, Ann Arbor MI, USA	Apr 2018
23. Invited Seminar, Dartmouth University, Hanover NH, USA	Apr 2018
22. Invited Seminar, University of Melbourne, Melbourne VIC, Australia	Jan 2018
21. Invited Seminar, MIT Center for Theoretical Physics, Camb. MA, USA	Sep 2017
20. PhD Completion Seminar, University of Melbourne, Melb VIC, Australia	Mar 2017
19. Invited Talk, TRIUMF, Vancouver BC, Canada (remote)	Dec 2016
18. Invited Talk, ATLAS Astroparticle Forum Plenary Meeting, CERN (remote)	Nov 2016
17. Invited Talk, CETUP Dark Matter Workshop, Deadwood SD, USA	Jul 2016
16. Invited Seminar, University of Cincinnati, Cincinnati OH, USA	May 2016
15. Invited Seminar, CCAPP, Ohio State University, Columbus OH, USA	Jun 2016
14. Invited Seminar, UC Riverside, Riverside CA, USA	May 2016
13. Invited Seminar, UC Irvine, Irvine CA, USA	May 2016
12. Parallel Talk, Pheno 2016 Symposium, Pittsburgh PA, USA	May 2016
11. Invited Seminar, University of Melbourne, Melbourne VIC, Australia	Apr 2016
10. Invited Seminar, SLAC, Menlo Park CA, USA	Oct 2015
9. Invited Seminar, CCAPP, Ohio State University, Columbus OH, USA	Oct 2015
8. Invited Seminar, Fermilab, Batavia IL, USA	Sep 2015
7. Invited Seminar, Vanderbilt University, Nashville TN, USA	Sep 2015
6. Invited Seminar, University of Melbourne, Melbourne VIC, Australia	Aug 2015
5. Parallel Talk, SUSY2015, Lake Tahoe CA, USA	Aug 2015
4. Seminar, Geoff Opat Seminar Series, U. Melbourne, Australia	May 2015
3. Parallel Talk, CoSPA2014, Auckland, New Zealand	Dec 2014
2. Contributed Talk, RESCEU APCosPA School, Matsumoto, Japan	Jul 2014
1. Invited Seminar, University of Cambridge, UK	Jun 2013

OUTREACH & PRESS	Interview, <i>The Boston Globe Newspaper</i> , MIT scientists find dark matter could be cause of mysterious energy at the center of our galaxy	2019
	Interview, <i>MIT News</i> , Is there dark matter at the center of the Milky Way?	2019
	Press Piece, <i>APS Physics</i> , New Hope for Milky-Way Dark Matter	2019
	Interview, <i>Gizmodo</i> , The Future of Particle Physics Is Bright, Bleak, and Magical	2019
	Interview, <i>Quanta Magazine</i> , Dark Matter Gets a Reprieve in New Analysis	2019
	Interview, <i>Kavli Foundation</i> , Dark Matter is Back	2019
	Interview, <i>Science Magazine</i> , Physicists Revive Hunt for Dark Matter in the Heart of the Milky Way	2019
	Interview, <i>Popular Mechanics</i> , Filling the Void: What is Dark Matter?	2019
	Open House Talk, MIT Center for Theoretical Physics, Cambridge MA, USA	2018
	Young Scientist Research Prize Talk, Royal Society of Victoria, Australia	2016
	Key Scientific Researcher on International Science Documentary Series “Uranium: Twisting the Dragon’s Tail”	2014–2015
	Worked with Emmy Award winning producer Sonya Pemberton and writer Wain Fimeri part time over 12 months. Had a major role in explaining science content and developing the script for the series. Aired in the United States, Australia, Germany, France, Middle East, Norway and Sweden. The series has been nominated for and won numerous science communication and film awards.	
	Public Talk, Strathcona Girls’ School, Australia	2014
	Panel Member, National Science Week: Kids Ask Questions, Australia	2013
	Panel Member, National Science Week: Ask a Scientist, Australia	2013
SERVICE	Public Talk, Monash University Open Day Seminar Series, Australia	2011
	Physics Demonstrator, Monash University Open Day, Australia	2011
	Convener, Dark Matter Session, TeV Particle Astrophysics (TeVPA) Conference	2019
TECHNICAL SKILLS	Particle Theory Seminar Organizer, MIT Center for Theoretical Physics	2018–2020
	MIT Heising-Simons Physics Research Fellowship Peer Review Committee	2018
	Programming Languages: C/C++, Python, Bash/zsh, HTML/CSS, Mathematica (all working proficiency level)	
	Packages & Frameworks: FeynRules, MadGraph, Pythia, ROOT, MadAnalysis, Fastjet, Delphes, MultiNest, Micromegas, PPC4DMID, DRAGON, FeynArts, FeynCalc, TikZ, Minuit, Matplotlib	
	Other: Linux OS, L ^A T _E X	

Cambridge MA, June 1, 2020