

REBECCA K. LEANE

MIT Center for Theoretical Physics
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RESEARCH Dark Matter Phenomenology, Particle Astrophysics and Cosmology,
INTERESTS Collider Physics, Physics Beyond the Standard Model

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| ACADEMIC | Massachusetts Institute of Technology | 2017–Present |
| APPOINTMENTS | <i>MIT Center for Theoretical Physics</i> Postdoctoral Research Associate | |
| | <i>MIT Kavli Institute for Astrophysics and Space Research</i> Affiliate Postdoctoral Scholar | |

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| EDUCATION | University of Melbourne | 2013–2017 |
| | <i>Centre of Excellence for Particle Physics at the Terascale (CoEPP)</i> | |
| | Ph.D. in Theoretical Particle Physics | |
| | Thesis Title: Phenomenology of Particle Dark Matter | |
| | Thesis Advisor: A/Prof. Nicole Bell | |
| | University of Cambridge | 2012–2013 |
| | <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 | |
| | Monash University | 2008–2011 |
| Bachelor of Science Advanced with Honours | | |
| Majors: Physics and Mathematics. High Distinction. | | |
| Thesis Advisor: A/Prof. Csaba Balazs | | |

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| FUNDED | NASA Fermi Guest Investigator Program, Cycle 12, \$70,000 USD | 2019–2020 |
| GRANTS | Grant No. 80NSSC19K1515, Slatyer and Leane | |

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| PRIZES, AWARDS & SCHOLARSHIPS | Chancellor's Prize for Excellence in the PhD Thesis, U. Melbourne | 2018 |
| | Dean's Award for Excellence in Graduate Research, U. Melbourne | 2018 |
| | Best PhD Completion Seminar, Physics Dept., U. Melbourne | 2017 |
| | Royal Society of Victoria Young Scientist Research Prize | 2016 |
| | Science Abroad Travelling Scholarship | 2016 |
| | Best Geoff Opat Seminar Series Talk, Physics Dept., U. Melbourne | 2015 |
| | Laby Foundation Early Career Researcher Travel Scholarship | 2015 |
| | Australian Postgraduate Award (APA) | 2012–2016 |
| | Monash Jubilee Honours Scholarship | 2011 |
| | J. L. William Honours Scholarship | 2011 |

14. J. Acevedo, J. Bramante, **R. K. Leane***, N. Raj, “Cooking Pasta with Dark Matter: Kinetic and Annihilation Heating of Neutron Star Crusts”, Submitted to JCAP, MIT-CTP/5152, [arXiv:[1911.06334](#) [hep-ph]].
13. **R. K. Leane** and T. R. Slatyer, “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*
12. M. Un Nisa, J. F. Beacom, S. Y. BenZvi, **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 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 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, “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, “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, “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***, “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***, “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***, “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, “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, “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***), “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.)

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| 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 |
| OUTREACH & PRESS | 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 | 2014–2015 |
| | <i>“Uranium: Twisting the Dragon’s Tail”</i> | |
| | 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 |
| | Public Talk, Monash University Open Day Seminar Series, Australia | 2011 |
| | Physics Demonstrator, Monash University Open Day, Australia | 2011 |

SEMINARS &
CONFERENCE
TALKS

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| <i>“Indirect Detection of Dark Matter in the Galaxy” (Upcoming)</i> | |
| Invited Overview Talk, 3rd World Summit on EDSU, Guadeloupe, France | Mar 2020 |
| <i>Upcoming</i> | |
| Invited Talk, Aspen Winter Conf. on Particle Physics, Aspen CO, USA | Mar 2020 |
| Invited Seminar, U. Mass Amherst, Amherst MA, USA | Dec 2019 |
| <i>“The Hunt for Dark Matter: Hints and New Searches”</i> | |
| Invited Seminar, Boston University, Boston MA, USA | Nov 2019 |
| Invited Seminar, SLAC, Menlo Park CA, USA | Oct 2019 |
| <i>“Interplay of Collider and Indirect Searches for Dark Matter”</i> | |
| Invited Plenary Talk, DM@LHC 2019, Seattle WA, USA | Aug 2019 |
| <i>“Dark Matter Strikes Back at the Galactic Center”</i> | |
| Invited Seminar, Texas A&M University, College Station TX, USA | Oct 2019 |
| Invited Seminar, MIT Center for Theoretical Physics, Cambridge MA, USA | Sep 2019 |
| Invited Seminar, Perimeter Institute, Waterloo ON, Canada | Jun 2019 |
| Invited Talk, Aspen Center for Physics, Aspen CO, USA | Jun 2019 |
| Invited Seminar, KICP, University of Chicago, Chicago IL, USA | Apr 2019 |
| Invited Seminar, Brown University, Providence RI, USA | Apr 2019 |
| Invited Seminar, Fermilab, Batavia IL, USA | Mar 2019 |
| Invited Seminar, Brandeis University, Boston MA, USA | Mar 2019 |
| Invited Seminar, Princeton University, Princeton NJ, USA | Feb 2019 |
| Invited Talk, TRIUMF Dark Matter Workshop, Vancouver BC, Canada | Feb 2019 |
| <i>“A Tour of the Universe: The Hunt for Dark Matter”</i> | |
| Invited Colloquium, University of Melbourne, Melbourne VIC, Australia | Dec 2018 |
| <i>“Tricking Non-Poissonian Template Fitting: DM Hiding at the Galactic Center?”</i> | |
| Parallel Talk, DESY Theory Workshop, Hamburg, Germany | Sep 2018 |
| Seminar, University of Melbourne, Melbourne VIC, Australia | Sep 2018 |
| <i>“Point Sources at the Galactic Center”</i> | |
| Parallel Talk, IDM 2018, Providence RI, USA | Jul 2018 |
| <i>“GeV-Mass Thermal WIMPs: Not Even Slightly Dead”</i> | |
| Parallel Talk, IDM 2018, Providence RI, USA | Jul 2018 |
| Invited Parallel Talk, PASCOS 2018, Cleveland OH, USA | Jun 2018 |
| Parallel Talk, Pheno 2018 Symposium, Pittsburgh PA, USA | May 2018 |
| Invited Seminar, California Institute of Technology, Pasadena CA, USA | Apr 2018 |
| Invited Seminar, Lawrence Berkeley National Laboratory, Berkeley CA, USA | Apr 2018 |
| Invited Seminar, Michigan Center for Theoretical Physics, Ann Arbor MI, USA | Apr 2018 |
| Invited Seminar, Dartmouth University, Hanover NH, USA | Apr 2018 |
| Seminar, University of Melbourne, Melbourne VIC, Australia | Jan 2018 |
| <i>“Novel Signatures of Dark Matter in the Sky”</i> | |
| Invited Seminar, MIT Center for Theoretical Physics, Cambridge MA, USA | Sep 2017 |
| <i>“Phenomenology of Particle Dark Matter”</i> | |
| PhD Completion Seminar, University of Melbourne, Melb VIC, Australia | Mar 2017 |
| <i>“Dark Matter Theory and New Searches”</i> | |
| Invited Talk, CAASTRO-CoEPP Joint Workshop, Melb VIC, Australia | Jan 2017 |
| <i>“Novel Signatures of Dark Matter in the Sky”</i> | |
| Invited Talk, TRIUMF, Vancouver BC, Canada (remote) | Dec 2016 |

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| SEMINARS & CONFERENCE TALKS (CONT'D) | <i>“Impact of Mass Generation for Simplified Dark Matter Models”</i> | |
| | Invited Talk, ATLAS Astroparticle Forum Plenary Meeting, CERN (remote) | Nov 2016 |
| | <i>“Unitarity and Gauge Invariance in Dark Matter Models”</i> | |
| | Invited Talk, CETUP Dark Matter Workshop, Deadwood SD, USA | Jul 2016 |
| | Invited Seminar, University of Cincinnati, Cincinnati OH, USA | May 2016 |
| | <i>“Dark Forces in the Sky: Signals from Z' and the Dark Higgs”</i> | |
| | Invited Seminar, CCAPP, Ohio State University, Columbus OH, USA | Jun 2016 |
| | Invited Seminar, UC Riverside, Riverside CA, USA | May 2016 |
| | Invited Seminar, UC Irvine, Irvine CA, USA | May 2016 |
| | Parallel Talk, Pheno 2016 Symposium, Pittsburgh PA, USA | May 2016 |
| | Invited Seminar, University of Melbourne, Melbourne VIC, Australia | Apr 2016 |
| | <i>“Dark Matter at the LHC”</i> | |
| | Invited Seminar, SLAC, Menlo Park CA, USA | Oct 2015 |
| | Invited Seminar, CCAPP, Ohio State University, Columbus OH, USA | Oct 2015 |
| | Invited Seminar, Fermilab, Batavia IL, USA | Sep 2015 |
| | Invited Seminar, Vanderbilt University, Nashville TN, USA | Sep 2015 |
| | <i>“Dark Matter at the LHC: EFTs, Gauge Invariance and the Mono-W”</i> | |
| | Invited Seminar, University of Melbourne, Melbourne VIC, Australia | Aug 2015 |
| | <i>“Dark Matter at the LHC: EFTs and Gauge Invariance”</i> | |
| | Parallel Talk, SUSY2015, Lake Tahoe CA, USA | Aug 2015 |
| | Seminar, Geoff Opat Seminar Series, U. Melbourne, Melb VIC, Australia | May 2015 |
| | <i>“Leptophilic Dark Matter with Z' Interactions”</i> | |
| | Parallel Talk, CoSPA2014, Auckland, New Zealand | Dec 2014 |
| | Contributed Talk, RESCEU APCosPA Summer School, Matsumoto, Japan | Jul 2014 |
| | <i>“Dark Matter and the Universe”</i> | |
| | Invited Seminar, St Edmund’s Academic Talks Series, U. Cambridge, UK | Jun 2013 |
| STUDENT PROJECTS | Gregory Ridgway, MIT Graduate Student | 2019–Present |
| | Project: Kilonovae as a Probe of New Physics, <i>in progress</i> | |
| CO-ADVISED | Field Rogers, MIT Graduate Student | 2019–Present |
| | Project: Cosmic Ray Propagation Models and the AMS positron flux, <i>in progress</i> | |
| SERVICE | Convener, Dark Matter Session, TeV Particle Astrophysics (TeVPA) Conference | 2019 |
| | Particle Theory Seminar Organizer, MIT Center for Theoretical Physics | 2018–Present |
| | MIT Heising-Simons Physics Research Fellowship Peer Review Committee | 2018 |
| TECHNICAL SKILLS | 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 | |