

## 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 Dark Matter Phenomenology, Particle Astrophysics and Cosmology,  
INTERESTS Collider Physics, Physics Beyond the Standard Model

ACADEMIC	<b>Massachusetts Institute of Technology</b>	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	

EDUCATION	<b>University of Melbourne</b>	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	
	<b>University of Cambridge</b>	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	
	<b>Monash University</b>	2008–2011
Bachelor of Science Advanced with Honours		
Majors: Physics and Mathematics. High Distinction.		
Thesis Advisor: A/Prof. Csaba Balazs		

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

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

15. D. Hooper, **R. K. Leane**<sup>\*</sup>, Y. Tsai, S. Wegsman, S. Witte, “A Systematic Study of Hidden Sector Dark Matter: Application to the Gamma-Ray and Antiproton Excesses”, MIT-CTP/5157, [arXiv:[1912.08821](#) [hep-ph]].
14. J. Acevedo, J. Bramante, **R. K. Leane**<sup>\*</sup>, 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**<sup>\*</sup>, 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**<sup>\*</sup>, 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**<sup>\*</sup>, 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**<sup>\*</sup>, “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.)

#### OUTREACH & PRESS

Interview, <i>The Boston Globe Newspaper</i> , <a href="#">MIT scientists find dark matter could be cause of mysterious energy at the center of our galaxy</a>	2019
Interview, <i>MIT News</i> , <a href="#">Is there dark matter at the center of the Milky Way?</a>	2019
Press Piece, <i>APS Physics</i> , <a href="#">New Hope for Milky-Way Dark Matter</a>	2019
Interview, <i>Gizmodo</i> , <a href="#">The Future of Particle Physics Is Bright, Bleak, and Magical</a>	2019
Interview, <i>Quanta Magazine</i> , <a href="#">Dark Matter Gets a Reprieve in New Analysis</a>	2019
Interview, <i>Kavli Foundation</i> , <a href="#">Dark Matter is Back</a>	2019
Interview, <i>Science Magazine</i> , <a href="#">Physicists Revive Hunt for Dark Matter in the Heart of the Milky Way</a>	2019
Interview, <i>Popular Mechanics</i> , <a href="#">Filling the Void: What is Dark Matter?</a>	2019
Open House Talk, MIT Center for Theoretical Physics, Cambridge MA, USA	2018
Young Scientist Research Prize Talk, Royal Society of Victoria, Australia	2016
<a href="#">Key Scientific Researcher on International Science Documentary Series</a> “ <i>Uranium: Twisting the Dragon’s Tail</i> ”	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
Public Talk, Monash University Open Day Seminar Series, Australia	2011
Physics Demonstrator, Monash University Open Day, Australia	2011

SEMINARS &  
CONFERENCE  
TALKS

<i>“Indirect Detection of Dark Matter in the Galaxy” (Upcoming)</i>	
Invited Overview Talk, 3rd World Summit on EDSU, Guadeloupe	Mar 2020
<i>Upcoming</i>	
Invited Talk, Aspen Winter Conf. on Particle Physics, Aspen CO, USA	Mar 2020
Invited Seminar, Tufts University, Medford MA, USA	Feb 2020
<i>“Status of the Galactic Center Gamma-Ray Excess”</i>	
Invited Seminar, U. Mass Amherst, Amherst MA, USA	Feb 2020
Invited Colloquium, MIT, Cambridge MA, USA	Feb 2020
<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

SEMINARS & CONFERENCE TALKS (CONT'D)	<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
	<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 <math>Z'</math> 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-<math>W</math>”</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 <math>Z'</math> 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
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	<b>Programming Languages:</b>	
	C/C++, Python, Bash/zsh, HTML/CSS, Mathematica (all working proficiency level)	
	<b>Packages &amp; Frameworks:</b>	
	FeynRules, MadGraph, Pythia, ROOT, MadAnalysis, Fastjet, Delphes, MultiNest, MicrOMEGAS, PPC4DMID, DRAGON, FeynArts, FeynCalc, TikZ, Minuit, Matplotlib	
	<b>Other:</b>	
	Linux OS, L <sup>A</sup> T <sub>E</sub> X	

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

*Cambridge MA, January 22, 2019*