

REBECCA K. LEANE



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RESEARCH INTERESTS	Particle Astrophysics and Cosmology, Physics Beyond the Standard Model <u>Expertise:</u> Indirect Dark Matter Detection, New Particle Search Strategies, Using Astrophysical Datasets to Investigate New Particles + Dark Matter	
ACADEMIC APPOINTMENTS	SLAC National Accelerator Laboratory <i>SLAC Particle Theory Group, Stanford University</i> Postdoctoral Research Associate Massachusetts Institute of Technology <i>MIT Center for Theoretical Physics</i> Postdoctoral Research Associate	2020–Present 2017–2020
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 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 Monash University Bachelor of Science Advanced with Honours Majors: Physics and Mathematics. High Distinction. Thesis Advisor: Prof. Csaba Balazs	2013–2017 2012–2013 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

PUBLICATIONS

[INSPIRE profile](#) and [ARXiv publication list](#)

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

21. **R. K. Leane***, T. Linden, P. Mukhopadhyay, N. Toro, 2021
Celestial-Body Focused Dark Matter Annihilation Throughout the Galaxy
Submitted to PRD, [arXiv:[2101.12213](#) [astro-ph.HE]]
20. **R. K. Leane*** and J. Smirnov 2020
Exoplanets as New Sub-GeV Dark Matter Detectors
Accepted in PRL, [arXiv:[2010.00015](#) [hep-ph]]
Selected as PRL Editor's Suggestion
19. D. Croon, G. Elor, **R. K. Leane***, S. McDermott 2020
Supernova Muons: New Constraints on Z' Bosons, Axions, and ALPs
JHEP 01 (2021) 107, [arXiv:[2006.13942](#) [hep-ph]]
18. **R. K. Leane** 2020
Indirect Detection of Dark Matter in the Galaxy
[arXiv:[2006.00513](#) [hep-ph]]
17. **R. K. Leane** and T. R. Slatyer 2020
Spurious Point Source Signals in the Galactic Center Excess
Phys. Rev. Lett. 125, 121105 (2020), [arXiv:[2002.12370](#) [astro-ph.HE]]
16. **R. K. Leane** and T. R. Slatyer 2020
The Enigmatic Galactic Center Excess:
Spurious Point Sources and Signal Mismodeling
Phys. Rev. D 102, 063019 (2020), [arXiv:[2002.12371](#) [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
JHEP 07 (2020) 163, [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, [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, [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 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, [arXiv:[1808.05624](#) [hep-ph]]. 2018
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, [arXiv:[1808.05620](#) [astro-ph.HE]] 2018
9. **R. K. Leane**, T. R. Slatyer, J. F. Beacom, K. C.Y. Ng
GeV-Scale Thermal WIMPs: Not Even Slightly Dead
Phys. Rev. D 98 (2018), 023016 [arXiv:[1805.10305](#) [hep-ph]] 2018
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. D 96 (2017), 023011 [arXiv:[1705.01105](#) [hep-ph]] 2017
7. **R. K. Leane**, K. C.Y. Ng, J. F. Beacom
Powerful Solar Signatures of Long-Lived Dark Mediators
Phys. Rev. D 95 (2017), 123016 [arXiv:[1703.04629](#) [astro-ph.HE]] 2017
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]] 2016
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]] 2016
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]] 2015
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. D 92, 053008 (2015) [arXiv:[1503.07874](#) [hep-ph]] 2015
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]] 2014
1. G. Brooijmans et al (incl **R. K. Leane***)
Les Houches 2011: Physics at TeV Colliders New Physics Working Group Report
(2012) [arXiv:[1203.1488](#) [hep-ph]]
(*Note:* Contribution 1, “DLHA: Dark Matter Les Houches Agreement”, is heavily based on my bachelor thesis.) 2012

TALKS

Summary: 8 invited plenary talks, 6 invited colloquia, 43 invited seminars, 20 other conference/workshop talks (incl. 11 invited). Talks across Australia, Austria, Brazil, Canada, Germany, Guadeloupe, Japan, New Zealand, Spain, Sweden, Switzerland, United Kingdom, and the United States.

Invited Plenary Talks and Colloquia:

78. Invited Plenary Talk, Identification of DM 2022, Vienna, Austria	Jul 2022
77. Invited Plenary Talk, Planck 2021, Durham, UK	Jun 2021
76. Invited Colloquium, Stockholm University, Stockholm, Sweden	May 2021
75. Invited Colloquium, University of Chicago KICP, Chicago IL, USA	May 2021
74. Invited Colloquium, University at Albany SUNY, Albany NY, USA	Mar 2021
73. Invited Colloquium, Northeastern University, Boston MA, USA	Feb 2021
72. Invited Plenary Talk, Light Dark World 2020, Sydney, Australia	Dec 2020
71. Invited Plenary Talk, Identification of DM 2020, Vienna, Austria	Jul 2020
70. Invited Plenary Talk, Dark Matter 2020, Santander, Spain (<i>postponed due to covid-19</i>)	Jun 2020
69. Invited Plenary Talk, 3rd World Summit on EDSU, Guadeloupe	Mar 2020
68. Invited Colloquium, MIT, LNS, Cambridge MA, USA	Feb 2020
67. Invited Plenary Talk, DM@LHC 2019, Seattle WA, USA	Aug 2019
66. Invited Colloquium, University of Melbourne, Melbourne Australia	Dec 2018
65. Invited Overview Talk, CAASTRO-CoEPP Joint Workshop, Australia	Jan 2017

Invited Seminars and Other Conference Talks:

64. Invited Seminar, Max-Planck Institute, Heidelberg, Germany (remote)	Jul 2021
63. Invited Seminar, Imperial College London, London, UK (remote)	Apr 2021
62. Invited Seminar, University of Torino, Torino, Italy (remote)	Apr 2021
61. Invited Talk, Aspen Center for Physics Winter Conf., Aspen CO, USA	Mar 2021
60. Invited Seminar, U. Notre Dame, Notre Dame IN, USA (remote)	Mar 2021
59. Invited Seminar, BNL, Upton NY, USA (remote)	Feb 2021
58. Invited Seminar, Queen's University, Kingston ON, Canada (remote)	Feb 2021
57. Invited Seminar, Stanford University, Stanford CA, USA (remote)	Dec 2020
56. Invited Seminar, Caltech, Pasadena CA, USA (remote)	Dec 2020
55. Invited Talk, 3rd South American DM Workshop, Brazil (remote)	Dec 2020
54. Invited Seminar, UC Santa Cruz, Santa Cruz CA, USA (remote)	Nov 2020
53. Invited Seminar, SLAC, Menlo Park CA, USA (remote)	Nov 2020
52. Invited Talk, Snowmass CF-01 Group Meeting (remote)	Aug 2020
51. Invited Seminar, Sydney CCPC, Sydney, Australia (remote)	Aug 2020

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 (<i>canceled due to covid-19</i>)	May 2020
47. Invited Talk, Aspen Winter Conf. on Particle Physics, Aspen CO, USA (<i>canceled due to covid-19</i>)	Mar 2020
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 1, IDM 2018, Providence RI, USA	Jul 2018
29. Parallel Talk 2, 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, Australia	Mar 2017
19. Invited Talk, TRIUMF, Vancouver BC, Canada (remote)	Dec 2016
18. Invited Talk, ATLAS Astroparticle Forum Plenary Meeting, CERN	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, SUSY 2015, Lake Tahoe CA, USA	Aug 2015
4. Invited Seminar, University of Melbourne, Melbourne VIC, 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, Cambridge, UK	Jun 2013

OUTREACH & PRESS

Interview, <i>Science Magazine</i> ,	2021
Dark Matter Could Warm the Hearts of Lonely Old Planets, Scientists Predict	
Interview, <i>Quanta Magazine</i> ,	2020
Physicists are Expanding the Search for Dark Matter	
Interview, <i>The Boston Globe Newspaper</i> ,	2019
MIT scientists find DM could be cause of mysterious energy at the center of our galaxy	
Interview, <i>MIT News</i> ,	2019
Is there dark matter at the center of the Milky Way?	
Press Piece, <i>APS Physics</i> ,	2019
New Hope for Milky-Way Dark Matter	
Interview, <i>Gizmodo</i> ,	2019
The Future of Particle Physics Is Bright, Bleak, and Magical	
Interview, <i>Quanta Magazine</i> ,	2019
Dark Matter Gets a Reprieve in New Analysis	
Interview, <i>Kavli Foundation</i> ,	2019
Dark Matter is Back	
Interview, <i>Science Magazine</i> ,	2019
Physicists Revive Hunt for Dark Matter in the Heart of the Milky Way	
Interview, <i>Popular Mechanics</i> ,	2019
Filling the Void: What is Dark Matter?	
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

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
COMMUNITY	Snowmass Cosmic Frontier CF1 “Big Questions” White Paper Coordinator	2020–
	Particle Theory Seminar Organizer, MIT Center for Theoretical Physics	2018–2020
	Convener, Dark Matter Session, TeV Particle Astrophysics (TeVPA) Conference	2019
	MIT Heising-Simons Physics Research Fellowship Peer Review Committee	2018
	Referee for Physical Review Journals, SciPost	

Updated March 29, 2021