

# 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	<b>SLAC National Accelerator Laboratory</b> <i>SLAC Particle Theory Group, Stanford University</i> Postdoctoral Research Associate <b>Massachusetts Institute of Technology</b> <i>MIT Center for Theoretical Physics</i> Postdoctoral Research Associate	2020–Present    2017–2020
EDUCATION	<b>University of Melbourne</b> <i>Centre of Excellence for Particle Physics at the Terascale (CoEPP)</i> Ph.D. in Theoretical Particle Physics Thesis Advisor: Prof. Nicole Bell <b>University of Cambridge</b> <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> 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 <b>Leane</b>	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).

22. **R. K. Leane\*** and T. Linden, 2021  
First Analysis of Jupiter in Gamma Rays and a New Search for Dark Matter  
[arXiv:[2104.02068](#) [astro-ph.HE]]
21. **R. K. Leane\***, T. Linden, P. Mukhopadhyay, N. Toro, 2021  
Celestial-Body Focused Dark Matter Annihilation Throughout the Galaxy  
Accepted in 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 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, [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, [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  
 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  
 (2012) [arXiv:[1203.1488](#) [hep-ph]]  
 (*Note:* Contribution 1, “DLHA: Dark Matter Les Houches Agreement”, is heavily  
 based on my bachelor thesis.)

## 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<br>( <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
<a href="#">Dark Matter Could Warm the Hearts of Lonely Old Planets, Scientists Predict</a>	
Interview, <i>Quanta Magazine</i> ,	2020
<a href="#">Physicists are Expanding the Search for Dark Matter</a>	
Interview, <i>The Boston Globe Newspaper</i> ,	2019
<a href="#">MIT scientists find DM could be cause of mysterious energy at the center of our galaxy</a>	
Interview, <i>MIT News</i> ,	2019
<a href="#">Is there dark matter at the center of the Milky Way?</a>	
Press Piece, <i>APS Physics</i> ,	2019
<a href="#">New Hope for Milky-Way Dark Matter</a>	
Interview, <i>Gizmodo</i> ,	2019
<a href="#">The Future of Particle Physics Is Bright, Bleak, and Magical</a>	
Interview, <i>Quanta Magazine</i> ,	2019
<a href="#">Dark Matter Gets a Reprieve in New Analysis</a>	
Interview, <i>Kavli Foundation</i> ,	2019
<a href="#">Dark Matter is Back</a>	
Interview, <i>Science Magazine</i> ,	2019
<a href="#">Physicists Revive Hunt for Dark Matter in the Heart of the Milky Way</a>	
Interview, <i>Popular Mechanics</i> ,	2019
<a href="#">Filling the Void: What is Dark Matter?</a>	
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>	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 April 6, 2021*