

REBECCA K. LEANE



SLAC National Accelerator Laboratory
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RESEARCH INTERESTS

Particle Astrophysics and Cosmology, Physics Beyond the Standard Model
Expertise: Indirect Dark Matter Detection, New Astroparticle Search Strategies,
Using Astrophysical Datasets to Investigate New Particles + Dark Matter

CURRENT APPOINTMENTS

SLAC National Accelerator Laboratory 2021–Present
Stanford University

SLAC Particle Theory Group
Associate Staff Scientist (Tenure-Track)

Kavli Institute for Particle Astrophysics and Cosmology (KIPAC)
Senior Member

PREVIOUS APPOINTMENTS

SLAC National Accelerator Laboratory 2020–2021
SLAC Particle Theory Group, Stanford University
Postdoctoral Research Associate

Massachusetts Institute of Technology 2017–2020
MIT Center for Theoretical Physics
Postdoctoral Research Associate

EDUCATION

University of Melbourne 2013–2017
Centre of Excellence for Particle Physics at the Terascale (CoEPP)
Ph.D. in Theoretical Particle Physics
Thesis Advisor: Prof. Nicole Bell

University of Cambridge 2012–2013
Department of Applied Mathematics and Theoretical Physics (DAMTP)
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: Prof. Csaba Balazs

FUNDED GRANTS	NASA Fermi Guest Investigator Program, Cycle 12, \$70,000 USD <i>Characterizing Unresolved Point-Source Populations in the Inner Galaxy</i> 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 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 2016 2016 2015 2012–2016 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, First Analysis of Jupiter in Gamma Rays and a New Search for Dark Matter Submitted to PRL, [arXiv:2104.02068 [astro-ph.HE]]	2021
	21. R. K. Leane* , T. Linden, P. Mukhopadhyay, N. Toro, Celestial-Body Focused Dark Matter Annihilation Throughout the Galaxy Phys. Rev. D 103, 075030 (2021), [arXiv:2101.12213 [astro-ph.HE]]	2021
	20. R. K. Leane* and J. Smirnov Exoplanets as Sub-GeV Dark Matter Detectors Phys. Rev. Lett. 126, 161101 (2021), [arXiv:2010.00015 [hep-ph]] <i>Selected as PRL Editor’s Suggestion, Featured in APS Physics</i>	2020
	19. D. Croon, G. Elor, R. K. Leane* , S. McDermott Supernova Muons: New Constraints on Z' Bosons, Axions, and ALPs JHEP 01 (2021) 107, [arXiv:2006.13942 [hep-ph]]	2020
	18. R. K. Leane Indirect Detection of Dark Matter in the Galaxy [arXiv:2006.00513 [hep-ph]]	2020
	17. R. K. Leane and T. R. Slatyer Spurious Point Source Signals in the Galactic Center Excess Phys. Rev. Lett. 125, 121105 (2020), [arXiv:2002.12370 [astro-ph.HE]]	2020
	16. R. K. Leane and T. R. Slatyer The Enigmatic Galactic Center Excess: Spurious Point Sources and Signal Mismodeling Phys. Rev. D 102, 063019 (2020), [arXiv:2002.12371 [astro-ph.HE]]	2020

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 APS 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. D 98 (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. D 96 (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. D 95 (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***
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. D92, 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: 9 invited plenary talks, 9 invited colloquia, 48 invited seminars, 22 other conference/workshop talks (incl. 13 invited). Talks across Australia, Austria, Brazil, Canada, Germany, Guadeloupe, Japan, New Zealand, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States.

Note that talks from Mar 2020 – Aug/Sep 2021 are online due to the Covid-19 pandemic.

Invited Plenary Talks and Colloquia:

88. Invited Plenary Talk, Identification of DM 2022, Vienna, Austria	Jul 2022
87. Invited Colloquium, Carleton University, Ottawa, Canada	Dec 2021
86. Invited Colloquium, CERN, Geneva, Switzerland	Oct 2021
85. Invited Plenary Talk, Dark Matter 2021, Santander, Spain	Sep 2021
84. Invited Colloquium, North Carolina State U., Raleigh NC, USA	Sep 2021
83. Invited Plenary Talk, EXPLORE workshop, Germany	Aug 2021
82. Invited Plenary Talk, Planck 2021, Durham, UK	Jun 2021
81. Invited Colloquium, Stockholm University, Stockholm, Sweden	May 2021
80. Invited Colloquium, University of Chicago KICP, Chicago IL, USA	May 2021
79. Invited Colloquium, University at Albany SUNY, Albany NY, USA	Mar 2021
78. Invited Colloquium, Northeastern University, Boston MA, USA	Feb 2021
77. Invited Plenary Talk, Light Dark World 2020, Sydney, Australia	Dec 2020
76. Invited Plenary Talk, Identification of DM 2020, Vienna, Austria	Jul 2020
75. Invited Plenary Talk, 3rd World Summit on EDSU, Guadeloupe	Mar 2020
74. Invited Colloquium, MIT, LNS, Cambridge MA, USA	Feb 2020
73. Invited Plenary Talk, DM@LHC 2019, Seattle WA, USA	Aug 2019
72. Invited Colloquium, University of Melbourne, Melbourne Australia	Dec 2018
71. Invited Overview Talk, CAASTRO-CoEPP Joint Workshop, Australia	Jan 2017

Invited Seminars and Other Conference Talks:

70. Invited Seminar, Stanford University, Stanford CA, USA	Jan 2022
69. Invited Seminar, Rutgers University, Piscataway NJ, USA	Dec 2021
68. Invited Seminar, UC Berkeley/LBNL, Berkeley CA, USA	Nov 2021
67. Invited Seminar, Colgate University, Hamilton NY, USA	Nov 2021
66. Invited Parallel Talk, PANIC 2021, Lisbon, Portugal	Sep 2021
65. Invited Seminar, Max-Planck Institute, Heidelberg, Germany	Jul 2021
64. Invited Seminar, UCLA, Los Angeles CA, USA	Jun 2021
63. Invited Seminar, Imperial College London, London, UK	Apr 2021

62. Invited Seminar, University of Torino, Torino, Italy	Apr 2021
61. Invited Talk, Aspen Center for Physics Winter Conf., Aspen CO, USA	Mar 2021
60. Invited Seminar, University of Notre Dame, Notre Dame IN, USA	Mar 2021
59. Invited Seminar, Brookhaven National Laboratory, Upton NY, USA	Feb 2021
58. Invited Seminar, Queen's University, Kingston ON, Canada	Feb 2021
57. Invited Seminar, Stanford University, Stanford CA, USA	Dec 2020
56. Invited Seminar, California Institute of Technology, Pasadena CA, USA	Dec 2020
55. Invited Talk, 3rd South American DM Workshop, Brazil	Dec 2020
54. Invited Seminar, UC Santa Cruz, Santa Cruz CA, USA	Nov 2020
53. Invited Seminar, SLAC, Menlo Park CA, USA	Nov 2020
52. Invited Talk, Snowmass CF-01 Group Meeting	Aug 2020
51. Invited Seminar, Sydney CCPC, Sydney, Australia	Aug 2020
50. Invited Seminar, Kavli IPMU, Tokyo, Japan	May 2020
49. Parallel Talk, Pheno 2020, Pittsburgh PA, USA	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	Video Interview (~ 7,500 views), <i>Universe Today</i> ,	2021
	Interview with Dr. Rebecca K. Leane, Detecting Dark Matter	
	Interview, <i>SLAC News</i> ,	2021
	How Exoplanets Could Aid the Search for Dark Matter	
	Interview, <i>Universe Today</i> ,	2021
	Jupiter Could Make an Ideal Dark Matter Detector	
	Press Piece, <i>APS Physics</i> ,	2021
	Detecting Dark Matter in Exoplanets	
	Interview, <i>Science Magazine</i> ,	2021
	Dark Matter Could Warm the Hearts of Lonely Old Planets, Scientists Predict	
	Interview, <i>Wired Magazine</i> ,	2021
	Where's the Dark Matter? Look for Suspiciously Warm Planets	
	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

“Uranium: Twisting the Dragon’s Tail”

Worked with Emmy Award winning producer Sonya Pemberton and writer Wain Fimeri part time in a paid role 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

High impact papers on Altmetric (stats as of 06/14/21):

- “Exoplanets as Sub-GeV Dark Matter Detectors” (2021) paper w/ Juri Smirnov:
[Altmetric Score of 435, ranked #49 of all time for media coverage of PRL outputs](#)
- “Dark Matter Strikes Back at the Galactic Center” (2019) paper w/ Tracy Slatyer:
[Altmetric Score of 327, ranked #91 of all time for media coverage of PRL outputs](#)

TEACHING	Summer School Talk, EXPLORE2021 Workshop	2021
	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 Tutoring, Physics and Mathematics	2008–2010

COMMUNITY	Recommendation letter writing for junior collaborators	2021–
	Snowmass Cosmic Frontier CF1 “Big Questions” White Paper Coordinator	2020–
	Coordinator/Co-Principal Author of Two Snowmass Letters of Interest	2020
	Understanding the Galactic Center Gamma-Ray Excess: Observational Prospects	
	Understanding the Galactic Center Gamma-Ray Excess: Theory Prospects	
	Submitted to Cosmic Frontier and Theory Frontier Snowmass Working Groups	
	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

Journal peer-review referee for:

- Physical Review Journals
- Journal of Cosmology and Astroparticle Physics
- SciPost Physics

REFERENCES	Prof. Tracy Slatyer
	Center for Theoretical Physics
	Massachusetts Institute of Technology
	Email: tslatyer@mit.edu
	Prof. John Beacom
	Center for Cosmology and AstroParticle Physics (CCAPP)
	Ohio State University
	Email: beacom.7@osu.edu
	Prof. Dan Hooper
	Fermi National Accelerator Laboratory (Fermilab)
	& University of Chicago
	Email: dhooper@fnal.gov
	Prof. Nicole Bell (Ph.D. Advisor)
	University of Melbourne
	Email: n.bell@unimelb.edu.au