

REBECCA K. LEANE



SLAC National Accelerator Laboratory
Stanford University
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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

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 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*** 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: 9 invited plenary talks, 10 invited colloquia, 52 invited seminars, 23 additional conference/workshop talks (incl. 14 invited). Talks across Australia, Austria, Brazil, Canada, Germany, Guadeloupe, Japan, New Zealand, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States.

Note that most talks from Mar 2020 onwards are online due to the Covid-19 pandemic.

Invited Plenary/Overview Talks and Colloquia:

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

Invited Seminars and Other Conference Talks:

74. Invited Seminar, Stanford University, Stanford CA, USA	Apr 2022
73. Invited Seminar, University of Kentucky, Lexington KY, USA	Apr 2022
72. Invited Seminar, University of Hawaii, Manoa HI, USA	Apr 2022
71. Invited Seminar, Kings College London, London, UK	Mar 2022
70. Invited Talk, FISICA 2022, Mainz, Germany	Mar 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 (~ 8K 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
<i>“Uranium: Twisting the Dragon’s Tail”</i>	
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
<u>High impact papers on Altmetric (stats as of 06/14/21):</u>	
<ul style="list-style-type: none"> • “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	Invited Lecturer, Dark Matter Theory Lectures, SLAC Summer Institute	2022
	Invited Lecturer, EXPLORE2021 Summer School 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
MENTORING	PhD Students:	
	Joshua Tong, Stanford Graduate Student (Rotation Advisor)	Winter 2022
	Payel Mukhopadhyay, Stanford Graduate Student	2020–2021
	Undergraduate Students:	
	Afura Taylor, MIT Undergraduate Student	2020–2021
STANFORD/SLAC SERVICE	Stanford Physics Graduate Admissions, Astrophysics Committee	2021–2022
	Stanford Physics Recruitment Committee	2021–
	Stanford Physics, Identity, and Equity (PIE) Program Invited Speaker	2021
	Stanford Graduate Student Orientation: SLAC Theoretical Physics Overview Talk	2021
	SLAC Particle Theory Website Maintenance	2021–
	SLAC Dark Matter Meeting Founding Organizer	2021–
REVIEWING	Grant Reviewer for:	
	• National Science Foundation (NSF)	2021–
	Journal Referee for:	
	• Physical Review Journals	2019–
	• Reviews of Modern Physics	2019–
	• Journal of High Energy Physics (JHEP)	2021–
	• Journal of Cosmology and Astroparticle Physics (JCAP)	2021–
	• SciPost Physics	2020–
COMMUNITY	Coordinator, Editor, and Author	2021–2022
	Snowmass Cosmic Frontier CF01 White Paper: “Puzzling Excesses and How to Resolve Them”	
	Section Editor and Author	2021–2022
	Snowmass Cosmic Frontier CF03 White Paper: “Dark Matter In Extreme Environments”	
	Coordinator/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

REFERENCES

Prof. Tracy Slatyer

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Prof. John Beacom

Center for Cosmology and AstroParticle Physics (CCAPP)
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& University of Chicago
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Prof. Nicole Bell (Ph.D. Advisor)

University of Melbourne
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