

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

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| 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***
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, 10 invited colloquia, 48 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 Talks and Colloquia:

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| 90. Invited Plenary Talk, Identification of DM 2022, Vienna, Austria | Jul 2022 |
| 89. Invited Colloquium, SLAC, Menlo Park CA, USA | Feb 2022 |
| 88. Invited Colloquium, Carleton University, Ottawa, Canada | Dec 2021 |
| 87. Invited Colloquium, CERN, Geneva, Switzerland | Oct 2021 |
| 86. Invited Plenary Talk, Dark Matter 2021, Santander, Spain | Sep 2021 |
| 85. Invited Colloquium, North Carolina State U., Raleigh NC, USA | Sep 2021 |
| 84. Invited Plenary Talk, EXPLORE workshop, Germany | Aug 2021 |
| 83. Invited Plenary Talk, Planck 2021, Durham, UK | Jun 2021 |
| 82. Invited Colloquium, Stockholm University, Stockholm, Sweden | May 2021 |
| 81. Invited Colloquium, University of Chicago KICP, Chicago IL, USA | May 2021 |
| 80. Invited Colloquium, University at Albany SUNY, Albany NY, USA | Mar 2021 |
| 79. Invited Colloquium, Northeastern University, Boston MA, USA | Feb 2021 |
| 78. Invited Plenary Talk, Light Dark World 2020, Sydney, Australia | Dec 2020 |
| 77. Invited Plenary Talk, Identification of DM 2020, Vienna, Austria | Jul 2020 |
| 76. Invited Plenary Talk, 3rd World Summit on EDSU, Guadeloupe | Mar 2020 |
| 75. Invited Colloquium, MIT, LNS, Cambridge MA, USA | Feb 2020 |
| 74. Invited Plenary Talk, DM@LHC 2019, Seattle WA, USA | Aug 2019 |
| 73. Invited Colloquium, University of Melbourne, Melbourne Australia | Dec 2018 |
| 72. Invited Overview Talk, CAASTRO-CoEPP Joint Workshop, Australia | Jan 2017 |

Invited Seminars and Other Conference Talks:

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| 71. Invited Talk, FISICA 2022, Mainz, Germany | Mar 2022 |
| 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 |

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| 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 |

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| 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

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| 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 | |

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| TEACHING | Summer School Talk, EXPLORE2021 Workshop | 2021 |
| | Guest Lecturer for MIT graduate level course <i>8.811: Particle Physics II</i> Lecture Title: “Dark Matter Model Building” | 2017 |
| | 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 |
| STANFORD/SLAC SERVICE | 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 Founder and 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– |
| COMMUNITY | • SciPost Physics | 2020– |
| | Coordinator, Editor, and Author | 2021– |
| | Snowmass Cosmic Frontier CF01 White Paper: “Puzzling Excesses and How to Resolve Their Origin” | |
| | Section Editor and Author | 2021– |
| | Snowmass Cosmic Frontier CF03 White Paper: “Dark Matter In Extreme Environments” | |
| | 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 |

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