

# DR. REBECCA K. LEANE



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RESEARCH INTERESTS	Dark Matter Phenomenology, Astroparticle Physics, Collider Physics, Physics Beyond the Standard Model	
ACADEMIC APPOINTMENTS	<b>Massachusetts Institute of Technology</b> <i>MIT Center for Theoretical Physics</i> Postdoctoral Research Associate	2017–Present
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 Title: Phenomenology of Particle Dark Matter Thesis Advisor: A/Prof. Nicole Bell	2013–2017
	<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	2012–2013
	<b>Monash University</b> Bachelor of Science Advanced with Honours Majors: Physics and Mathematics. High Distinction. Thesis Advisor: A/Prof. Csaba Balazs	2008–2011
VISITING POSITIONS	<b>Center for Cosmology and AstroParticle Physics (CCAPP)</b> Ohio State University, USA Collaborating with Prof. John Beacom	Apr–Jun 2016
	<b>Vanderbilt University, USA</b> School of Physics and Astronomy Collaborating with Prof. Tom Weiler	Sep–Oct 2015
PRIZES, AWARDS & SCHOLARSHIPS	Royal Society of Victoria Young Scientist Research Prize	2016
	Science Abroad Travelling Scholarship	2016
	Best PhD Candidate Seminar of the Year in the School of Physics, U. Melbourne	2015
	Laby Foundation Early Career Researcher Travel Scholarship	2015
	Australian Postgraduate Award (APA)	2012–2016
	Monash Jubilee Honours Scholarship	2011
	J. L. William Honours Scholarship	2011

## PUBLICATIONS

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

1. N. F. Bell, Y. Cai, J. B. Dent, **R. K. Leane**\* and T. J. Weiler, “Enhancing Dark Matter Annihilation Rates with Dark Bremsstrahlung”, Phys. Rev. D96 (2017) no.2, 023011 [arXiv:[1705.01105](#) [hep-ph]].
2. **R. K. Leane**, K. C.Y. Ng, J. F. Beacom “Powerful Solar Signatures of Long-Lived Dark Mediators”, Phys. Rev. D95 (2017) no.12, 123016 [arXiv:[1703.04629](#) [astro-ph.HE]].
3. N. F. Bell, Y. Cai and **R. K. Leane**\*, “Impact of Mass Generation for Spin-1 Mediator Simplified Models”, JCAP 01 (2017) 039 [arXiv:[1610.03063](#) [hep-ph]].
4. N. F. Bell, Y. Cai and **R. K. Leane**\*, “Dark Forces in the Sky: Signals from  $Z'$  and the Dark Higgs”, JCAP 08 (2016) 001 [arXiv:[1605.09382](#) [hep-ph]].
5. N. F. Bell, Y. Cai and **R. K. Leane**\*, “Mono- $W$  Dark Matter Signals at the LHC: Simplified Model Analysis”, JCAP 01 (2016) 051 [arXiv:[1512.00476](#) [hep-ph]].
6. N. F. Bell, Y. Cai, J. B. Dent, **R. K. Leane**\* and T. J. Weiler, “Dark matter at the LHC: Effective field theories and gauge invariance”, Phys. Rev. D92, no.5 053008 (2015) [arXiv:[1503.07874](#) [hep-ph]].
7. N. F. Bell, Y. Cai, **R. K. Leane**\* and A. D. Medina, “Leptophilic dark matter with  $Z'$  interactions”, Phys. Rev. D 90, no.3, 035027 (2014) [arXiv:[1407.3001](#) [hep-ph]].
8. G. Brooijmans et al, “Les Houches 2011: Physics at TeV Colliders New Physics Working Group Report”, FERMILAB-CONF-12-924-T (2012) [arXiv:[1203.1488](#) [hep-ph]]. (Note: Contribution 1, “DLHA: Dark Matter Les Houches Agreement”, is heavily based on my bachelor thesis.)

\*Author list is alphabetical, as per convention in particle physics.

## OUTREACH

[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 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 several science communication and film awards.

Young Scientist Research Prize Talk, Royal Society of Victoria, Australia	2016
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
Physics Demonstrator, Monash University Open Day, Australia	2011

INVITED SEMINARS & CONFERENCE TALKS	<i>“Phenomenology of Particle Dark Matter”</i>	
	PhD Completion Seminar, University of Melbourne, Australia	Mar 2017
	<i>“Dark Matter Theory and New Searches”</i>	
	Invited Talk, CAASTRO-CoEPP Joint Workshop, Melbourne, Australia	Jan 2017
	<i>“Novel Signatures of Dark Matter in the Sky”</i>	
	Invited Talk, TRIUMF, Vancouver BC, Canada (remote)	Dec 2016
	<i>“Impact of Mass Generation for Simplified Dark Matter Models”</i>	
	Invited Talk, ATLAS Astroparticle Forum Plenary Meeting, CERN (remote)	Nov 2016
	<i>“Unitarity and Gauge Invariance in Dark Matter Models”</i>	
	Invited Talk, CETUP Dark Matter Workshop, Deadwood SD, USA	Jul 2016
	Invited Talk, University of Cincinnati, Cincinnati OH, USA	May 2016
	<i>“Dark Forces in the Sky: Signals from <math>Z'</math> and the Dark Higgs”</i>	
	Invited Talk, CCAPP, Ohio State University, Columbus OH, USA	Jun 2016
	Invited Talk, UC Riverside, Riverside CA, USA	May 2016
	Invited Talk, UC Irvine, Irvine CA, USA	May 2016
	Parallel Talk, Pheno 2016 Symposium, Pittsburgh PA, USA	May 2016
	Invited Talk, University of Melbourne, Australia	Apr 2016
	<i>“Dark Matter at the LHC”</i>	
	Invited Talk, SLAC National Accelerator Laboratory, Menlo Park CA, USA	Oct 2015
	Invited Talk, CCAPP, Ohio State University, Columbus OH, USA	Oct 2015
	Invited Talk, Fermilab, Batavia IL, USA	Sep 2015
	Invited Talk, Vanderbilt University, Nashville TN, USA	Sep 2015
	<i>“Dark Matter at the LHC: EFTs, Gauge Invariance and the Mono-<math>W</math>”</i>	
	Invited Talk, University of Melbourne, Australia	Aug 2015
	<i>“Dark Matter at the LHC: EFTs and Gauge Invariance”</i>	
	Parallel Talk, SUSY2015, Lake Tahoe CA, USA	Aug 2015
	Geoff Opat Seminar Series, University of Melbourne, Australia	May 2015
	<i>“Leptophilic Dark Matter with <math>Z'</math> Interactions”</i>	
	Parallel Talk, CoSPA2014, Auckland, New Zealand	Dec 2014
	Contributed Talk, RESCEU APCosPA Summer School, Matsumoto, Japan	Jul 2014
	<i>“Dark Matter and the Universe”</i>	
	Invited Talk, St Edmund’s Academic Talks Series, Univ. of Cambridge, UK	Jun 2013
TEACHING	ATLAS International Masterclass Tutor, Univ. of Melbourne	2015
	Physics Teaching Assistant (Tutorials, Grading, Office Hours), Univ. of Melbourne	2014
	Physics Teaching Assistant (Lab Demonstrator, Grading), Univ. of Melbourne	2012
	Physics Teaching Assistant (Lab Demonstrator, Grading), Monash University	2011
	High School Senior Tutoring, Physics and Mathematics	2008–2010
TECHNICAL SKILLS	<b>Languages:</b> C++, Python, Bash, Mathematica	
	<b>Packages &amp; Frameworks:</b> FeynRules, MadGraph, Pythia, ROOT, MadAnalysis, Fast-jet, Delphes, micrOMEGAs, PPPC4DMID, FeynArts, FeynCalc, Ti $\mathcal{K}$ Z, matplotlib	
	<b>Other:</b> Linux OS, L <sup>A</sup> T <sub>E</sub> X	