

MADELEINE J. ZUROWSKI

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ACADEMIC HISTORY

- University of Toronto** *2022 - Present*
Postdoctoral Research Fellow, SuperCDMS
Supervisor: Professor Pekka Sinervo
- ARC Centre of Excellence for Dark Matter Particle Physics** *2023 - Present*
Associate Investigator

EDUCATION

- University of Melbourne** *2014 - 2023*
Doctor of Philosophy (2023)
Thesis: *Designing and assessing model independent tests of the DAMA modulation*
Supervisors: Professor Elisabetta Barberio, Professor Phillip Urquijo
Committee chair: Professor Rachel Webster
Master of Science - Physics (2018), First Class Honours
Thesis: *Inelastic Dark Matter and the SABRE Experiment*
Supervisor: Professor Elisabetta Barberio
Bachelor of Science (2016), First Class Honours
Major: Physics
- Princeton University** *2017, 2018, 2019*
Visiting Student Research Collaborator Position (Oct - Dec 2019)
Collaborator: Professor Frank Calaprice
Research undertaken as part of Masters Thesis (Jan - Feb 2018, Jul - Aug 2017)
- University of California, Berkeley** *Jan - Jun 2016*
Studied physics abroad for a semester as part of an exchange program.
- Loreto Kirribilli, Sydney** *2008 - 2013*
Higher School Certificate

DESCRIPTION OF RESEARCH

My PhD research, conducted as a member of the SABRE experiment, falls into several categories; work on purifying and growing the ultra-pure sodium iodide crystals, Geant4 simulation of physical processes within the detector for background and reconstruction studies, and statistical analysis of different models of dark matter SABRE's ability to probe them. As well as this, during my PhD I also designed and supervised three research projects for undergraduate students, and mentored a Masters student.

As a postdoc, and member of SuperCDMS, I worked on several aspects of the experiment; integration and installation of the detector on site at SNOLAB (involving significant time spent underground), background modelling (radioactive simulations and detector response) and sensitivity analysis for solar axions.

Areas of interest

- Dark matter direct detection and phenomenology, low background physics, experimental design.

AWARDS AND ACHIEVEMENTS

Research Training Program Scholarship	2019-2022
Best PhD Completion Seminar, School of Physics, University of Melbourne	2022
Laby Travelling Scholarship	2022
Best Poster (panel vote) Centre of Excellence for Dark Matter Workshop	2021
Centre of Excellence for Dark Matter Collaboration and Centre Values Award	2021
Dr Jean Laby Women in Physics Travel Award	2021
Dr Jean E Laby Bursary	2018
Allan and Maria Myers Scholarship	2017
Melbourne Global Scholars Award	2016
Residential Scholarship for Newman College	2015, 2016
National Youth Science Forum	2013
Distinguished Achiever, Higher School Certificate	2013

RESEARCH OUTPUTS

Papers

- *Direct searches of dark matter with the SABRE South experiment*, M. J. Zurewski on behalf of SABRE South, SciPost Phys.Proc. 12 (2023) 029.
- *Hidden dependencies in model independent tests of DAMA*, M. J. Zurewski, SciPost Phys.Proc. 12 (2023) 027.
- *Status of the SABRE South experiment at the Stawell underground physics laboratory*, M. J. Zurewski on behalf of SABRE South, Nucl.Instrum.Meth.A 1045 (2023) 167585.
- *Simulation and background characterisation of the SABRE South experiment*, M. J. Zurewski in E. Barberio et al., [The SABRE South Collaboration], to appear in EPJC
- *Influence of NaI background and mass on testing the DAMA modulation*, M. J. Zurewski and E. Barberio, EPJC 82, 1122 (2022).
- *Influence of NaI background and mass on testing the DAMA modulation*, M. J. Zurewski and E. Barberio, J. Phys. Conf. Ser. 2156 012212 (2021)
- *Quenching factor measurements of sodium nuclear recoils in NaI:Tl determined by spectrum fitting*, M. J. Zurewski in L. J. Bignell et al., JINST 16 P07034 (2021)
- *Characterization of SABRE crystal NaI-33 with direct underground counting*, M. Zurewski in M. Antonello et al. [The SABRE Collaboration], Eur. Phys. J. C 81, 299 (2021)
- *Inelastic Dark Matter and the SABRE Experiment*, M. J. Zurewski, E. Barberio, and G. Busoni, JCAP 12 014 (2020)
- *First measurements with a NaI(Tl) crystal for the SABRE experiment*, M. Zurewski in A. Mariani et al. [The SABRE Collaboration], J. Phys. Conf. Ser. 1468 1 (2020)
- *The SABRE experiment for dark matter search*, M. Zurewski in G. D’Imperio et al. [The SABRE Collaboration], ICHEP2018 Volume 340, (2019)
- *Monte Carlo simulation of the SABRE PoP background*, M. Zurewski in M. Antonello et al. [The SABRE Collaboration], Astroparticle Physics 106, (2019).

Seminars

- *Direct detection of dark matter with the SABRE South experiment*, SNOLAB Seminar, April 2023
- *Designing and assessing model independent tests of DAMA’s modulation signal*, University of Melbourne, PhD Completion Seminar, August 2022 (prize for best completion talk)
- *Death to DAMA? Designing and assessing model independent tests of DAMA’s modulation signal*, HEPHY Seminar, July 2022
- *Death to DAMA? Designing and assessing model independent tests of DAMA’s modulation signal*, University of Minnesota Seminar, June 2022

- *Death to DAMA? Designing and assessing model independent tests of DAMA's modulation signal*, University of Toronto Seminar, June 2022
- *Death to DAMA? Designing and assessing model independent tests of DAMA's modulation signal*, Cosmic Physics Centre Seminar, Fermilab (virtual), May 2022
- *Status of the SABRE South Experiment at the Stawell Underground Physics Laboratory*, Vienna Conference on Instrumentation (virtual), February 2022
- *Death to DAMA? Assessing and designing model independent tests of DAMA's modulation signal*, SLAC Special Seminar (virtual), February 2022
- *Detecting Dark Matter; The Physics of the SABRE Experiment*, Work Experience Seminar, University of Melbourne, June 2021.
- *Sensitivity Analysis for the SABRE Experiment*, Geoff Opat Seminar Series, University of Melbourne, May 2020.
- *Ghost Busting; Dark Matter Detection Strategies*, PSS Seminar, University of Melbourne, August 2019.
- *Detecting Dark Matter; The Physics of the SABRE Experiment*, Work Experience Seminar, University of Melbourne, July 2019.
- *Inelastic Dark Matter and the SABRE Experiment* MSc. Completion Talk, University of Melbourne, October 2018.
- *Beefing up WIMPs: the Search for Dark Matter*, Scholars' Presentation, Newman College, March 2017.

Conference Talks

- *Dark Matter at ICRC 2023*, Rapporteur talk, International Cosmic Ray Conference, Nagoya, August 2023
- *Impact of quenching factor model on tests of DAMA*, Dark Side of the Universe, Sydney, December 2022
- *SABRE South: Overview, simulation, and prospects*, Centre of Excellence for Dark Matter Particle Physics Workshop, Geelong, November 2022
- *Direct search for Dark Matter with the SABRE South experiment*, 14th International Conference on Identification of Dark Matter, July 2022
- *Hidden dependencies in model independent tests of DAMA*, 14th International Conference on Identification of Dark Matter, July 2022
- *Status of the SABRE South Experiment at the Stawell Underground Physics Laboratory*, International Conference on Interconnections between Particle Physics and Cosmology XV, June 2022
- *Model independent tests of DAMA*, AIP Summer Workshop, Brisbane (virtual), December 2021.
- *SABRE Prospects and Physics Reach*, Centre of Excellence for Dark Matter Particle Physics Workshop, Melbourne, November 2021.
- *Physics of the SABRE Experiment*, Early Career Research Workshop, CDM, February 2021.

Posters

- *A Digitisation Tool for Detector Emulation of SABRE South and other Low Background Experiments*, AIP Summer Workshop, Brisbane (virtual), December 2021.
- *Optical simulation of the SABRE veto system*, AIP Summer Workshop, Brisbane (virtual), December 2021.
- *Influence of NaI background and mass on model independent tests of DAMA's modulation*, ARC CDM Workshop, Melbourne, November 2021 (voted best poster by panel).
- *Influence of NaI background and mass on testing the DAMA modulation*, TAUP2021, Valenica (remote).
- *Inelastic Dark Matter and SABRE*, ARC CDM Workshop, Melbourne, December 2020
- *'Eye' of the Tiger: Light detection at the SABRE Experiment*, ARC CoEPP Workshop, Adelaide, January 2017.

SERVICE AND OUTREACH

Talks/interviews (Public facing)

- ABC Catalyst: ‘[The Dark Side of the Universe](#)’, April 2023
- Veritasium: ‘[The Absurd Search for Dark Matter](#)’, May 2022
- ABC Afternoon: ‘[The search for dark matter in a gold mine](#)’, May 2022
- Dark Matter Day: ‘Dark Matter in the Southern Hemisphere’, October 2021
- The Age: ‘[Burying vital physics study can only shed light](#)’, October 2021
- Science Festival Mid-Afternoon Masterclass: ‘[Lighting the Dark Universe](#)’, August 2021.
- ABC Wimmera: Science Festival, August 2021
- ‘Mitchell’s Front Page’, The Pulse, Geelong: Dark Matter and National Science Week, August 2021.
- VCE lecture series, University of Melbourne: ‘[Bringing Dark Matter to Light](#)’, April 2021.
- Dark Chatter Ep 4: [The SABRE Experiment](#), March 2021.

SuperCDMS Collaboration

2022 - present

Leadership and service roles

- Background modelling sub-working group leader (2023 - present)
- Background working group deputy (2023 - present)
- Official Review Committee Member (2023 - present)
- Alignment coordinator (2023 - present)

SABRE South Collaboration

2017 - present

Leadership and service roles

- Speakers committee member (2021-present)
- External review presentations (2021, 2022, 2023)
- Physics working group leader (2021 - 2022)

Equity and Diversity Committee

2021 - 2022

Centre of Excellence for Dark Matter Particle Physics

- Represented the Early Career Researchers in the Centre of Excellence Committee focused on promoting equity and diversity within the research community.

Graduate Research Advisory Group

2021

University of Melbourne

- Physics representative on a group started by the Faculty of Science to get feedback on events and activities held by the faculty and identify opportunities that the Graduate Research Team or Faculty of Science could provide to improve the experience of graduate researchers.

Postgraduate Physics Students Society

2017-2021

University of Melbourne

- Publications Officer (2020 - 2021): Collate and disseminate all society related publication, including the “Postgraduate Survival Guide” (also as a contributing author), and the past thesis library.
- Health and Safety Officer (2019): Represent graduate physics students in Health and Safety committee meetings, assisted with the planning and execution of PPSS events.
- Treasurer (2018): Budget all PPSS events, and apply for grants and refunds. In this role I also spearheaded a green campaign in designing and ordering society KeepCups.
- Executive member (2017): Organised events and networking opportunities for postgraduate students and faculty, as well as being a liaison point for the undergraduate Physics Students Society.

Dark Matter Day

2020, 2021

Centre of Excellence for Dark Matter Particle Physics

- Helped host an ‘open day’ for a virtual lab space available to the public. Provided informative posters on the SABRE experiment and was available for explanations and ‘tours’ of the space as well as preparing a talk.

Antarctic Explorer

2020

University of Melbourne/Laby Foundation/Antarctica Flights

- Provided a running commentary on the magnetic field and cosmic radiation around the Antarctic region, as well as an explanation of the physics causing changes for the general public, on a scenic/commercial flight in Antarctic airspace.

Science Student Ambassador

2017 - 2020

University of Melbourne

- Selected from a range of both undergraduate and graduate students to represent faculty at a range of events and activities, both face to face and online.
- A particular focus was promoting physics (both as an undergraduate and graduate pathway) during University open days.

Hume Central Secondary College Outreach

2017

Broadmeadows, Melbourne

- For two months I led an after school physics club at Hume Central made up of year 7 and 8 students. This involved teaching them about physics concepts in a creative and interesting way by planning fun lab activities appropriate for this age group.

TEACHING AND SUPERVISION

University of Melbourne

2017 - 2021

Lab Demonstrator

- Supervision and marking of first, second, and third year physics lab sessions in groups of 4-16.
- Traditional lab based work, as well as code based computational ‘labs’ written in Python.
- Received Laser Safety Training and Safe Radiation Handling Training.
- Designed a number of experiments for the second year course.

University of Melbourne

2017 - 2021

Tutor: Physics 1, Subatomic Physics

- Tutored groups of 6-8 undergraduate students for an hour 2-3 times a week.
- Focus on both conceptual issues and practice exam problem solving.
- Provided marking for exams, assignments, and drop in office hours.

Newman College, Melbourne

2017 - 2018

Tutor: Physics 1, Electrodynamics, Quantum Mechanics, Differential Equations

- Provided additional, out of class tutoring for students at Newman College in a range of undergraduate physics and maths courses.