

Damon Binder

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I am interested in quantum field theory and its applications, in particular to particle physics. I am also interested in category theory as a universal language for mathematics and physics.

Research Experience

FEB 2016 – NOV 2016	Nuclear Interaction from Effective Field Theory
Honours Thesis	Investigated the origin of Skyrme functionals from quantum
Dr Cédric Simenel	hadrodynamical and quark-meson coupling models of nuclear interaction.
FEB 2016 – JUL 2016	Category Theory and Real Numbers
Dr Scott Morrison	Studied category theory, in particular higher categories and diagrammatic methods. Developed a novel, minimalistic definition of the real numbers, which can be found at arXiv:1607.05997 .
NOV 2015 – FEB 2016	Diphoton Resonance at 750 GeV
Prof. Raymond Volkas	Reviewed the literature to study the possibility of a portal to dark matter. Wrote a Python script to search through possible intermediate fermions.

Education

Australian National University (2014 – 2016):

Bachelor of Science (Advanced) (Honours) with First Class Honours in Physics and the University Medal.

Major: Physics

Minor: Mathematics

GPA: 7.0/7.0 (ANU)

WAM: 94%

Coursework:

- Theoretical Physics (Quantum Field Theory, General Relativity, Statistical Mechanics, Nuclear Physics, Open Quantum Systems, Quantum Measurement Theory)
- Applied Physics (Nuclear Physics, Cosmology, Thermal Physics, Plasma and Fluids)
- Mathematics (Functional Analysis, Complex Analysis, Numerical Analysis, Algebraic Topology, Category Theory, Advanced Algebra)

Townsville Grammar School (2002 – 2013):

Completed International Baccalaureate Diploma with a score 45 (converted to ATAR 99.95).

Academic Awards and Scholarships

2017 – 2019	John Monash Scholarship
2016	University Medal at Australian National University
2015 – 2016	Bruce Hall Half-Residential Scholarship
2014 – 2016	Bruce Hall Academic Award

	National Undergraduate Scholarship
2015 – 2016	Deputy Dean (Education) Commendation
2014 – 2015	Chancellor's Letter of Commendation
2013	Mary Foley-Elliott memorial for Dux of Townsville Grammar School

Professional Experience

IT Support, Bruce Hall (2015 – 2016):

Provided assistance to residents and staff with information technology. Maintained the internal website and liaised with university administration.

Skills

Programming Languages: Python, Mathematica, JavaScript, Haskell, Bash

Formatting: LaTeX, Word, HTML and CSS

Presentation: Highly skilled orator and debater, Beamer, PowerPoint

Lab Analysis: Error propagation, Bayesian reasoning, numerical analysis, plotting, Matplotlib

Extracurricular Interests and Activities

Simulations and Visualisations

- Statistical mechanics ([Ising model](#), [lattice gas](#), [continuous magnets](#))
- N-body simulations ([gravity](#), [log-gravity](#), [Lennard-Jones potential](#), [ions](#))
- Nature simulations ([fires](#), [extinction events](#))
- Partial differential equations ([heat](#), [standing waves](#))

Sports

- Keen runner and cyclist, pushing to challenge myself
- Last year fundraised and rode in the *Protect Your Head Campaign*, a charity ride from Dubbo to Canberra to fundraise for the National Institute for Mental Health Research
- Successfully completed Inward Bound Division 6, an adventure ultramarathon
- Successfully climbed Mt Kilimanjaro

Arts

- Competent pianist
- Acted, sung, and debated through school and at my residential college
- History, and more specifically quantitative and comparative history