

Keeley Peter Hoek

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Education

- 2016–2019** Studied a Bachelor of Philosophy (Honours) – Science in Pure Mathematics at the Australian National University with the University Medal and ANU National University Scholarship, graduated December 2019.
- 2014–2015** Graduated high school with maximum possible ATAR 99.95 (hence dux of school and state) from Burgmann Anglican School (ACT, Australia).

Publications and Preprints

- [1] Richard Taylor, Alexander C. Kalloniatis, and Keeley Hoek. Organisational hierarchy constructions with easy Kuramoto synchronisation. *Journal of Physics A: Mathematical and Theoretical*, 2020.
- [2] Mathew Zuparic and Keeley Hoek. Green’s functions and the Cauchy problem of the Burgers hierarchy and forced Burgers equation. *Communications in Nonlinear Science and Numerical Simulation*, 73:275–290, 2019.
- [3] Alexander C. Kalloniatis, Keeley Hoek, Mathew Zuparic, and Markus Brede. Optimising structure in a networked Lanchester Model for Fires and Manoeuvre in Warfare. Submitted.
- [4] Ryan Ahern, Mathew Zuparic, Alexander Kalloniatis, and Keeley Hoek. Unifying warfighting functions in mathematical modelling: combat, manoeuvre, and C2. Submitted.

Academic Awards

- 2019** University Medal
- 2018** Chancellor’s Letters of Commendation and ANU Dean’s Science Education Commendation
Simon Marais Mathematics Competition top 6 pair contestant in Australia
- 2017** Hanna Neumann Prize for Third Year Mathematics (Overall highest aggregate score in four Honours Pathway Mathematics courses, obtained second year)
Chancellor’s Letters of Commendation and ANU Dean’s Science Education Commendation
- 2016** Chancellor’s Letters of Commendation and ANU Dean’s Science Education Commendation for Semesters 1 and 2 (High Distinction in all courses with awarded grades greater than or equal to 90)
- 2015** Maximum possible ATAR of 99.95 (dux of school and state)
Honourable Mention representing Australia at the 16th Asian Physics Olympiad hosted in Hangzhou, China
Top 15 World Finalist in the Breakthrough Junior Challenge
Australian Informatics Olympiad (AIO), Bronze Certificate

- 2014 Australian Physics Olympiad, Gold Medal
- Australian Chemistry Olympiad, Silver Medal
- Australian Informatics Olympiad (AIO), Bronze Certificate
- Australian Invitational Informatics Olympiad (AIIO), Bronze Certificate
- Australian Mathematics Trust Prudence Award

Work and Community

2017–present Employed by the ANU Mathematical Sciences Institute as a teaching assistant in weekly 2-hour long workshops for the first year honours undergraduate mathematics courses MATH1115 and MATH1116. This involves marking weekly lecturer-set assignment work, examinations, etc.

I was formerly a Peer Assisted Learning mentor for the same courses, where as a member of a small team I devised and prepared 1-hour weekly mentoring sessions, targeting intuition and thinking processes, which I then personally delivered. I also facilitated a 1-hour lecturer-planned session delivered immediately afterward.

2017–present I have volunteered as a senior tutor at the 2017–2020 Australian Physics Olympiad Summer Schools (each consisting of a ~ 25 student cohort) and also subsequent training camps (each ranging from 1-3 weeks in length). I gave lectures and administered tutorials which prepare the Australian representative team for the International Physics Olympiad. I have twice accompanied the team overseas for this purpose.

2017–present Volunteer when possible as an enricher at the weekly Australian Mathematics Trust Canberra Mathematics Enrichment Programme for high-school students at the ANU, delivering sessions which I typically prepare.

2019 Teaching assistant for an *Automated Theorem Proving* mathematics special topics course at ANU.

2017–2018 Selected for 3 months of full-time work as part of a Defence Science and Technology Group Summer Vacation Scholarship. As part of my project I developed an “operationalisable” mathematical model of Command and Control in complex environments, with the primary application being use as a decision support tool for military planners. The result was a coupled system of many partial differential equations, which I then computationally implemented. I conducted simulations to compare the efficacy of various force layout topologies in a conflict between two adversaries.

Interests

I have written an entire computer operating system from scratch. This is often cited as one of the most difficult computer programming activities and was the product of many hundreds of hours of development and > 30 thousand lines of C and assembly code. The operating system is UNIX-like and is powerful enough to run programs like GNU Bash and the GNU C compiler. As a sort-of sequel, at the moment I’m building a computer out of basic logic gate ICs (just chips).

I actively participate in online physics and computer programming forums, and contribute to the open source software community through <https://github.com/khoek> (recently especially focusing on the automated theorem prover *Lean*). I compete in the Google Code Jam and USA Computing Olympiads for fun.

I enjoy playing club chess and cycling.

Fun fact: I can solve a Rubik’s Cube in under a minute!