DARIO TRINCHERO

PhD Candidate in Mathematical Physics

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EDUCATION

Doctorate in Mathematical Physics

Jan 2023 – present | Stellenbosch University, ZA

Thesis: *New isomorphism between spaces of skeins & holomorphic sections in Chern-Simons theory*

Master's in Theoretical Physics

Feb 2021 – Dec 2022 | Stellenbosch University, ZA

Thesis: *Pinhole interference in 3D fuzzy space*

Courses: Quantum information, relativity, solid-state physics

Honours in Mathematics

Feb 2020 – Dec 2020 | Stellenbosch University, ZA

Mini Thesis: *Generalised Feynman formula for Ising model*

Courses: Quantum field theory, (functional) analysis

Bachelor's in Theoretical Physics

Feb 2017 – Dec 2019 | Stellenbosch University, ZA

Majors: Physics, mathematics, abstract mathematics

Extra Courses:

- *3rd year:* Algebra, logic, abstract mathematics
- *2nd year:* Applied mathematics, abstract mathematics
- *1st year:* Chemistry

Cambridge International AS- & A-Levels

Jan 2015 – Nov 2016 | Somerset College, ZA

A-Levels: Mathematics, physics, computer science, chemistry

AS-Levels: English, Afrikaans

SKILLS & INTERESTS

Some of my broad interests, ranked by my aptitude in each:

Geometry, Quantum field theory, Programming	●●●●●
Quantum computing, Algebra, Topology, Lie theory	●●●●○
Teaching, Debating, Public speaking, Writing	●●●◐○
Cyber-security, Graphic design, Category theory	●●○○○

I have been programming since 2011, and have a strong grasp of algorithms. I am comfortable with Unix and the following languages:

Python, C/C++, Java, x86 Assembly, Ruby, Octave, MATLAB, Mathematica, Web frameworks, TEX, Haskell (learning), Rust (learning)

PROFILE

I am a passionate life-long student, with interests primarily in mathematical physics. My long-term dream is to pursue scientific research and lecture my field.

I love learning new skills, collaborating and sharing my knowledge with others. I am especially passionate about teaching, which I view both as an honour and a moral imperative. My knowledge and skills are products of a good deal of privilege, and it is by teaching a broad audience that I strive to pay this back.

Hobbies

I enjoy reading, trail-running, cooking, mushroom-hunting, and tabletop games, especially the abstract strategy game Hive.

Citizenship

I am a dual citizen of South Africa and Italy.

KEY ACCOLADES

- Globally-competitive results in university courses, A-Levels, and SAT tests
- Numerous awards from Stellenbosch University and associated institutions
- Graduated all degrees *cum laude*, including being top of my undergraduate class
- Author of academic research published in well-known journals

REFEREES

Dr Bruce Bartlett (Hons & PhD supervisor)
bbartlett@sun.ac.za
Mathematics department
Stellenbosch University, South Africa

Prof. Frederik Scholtz (MSc supervisor)
fgs@sun.ac.za
Physics department
Stellenbosch University, South Africa

Dr Johannes Kriel (MSc examiner)
hkriel@sun.ac.za
Physics department
Stellenbosch University, South Africa

RESEARCH OUTPUT

Journal Articles

- **D. Trinchero** and F. G. Scholtz, "Pinhole interference in three-dimensional fuzzy space," *Annals of Physics*, vol. 450, p. 169 224, Mar. 2023, ISSN: 00034916. DOI: 10.1016/j.aop.2023.169224.

Seminars & Colloquia

- **D. Trinchero**, *Introduction to quantum groups*, Stellenbosch University, Oct. 2023. DOI: 10.5281/zenodo.10000346.
- **D. Trinchero**, *Pinhole interference in 3D fuzzy space*, Room 316, Syracuse University, Sep. 2023. [Online]. Available: https://video.syr.edu/media/t/1_74dkljgj (visited on 09/02/2023).
- **D. Trinchero**, *Tour of knots & theta functions*, Stellenbosch University, Oct. 2023. DOI: 10.5281/zenodo.10047936.
- **D. Trinchero**, *Computing by collapsing*, Cosmic Conversations, Stellenbosch University, Apr. 2022. DOI: 10.5281/zenodo.8228648.
- **D. Trinchero**, *Exploring tensor products*, SUMS, Stellenbosch University, May 2021. DOI: 10.5281/zenodo.8228612.

ACHIEVEMENTS

2021–2022: Master's in Physics

- 100% for 1 of 3 modules; median mark of 97%; 89% for thesis
- Bursaries: Harry Crossley Foundation & Skye Foundation

2020: Honours in Mathematics

- 100% for 1 of 11 modules; median mark of 94%; 95% for mini thesis
- Dean's Medal: highest faculty average across 4 years of study
- Perimeter Institute for Theoretical Physics: attended summer program
- Bursary: National Research Foundation

2017–2019: Bachelor's in Physics

- 100% for 16 of 37 modules; median mark of 99%
- Rector's Award: among top students of faculty
- Rubbi Book Prize: top Mathematics student (2018, 2019)
- Top Computer Science & Applied Mathematics first year
- First Year Achievement Awards: among top first year students
- Winner (in team): South African Mathematical Modelling Contest (2018)
- Second place (in team): *SANReN* Cyber Security Challenge (2018)
- Bursary: Stellenbosch University Merit Award (2018, 2019)

2015–2016: Cambridge AS- & A-levels

- Dux scholar: Somerset College (Cambridge curriculum)
- Highest mark globally: AS-level Mathematics
- Highest mark in South Africa: AS-level Chemistry
- Perfect SAT scores (800) for Physics & Mathematics subject tests; score of 1530/1570 for general SAT (with essay)
- A* ("A-star") grade in all A-levels
- Winner (in team): SA National Schools Debating Championship; placed 10th individually
- Finalist: SA Mathematics & Computer Programming Olympiads
- Scholarship (Rhodes University): gold medal in *De Beers* English Olympiad

EMPLOYMENT

Mathematics Course Assistant

Feb 2018 – Dec 2023 | Stellenbosch University, ZA

I have tutored the following undergraduate classes:

- *3rd year:* Algebra, Fredholm theory
- *2nd year:* Linear algebra, advanced calculus, analysis
- *1st year:* Linear algebra, calculus

Software Development Engineer Intern

Nov 2019 – Feb 2020
Dec 2020 – Feb 2021 | Amazon Web Services, ZA

I interned twice for *Amazon Web Services* (AWS) where I worked on *Elastic Compute Cloud* (EC2).

Private Tutoring

Aug 2017 – Mar 2018 | Independent, *ad hoc*

Grade 11–12 mathematics, both national curriculum & advanced programme mathematics.

PERSONAL PROJECTS

Course Enrichment for 2019

- I attended an Honours-level course on *Lie theory*, which I applied to Hydrogen-atom physics as part of my 3rd-year abstract mathematics project.
- I attended a fluid dynamics course in my spare time.

Global Game Jam & Other Development

- Since 2019, a friend and I have partaken in the annual *Global Game Jam*, wherein participants have 3–5 days to design & build a computer game from scratch.
- Having started with no knowledge in *Unity*, *Godot*, *C#*, or game design, this was a rapid learning experience.
- We have independently created several game prototypes since, including a web version of Hive (see my GitHub).

Algebra & Geometry Investigation

- I spent the holiday of 2017–2018 independently working through every page & exercise of Alan Beardon's wonderful book, *Algebra and Geometry*.
- As my introduction to abstract mathematics, it now holds a special place in my heart.

Project Euler Problems

- An ongoing project of mine (since 2015) is completing programming challenges from the *Project Euler* database.
- These challenges demand mathematical proficiency & creativity to solve in the permitted 1min run-time.