PETER FAUL

Final year PhD student at the University of Cambridge

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EDUCATION

Doctor of Philosophy (Ongoing)

University of Cambridge

Sep 2017 – Present Cambridge, UK

- Field: cohomology, categorical algebra, monoid and semigroup theory
- Supervisors: Peter Johnstone and Martin Hyland (acting)

Masters of Science

University of Cape Town

2015 – 2016 Cape Town, ZA

- Awarded with distinction (cum laude)
- Field: graph theory
- Thesis title: Generalisations of Graph Broadcasts
- Supervisor: David Erwin
- Select comment from referee:

> "... he demonstrates creativity and a maturity of mathematical insight beyond the level of a masters student. He executes his ideas with technical dexterity and shows a thorough understanding of material from other mathematical areas that he applies to accomplish his goals. With this work he moves beyond the prescribed scope for a master's thesis to deliver an original advance to the theory of broadcasts in graphs."

Bachelor Honours

University of Cape Town

2014 Cape Town, ZA

- First class pass

Bachelor of Science

University of Cape Town

2011-2013 Cape Town, ZA

- Awarded with distinction in mathematics

PUBLICATIONS

Adjunctions in broadcast domination with a cost function, Australalsian Journal of Combinatorics 72, 70–18 (2018)

Artin glueings of frames as semidirect products (with coauthor G Manuell), Journal of Pure and Applied Algebra 224 volume 8 (2020) DOI:10.1016/j.jpaa.2020.106334

A characterization of weakly Schreier extensions of monoids, Journal of Pure and Applied Algebra (forthcoming)

λ-semidirect products of inverse Monoids are weakly Schreier extensions, Semigroup Forum (forthcoming)

TEACHING EXPERIENCE

Mathematics Tutor (Calculus, Linear Algebra, Real Analysis)

University of Cape Town

2015–2016 Cape Town, ZA

Mathematics Supervisor (Groups, Rings and Modules and Linear Algebra)

University of Cambridge

2019–2020 Cambridge, UK

Volenteer Lecturer for the UCT Algorithm Circle (Theoretical Computer Science)

University of Cape Town

2011–2014 Cape Town, UK

RESEARCH INTERESTS

Homological algebra
Generalising group cohomology to the monoid setting (and beyond)

Categorical algebra
$\mathcal{S}$-protomodularity and its generalisations

Monoids and semigroup theory
Structure theorems and generalised semidirect products

Graph Theory
Applications of order theory to generalisations of graph domination

LANGUAGES

English
Python
Rust
Afrikaans

PAPERS UNDER REVIEW

Baer sums for a natural class of monoid extensions, arXiv preprint arXiv:2005.09063 (Semigroup Forum)

Quotients of monoid extensions and their interplay with Baer sums (with coauthor G Manuell), arXiv preprint arXiv:2006.10537 (Journal of Algebra).

TALKS

Broadcast domination on graphs with a cost function

South African Mathematical Society Annual Congress

November 2016 — Cape Town, ZA

Artin glueings as semidirect products

Topology, Algebra and Categories in Logic (TACL 2019)

June 2019 — Nice, FR

Artin glueings of frames and toposes as semidirect products

Category Theory (CT 2019)

July 2019 — Edinburgh, UK

Weak semidirect products of monoids

Postgraduate Conference in Category Theory and its Applications

November 2019 — Leicester, UK

Characterizing weakly Schreier extensions

Invited speaker for the York Semigroup Seminar

January 2020 — York, UK

Characterizing weakly Schreier extensions of monoids

Cambridge Category Theory Seminar

Febuary 2020 — Cambridge, UK

Cohomology and Baer sums for a natural class of monoid extensions

Cambridge Junior Algebra Seminar

June 2020 — Cambridge, UK

Statistical Nonsense

Invited guest lecture at Ashoka University

April 2019 — Delhi, IN

A universal technique in sudoku (sort of)

Peterhouse graduate symposium

Febuary 2018 — Cambridge, UK

NOTABLE SERVICES

UCT Algorithm Circle (various capacities)

University of Cape Town

2011-2014 — Cape Town, ZA

- The algorithm circle was a student run society teaching theoretical computer science to high-school and under graduate students.
- I served in various administrative positions through the years as well as serving as a frequent lecturer.
- There were two lecture streams: fundamentals and advanced. **I designed the fundamental syllabus in 2012** which was a year long course preparing students to enter the advanced stream the next year.

Organiser of the Category Theory Seminar

University of Cambridge

2019–Present — Cambridge, UK

AWARDS

Harry Crossley Research Fellowship

Univeristy of Cape Town

2015–2016 — Cape Town, ZA

National Research Fellowship Innovation Masters Scholarship

Univeristy of Cape Town

2015–2016 — Cape Town, ZA

Second Prize, Student Presentation Award, MSc Category

South African Mathematical Society Annual Congress

2016 — Cape Town, ZA

Dean's Merit List

University of Cape Town

2012 and 2013 — Cape Town, ZA

Reached the final round of the South African Mathematics Olympiad

South African Mathematics Olympiad

2010 — South Africa

- The top one hundred participants nationally are selected for the final round.