

PhD from JHU, fall 2022
Supervised by [Emily Riehl](#)

— Education —

■ July 2022 PhD in Mathematics

JOHNS HOPKINS

Dissertation: Towards the theory of proof-relevant categories

■ Spring 2020 Programme Associate

MATHEMATICAL SCIENCES RESEARCH INSTITUTE

Higher Categories and Categorification

■ 2018 Masters Degree

JOHNS HOPKINS, M.A. MATH.

Completed written qualifying exams and oral speciality exam

■ 2016-2018 Principle Fulbright Scholar

JOHNS HOPKINS

Selected & funded to pursue PhD in Math., transferred from George Washington University

■ 2015-2016 Principle Fulbright Scholar

GEORGE WASHINGTON UNIVERSITY

Graduate coursework

■ 2015 Masters Degree

UNIVERSITY OF CAPE TOWN, M.Sc. MATH., WITH DISTINCTION

Dissertation: "On the local and global properties of information manifolds"

■ 2014-2015 Research Group

UNIVERSITY OF CAPE TOWN, INFORMATION GEOMETRY

Quantum Gravity and Strings Laboratory

■ 2014 Honours Degree

UNIVERSITY OF CAPE TOWN, PURE MATH., FIRST CLASS

■ 2011-2013 Bachelor of Science

UNIVERSITY OF CAPE TOWN, DEGREE WITH DISTINCTION

Majors: Pure Math., Applied Math., and Astrophysics, each with distinction

— Computer Science —

Prior to commencing graduate studies in mathematics, i organised, competed in, and taught the following:

■ 2011-2014 Algorithm Circle

THEORETICAL C.S. ORGANISATION, UNIVERSITY OF CAPE TOWN

Lecturer (2011-2014), Vice Chairman (2012, 2014), Chairman (2013) for an organisation that gave free & open, weekly lectures on topics in theoretical computer science (data structures, complexity theory, programming language theory, cryptography) and helped attendees prepare for programming contests.

■ Dec. 2012 Top 10 in Southern Africa

GOOGLE APP DEVELOPER CHALLENGE

Designed and implemented a website allowing for the easy, intuitive and visual organisation of free-form data into graphs and networks conveying relations and interconnections. Written in Python, Javascript, and using D3.js.

■ 2011 & 2012 Haskell Course

UNIVERSITY OF CAPE TOWN

Organised and gave a free & open Haskell programming language course.

In the period 2011-present, i have contributed code to several open-source projects, including:

- [MikeOS](#), a 16bit real-mode operating system written in x86 assembly
- [DoomRetro](#), a modern source port of ID Software's DOOM (II) game engine written in C using SDL2
- [tiny-menu.el](#), an Emacs minor mode to display interactive menus for quick actions written in Emacs Lisp

In the period 2016-present, i have created several medium-to-large projects of my own, including:

- [Art-deco clock](#) [AVR C, OpenSCAD], a 3D-printed art-deco clock using an ATTiny24, RTC chip, and two OLED displays
- [sieve-mode.el](#) [elisp], an Emacs minor mode to surround the region with smart delimiters interactively
- [msr](#) [C], a public-key signature verification tool using curve Ed25519, libsodium, GNU argp, and compatible with OpenBSD's signify
- [TakWrap](#) [Rust], a TUI for local play of the abstract strategy game of Tak
- [ctak](#) [C, ongoing], a line-mode interface for the game of Tak, complete with a computer opponent. This project was designed to learn about (convolutional) neural networks, adversarial tree search, & buildroot for cross-compiling and embedded computing on a Raspberry PI
- [ZiRC](#) [Zig, ongoing], a project to learn the Zig programming language and the basics of 3D rendering by building a featureful raycaster engine

— Papers —

- **Regular Calculi I: Graphical Regular Logic** ([arXiv 2109.14123](#))
joint with B. Fong & D. I. Spivak, on the novel structure of regular calculi and their use as an ergonomic & graphical syntax for regular logic.
- **A common misinterpretation of Isbell's obstruction to monoidal strictification** ([arXiv 2106.03652](#))
which shows that the widely disseminated obstruction to strictifying the associator is shown to be under-specified as stated, and the truth is more subtle.
- **Bi-representations and bi-initial objects are not so different** ([arXiv 2009.05545](#))
joint with L. Moser, on 2-categorical and double-categorical theorems characterising when pseudo-functors into Cat are representable, with applications to bi-adjunctions and 2-dimensional limits. To appear in Cahiers de Topologie et Géométrie Différentielle Catégoriques.
- **2-limits and 2-terminal objects are too different** ([arXiv 2004.01313](#))
joint with L. Moser, on the failure of all theorems of the form "a 2-dimensional limit is a 2-dimensional terminal object in a 2-dimensional slice category of cones".

— Award —

- April 2021 **William Kelso Morrill Award**

EXCELLENCE IN MATHEMATICS

For love of teaching, love of mathematics, and concern for students, nominated by undergraduates & selected by the department.

— Teaching Experience —

See my [website](#) for details, including my role as sole instructor, my role in administrating the online homework system, and my work as a course development assistant and the products thereof.

- 2018-2021 **Head T.A. & WeBWork administrator**

JOHNS HOPKINS

Calculus III & ODE (twice & thrice, resp.) and online homework system

- Spring 2019 **Course development**

JOHNS HOPKINS

Introduction to Proofs, assisted Prof. Riehl in course development

- Fall 2017 **Sole Instructor**

JOHNS HOPKINS

Introduction to Calculus

- Jan. 2017 **Primary Instructor**

JOHNS HOPKINS

Intersession Course: Recreational Math. for All

- 2017-'19, '21 **DRP Mentor**

JOHNS HOPKINS

Mentored projects in: General Topology, Braid Group Representations, Category Theory, Homotopy Type Theory

- Oct. 2014 **Invited Instructor**

UNIVERSITY OF CAPE TOWN

Introduction to Group Theory

- 2014-2021 **Teaching Assistant**

Real Analysis, Introductory Abstract Algebra, Linear Algebra, Differential Equations, Calculus Sequence, String Theory

— Notable Service & Leadership —

- 2019 **Primary organiser**

2019 CATEGORY THEORY OCTOBERFEST ([website](#)),

JOHNS HOPKINS

- 2018 **Chapter representative**

DIRECTED READING PROGRAM (DRP)

Represented the JHU DRP chapter at the Directed Reading Programme Network & Workshop, MIT

- 2017-2019 **Co-organiser**

DIRECTED READING PROGRAM (DRP), JOHNS HOPKINS

Individual pairing of undergraduates with graduates for independent studies ([website](#)). Mentor & co-organiser (2017-2019), primary organiser (2018-2019)

- 2015 **Organiser**

MATHS POSTGRAD. TEA PARTY, UNIVERSITY OF CAPE TOWN

Founder of a biweekly meeting of graduates, comprising peer lectures and discussions over tea

- 2011-2015 **Various roles**

ALGORITHM CIRCLE – THEORETICAL COMP. SCI. CLUB, UNIVERSITY OF CAPE TOWN

Free and open lectures, and competition prep. Lecturer (2011-2015), Vice-chairman (2012, 2014), Chairman (2013)

- 2011 & 2012 **Organiser**

HASKELL PROGRAMMING COURSE, UNIVERSITY OF CAPE TOWN

Organised and gave a free and open Haskell language programming course

— Competencies —

- Comfortable in C and Haskell, with experience in Agda, (x86 & AVR) Assembly, Common Lisp, Coq, L^AT_EX, Python, Rust, and Zig
- English (fluent), Hebrew (intermediate), Afrikaans (intermediate)

— Personal Pursuits —

- *Electronics & 3D printing*: Various projects leveraging micro-controllers and custom circuitry
- *Cellular automata*: Exploration of rule sets and pattern engineering
- *Esoteric Programming Languages*: Authored and implemented several languages ([url](#))
- *Fractal Art*: Exploration of the media of iterated function systems, chaotic maps and attractors, and epicyclic generators
- *Digital Music*: Leveraged trackers and other platforms to create a variety of compositions