tslil clingman

✉ tslil@jhu.edu
https://tslil.xyz

PhD from JHU, fall 2022
Supervised by Emily Riehl
Interested in: *formal category theory*, *higher categories*, and *homotopy type theory*.

Work Experience

- 2022- **Quantitative Technologist**
  Radix Trading B.V.
- 2016-2022 **Teaching Assistant**
  Johns Hopkins

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**
  Univ. Cape Town, M.Sc. Math., with Distinction
  Dissertation: "On the local and global properties of information manifolds"
- 2014-2015 **Research Group**
  Univ. Cape Town, Information Geometry
  Quantum Gravity and Strings Laboratory
- 2014 **Honours Degree**
  Univ. Cape Town, Pure Math., First Class
- 2011-2013 **Bachelor of Science**
  Univ. Cape Town, Degree with Distinction
  Majors: Pure Math., Applied Math., and Astrophysics, each with distinction

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**
  Univ. Cape Town
  Introduction to Group Theory
- 2014-2021 **Teaching Assistant**
  Real Analysis, Introductory Abstract Algebra, Linear Algebra, Differential Equations, Calculus Sequence, String Theory

Teaching 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.

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 strictfication** (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** (link)

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. Cahiers de Topologie et Géométrie Différentielle Catégoriques, LXIII-3.

- **2-limits and 2-terminal objects are too different** (link)

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". Appl. Categor. Struct. 2022

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, Univ. 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:

- ctak [C], a line-mode interface for the game of Tak, complete with a computer opponent. This project was designed to learn about neural networks, adversarial tree search, & buildroot for cross-compiling and embedded computing on a Raspberry PI
- srchr [Rust], a parallelised keyboard layout optimiser. This project exploits symmetries in "pre-layouts" to reduce the search space, which it explores by way of a genetic algorithm in order to optimise layouts given certain n-gram distributions and a customisable loss function as input. Includes schematics for custom keyboard pcbs
- Art-deco clock [AVR C, OpenSCAD], a 3D-printed art-deco clock using an ATTiny24, RTC chip, and two OLED displays
- siege-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
- ZiRC [Zig], a project to learn the Zig programming language and the basics of 3D rendering by building a featureful raycaster engine

Notable Service

- 2019 **Primary organiser**

2019 Category Theory Octoberfest *(website)*
hosted at 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, Univ. 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, Univ. Cape Town
Free and open lectures, and competition prep. Lecturer (2011-2015), Vice-chairman (2012, 2014), Chairman (2013)

- 2011 & 2012 **Organiser**

Haskell Programming Course, Univ. Cape Town
Organised and gave a free and open Haskell language programming course

Talks

See my website for slides.

- 2021/11/11 **Topology Seminar**

University of Virginia
Structures for witnessed composition, an approach to higher categories

- Sept. 2021 **Category Theory 20→21**

Representation presentation: to present a representative, 2-representative theorem

- 2021/08/10 **Topos Institute**

Berkeley
Invitation to the next dimension: 2D doesn't mean double the work, only twice as much

- 2021/07/16 **Applied Cat. Theory 2021**

University of Cambridge
Graphical Regular Logic: the complete 2D picture

- 2020/10/14 **Category Theory Seminar**

Johns Hopkins (online, open to public)
2-lessons from Australian Category Theory: Mates and Doctrinal Adjunction

- 2020/09/11 **Category Theory Seminar**

Johns Hopkins (online, open to public)
BI DOUBLing categories we'll see/ MULTIple morphisms acting weakly/ Two out of the four/ Have laws rather poor/ But the last is coherent VIRTUALLY!

- 2019/11/05 **Category Theory Seminar**

Johns Hopkins
Within and not without: an apology for internal languages (2 parts)

- 2019/09/17 **Category Theory Seminar**

Johns Hopkins
Induction & construction: the pointless theory of localic topox

- 2019/06/15 **Types 2019**

Oslo
Towards proof relevant category theory, as modelled by globular T-categories

- 2019/06/06 **HoTT-UF Project**

CAS Oslo
What is proof relevant category theory?

- 2019/04/02 **School and Workshop on Univalent Mathematics**

University of Birmingham
The univalence axiom, a brief & incomplete tour

- 2019/02/19 **Category Theory Seminar**

Johns Hopkins
Polynomial functors, a degree of generality

- 2019/02/10 **Johns Hopkins Mathematics Tournament**

audience of high-school students
Fractions: ratio of two integers or universal machine?

- 2018/11/30 **University Seminar**

George Washington Univ.
Homotopy Type Theory, the confluence of logic and space

- 2018/11/08 **Category Theory Seminar**

Johns Hopkins
What is an LCC?

- 2018/09/20 **Oral Speciality Exam**

Johns Hopkins
Type Theory and Categories, the unbearable likeness of being

- 2017/12/05 **Graduate Topics Course**

Johns Hopkins
'Rings Modules and Algebras in Infinite Loop Space Theory' at a glance

- 2017/11/15 **Graduate Topics Course**

Johns Hopkins
What do we mean when we say spectra?

- 2017/11/30 **University Seminar**
George Washington Univ.
An Intuitive Description of Toposes, Toposes as a Description of Intuitionism
- 2017/10/12 **Category Theory Seminar**
Johns Hopkins
All good things must come to an end
- 2017/04/09 **Graduate Topics Course**
Johns Hopkins
The Calculus of Fractions and Homotopy Theory
- 2016/12/12 **Category Theory Seminar**
Johns Hopkins
A monad is just ...(with an eye to universal algebra)

Conferences Attended

- 2021 CT 20→21 online, Genoa
- 2021 ACT 2021 online, Cambridge
- 2019 Category Theory Octoberfest, JHU
- 2019 Homotopy Type Theory, CMU
- 2019 Category Theory, Edinburgh
- 2019 Types, Oslo
- 2019 HoTT-UF Project, CAS Oslo
- 2019 Summer School on Higher Topos Theory and Univalent Foundations, Leeds
- 2019 School and Workshop on Univalent Mathematics, Birmingham
- 2018 Vladimir Voevodsky Memorial Conference, IAS
- 2018 Category Theory Octoberfest, CUNY
- 2018 Directed Reading Programme Network & Workshop, MIT
- 2017 Category Theory Octoberfest, CMU
- 2017 Category Theory 2017, UBC

Competencies

- Comfortable in Python & Haskell, with experience in Agda, C, Common Lisp, Coq, LaTeX, Python, Rust, and Zig
- English (fluent), Hebrew (intermediate), Dutch (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

References available upon request