# Nathanael Chwojko-Srawley

WEBSITE: http://www.nathanaelsrawley.com/
EMAIL: nathanael.srawley@mail.utoronto.ca

## Education

**Undergraduate Degree at the University of Toronto** — Sept 2017 - May 2023
*Specialist in Mathematics, Minor in Computer Science (Deans List Scholar)*
GPA in 3rd and 4th year: 3.95/4

## Research Experience

**Classifying Automorphism-Representable Groups** — May 2021 - Aug 2021
*Supervisor: Ehsaan Hossain*
*Research Opportunity Program (ROP)*
Generalizing the classical result from group theory that there does not exist a group $G$ such that $\mathrm{Aut}(G) = \mathbb{Q}$, I worked on finding conditions on a group $G$ for which $\mathrm{Aut}(G) = H$ exists for various of groups $H$ (ex. $H = \mathbb{R}, \mathbb{Z}, \prod_i \mathbb{Z}$)

**Almost Global Existence for Nonlinear Wave Equations** — May 2022 - Aug 2022
*Supervisor: Yakov Shlapentokh-Rothman*
*Received Grant of $7500 From the* MCSRA
Building off of the work of Sergiu Klainerman, I worked on finding almost global existence for nonlinear wave equations in the setting of time dependent inhomogeneous media and Schwarzschild black hole exterior

## Senior Thesis

**Connections in Algebra and Geometry** — Sept 2021 - Dec 2021
*Supervisor: Ehsaan Hossain*
Using The Stacks Project and Hartshorne, as well as some independent research, I found solutions to a list of open-ended problems presented by my supervisor in the fields of commutative algebra and algebraic geometry. I presented interesting results at undergraduate seminars.

## Talks I have given

**Automorphism-Representable Groups** — Aug 2021
*Smarti Gras Convention*
I presented my ROP research results, in particular some properties of groups $G$ where $\mathrm{Aut}(G) = \mathbb{Z} \times \mathbb{Z}$

**Functional Analysis and Sobelev Spaces** — July 2022
*Canadian Undergraduate Mathematics Conference* (CUMC)
I presented on topics within Functional Analysis concerning Sobelev spaces, as well as their application to my research in PDEs

**Introduction to Modern Algebraic Geometry** — Oct 2022

*Mathematics Student Talk*

I presented on the foundations of modern Algebraic Geometry, its connection to Differential Geometry, and on the classification of algebraic surfaces.

**Consequences of Nakayama's Lemma** — Nov 2021

*Senior Thesis*

I presented Nakayama's lemma as well as some consequences (ex. a finitely generated module $M$ over a commutative ring $A$ implies that surjective endomorphisms are injective, or that an absolutely flat local ring is a field)

**Artin-Tate Lemma** — Nov 2021

*Senior Thesis*

I presented on the Artin-Tate lemma, which is the commutative algebra equivalent of a subgroup of finite index of a finitely generated subgroup is finitely generated

**Applications of Category Theory** — Nov 2021

*Mathematics Student Talk*

I presented on the intuitions behind Category theory and 'Categorical thinking', common examples of categorical constructions, and the applications of Category theory to the fields of Algebra, Analysis, Physics, and Computer Science

**Integral Extensions and Localizations** — Sept 2021

*Senior Thesis*

I presented proofs of the Lying-Over, Going-Up, and Going-Down theorem, how they translate in the context of the localization of rings, and made connections to algebraic geometry

**Classification of Divisible Groups** — Jul 2021

*Seminar*

I presented on the classification of divisible groups, and elementary theory of injective modules.

## Talks I have Attended

**Akshay Venkatesh Fields Symposium** — Oct 2022

*Fields Medal Symposium*

Presentation by Emily Riehl on revisiting the foundations of Mathematics via type theory and univalent foundations

**Curvature in Metric Geometry** — Sept 2022

*Seminar*

Presentation by Nicola Gigli introducing how the idea of Gaussian curvature from Riemann Geometry can be imported into Metric Geometry

**A First Encounter with Diffeology** — Oct 2022

*Seminar*

Presentation by David Miyamoto introducing the notion of Diffeology, including many examples (Ex. manifolds, orbifolds, quasifolds) and some basic constructions

**P=W Conjecture Solved** — Oct 2022 - Nov 2022

*Seminar*

I attended a series of presentations on 2 recent papers by Mauilik and Shen proving the $P = W$ conjecture

## Teaching Experience

**Teaching Assistant** (TA)
Sept 2021 - Apr 2023

Prepared and ran tutorials, graded assignments, held office hours, and invigilated tests. Courses I was a TA for are:

- Abstract Algebra (MAT301) Jan 2023-Apr 2023
- Abstract Algebra (MAT301) Sept 2021-Dec 2021
- Linear Algebra II (MAT224) July 2021-Aug 2021
- Linear Algebra II (MAT224) May 2021-June 2021
- Combinatorics (MAT202) Jan 2021-Apr 2021
- Calculus II (MAT136) Sept 2020-Dec 2020

## Independent Study Units

**Quivers and their Representations**
Jan 2022 - Apr 2022

One-on-one course covering Quiver Decomposition, Root Systems, Gabriel's Theorem, Path Algebras of Quivers, and relation to Lie Algebras

**Module Theory**
Sept 2020 - Dec 2020

One-on-one course covering the construction of Modules, tensor algebras, projective/injective/flat modules, and homological algebra from a computational approach

## Volunteer Experience

**UTM Math Club Administrator**
Nov 2020-

I am actively involved in the mathematical community in answering questions, sharing new perspectives, facilitating events, and guiding newer students
(member count: $\approx 3785$)

**Everything You Need To Know About Algebra**
Aug 2019-

Wrote pedagogical book on Algebra comprehensively covering areas in undergraduate mathematics from group, ring, module, and field theory, to commutative algebra and representation theory. Available at http://www.nathanaelsrawley.com/Notes

## Work Experience

**Software Developer**
May 2019 - Aug 2020

Full stack software developer at SOTI working in the next generation team which focused on future projects for the company