# Nathanael Chwojko-Srawley

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## EDUCATION

**Undergraduate Degree at the University of Toronto**   SEPT 2017
*Specialist in Mathematics, Minor in Computer Science*   -MAY 2023
GPA in 3rd and 4th year: 3.95/4

## RESEARCH EXPERIENCE

**Classifying Automorphism-Representable Groups**   MAY 2021
*Supervisor: Ehsaan Hossain*   -AUG 2021

*Research Opportunity Program (ROP)*

Generalizing the classical result from group theory that there does not exist a group $G$ such that $\mathrm{Aut}(G) = \mathbb{Q}$, we looked into 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
*Supervisor: Yakov Shlapentokh-Rothman*   -AUG 2022

*Received Grant of \$7500 From the* MCSRA

Building off of the work of Sergiu Klainerman, we looked into finding almost global existence for nonlinear wave equations in the setting of time dependent inhomogeneous media and Schwarzschild black hole exterior

## TALKS AND CONFERENCES

**Functional Analysis and Sobelev Spaces**   JULY 2022
*Canadian Undergraduate Mathematics Conference* (CUMC)

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*

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

**Integral Extensions and Localizations**   SEPT 2021
*Senior Thesis*

Presented proofs and consequences of the Lying-Over, Going-Up, and Going-Down theorem

## Consequences of Nakayama's Lemma

*Senior Thesis*

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)

Nov 2021

## Applications of Category Theory

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

Nov 2021

## Automorphism-Representable Groups

*Smarti Gras Convention*

Presented ROP research results, in particular some properties of free groups and groups $G$ where $\text{Aut}(G) = \mathbb{Z} \times \mathbb{Z}$ and $\text{Aut}(G) = \mathbb{Z}$

Aug 2021

## Classification of Divisible Groups

*Seminar*

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

Jul 2021

## Akshay Venkatesh Fields Symposium

*Fields Medal Symposium*

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

Oct 2022

## Curvature in Metric Geometry

*Seminar*

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

Sept 2022

## A First Encounter with Diffeology

*Seminar*

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

Oct 2022

## P=W Conjecture Solved

*Seminar*

Series of presentations on 2 recent papers by Mauilik and Shen proving the $P = W$ conjecture

Oct 2022
-Nov 2022

# Teaching Experience

**Teaching Assistant** (TA)                                          Sept 2021
Prepared and ran tutorials, graded assignments, held office hours, and invigilated    - Apr 2023
tests. Courses I was a TA for are:

- Abstract Algebra (MAT301)
  Jan 2023-Apr 2023

- Abstract Algebra (MAT301)
  Sept 2022-Dec 2022

- Linear Algebra II (MAT224)
  July 2022-Aug 2022

- Linear Algebra II (MAT224)
  May 2022-June 2022

- Combinatorics (MAT202)
  Jan 2022-Apr 2022

- Calculus II (MAT136)
  Sept 2021-Dec 2021

# Independent Study Units

**Connections in Algebra and Geometry**                              Sept 2021

*Supervisor: Ehsaan Hossain*                                         -Dec 2021

*Senior Thesis*

Using The Stacks Project, Hartshorne, and 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

**Quivers and their Representations**                                Jan 2022

Quiver Decomposition, Root Systems, Gabriel's Theorem, Path Algebras of Quivers,    -Apr 2022
relation to Lie Algebras

**Module Theory**                                                    Sept 2020

Construction of Modules, tensor algebras, and elementary homological algebra (with    -Dec 2020
a focus on projective, injective, and flat modules)

# Volunteer Experience

**UTM Math Club Administrator**                                      Nov 2020-

Active community involvement in answering questions, sharing new perspectives, fa-
cilitating events, and guiding newer students (member count: $\approx 3785$)

**Every You Need To Know about Algebra** (EYNTKA 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