

## RESEARCH INTERESTS

Numerical Hydrodynamics,  
Physics-Based Computer Graphics,  
Development of Numerical Methods

## EDUCATION AND AWARDS

2021-  
Doctor of Philosophy in  
Computer Science  
University of Toronto

2018-2020  
Master of Mathematics in  
Computer Science  
University of Waterloo  
GPA: 94%

2014-2018  
Honours Bachelor of Integrated Science  
Math and Stats Concentration  
Physics Minor  
McMaster University  
Summa Cum Laude  
GPA: 11.9 on a 12-point scale

2022-2025 | NSERC/CRSNG  
Canada Graduate Scholarship - Doctoral  
2021 | Government of Ontario  
Ontario Graduate Scholarship - Doctoral  
2019 | Government of Ontario  
Ontario Graduate Scholarship - Master's  
2018 | NSERC/CRSNG  
Canada Graduate Scholarship - Master's  
2018 | University of Waterloo  
President's Graduate Scholarship  
Math Domestic Master's Scholarship

## PROGRAMMING SKILLS

**Programming Languages**  
C, C++, Python, Bash, PIC MCU Assembly  
**Markup Languages:**  $\text{\LaTeX}$ , Markdown  
**Math Tools:** MATLAB, Maple, R  
**Web:** HTML, CSS, JS, Jekyll, Bootstrap

## CERTIFICATIONS AND TRAINING

High Performance Computing Training  
Sharcnet 2016 HPC Summer School  
Planetarium Hosting Training  
WHMIS and Workplace Safety Training

## PUBLICATIONS

**2023** | PolyStokes: A Polynomial Model Reduction Method for Viscous Fluid Simulation

ACM Transactions on Graphics | Jonathan Panuelos, Ryan Goldade, Eitan Grinspun, David Levin, and Christopher Batty  
<https://doi.org/10.1145/3592146>

**2020** | Efficient Unified Stokes using a Polynomial Reduced Fluid Model

Symposium on Computer Animation 2020 (Poster)  
Jonathan Panuelos, Ryan Goldade, and Christopher Batty  
<https://doi.org/10.2312/sca.20201214>

**2020** | Low shear diffusion central schemes for particle methods

Journal of Computational Physics (Vol 414)  
Jonathan Panuelos, James Wadsley, and Nicholas Kevlahan  
<https://doi.org/10.1016/j.jcp.2020.109454>

## PRESENTATIONS

**2023 Aug** | PolyStokes: A Polynomial Model Reduction Method for Viscous Fluid Simulation

SIGGRAPH 2024; Los Angeles, CA, USA  
20-minute academic presentation of published work in the premiere venue of computer graphics research;

**2018 Apr** | Central Schemes and Shearing Diffusion in Particle Methods

iSci Synthesis Conference; Hamilton, ON, Canada  
20-minute thesis presentation on improving shearing diffusion in central schemes for meshless geometries;

**2017 Oct** | Stability and Artificial Viscosity in Numerical Hydrodynamics

Canadian Undergraduate Physics Conference; Ottawa, ON, Canada  
10-minute presentation regarding the balance between numerical stability and resolving physical instabilities, as well as an overview of the constant-mass Kurganov-Tadmor central scheme;

**2017 Apr** | Central Upwind Schemes in SPH

iSci Synthesis Conference; Hamilton, ON  
10-minute presentation on summarizing research performed in the preceding four months involving the reformulation of the Kurganov-Tadmor central scheme, classically finite-volume, into a finite-mass scheme;

### **2016 Oct | When Bad Things Happen to Good SPH**

Canadian Undergraduate Physics Conference; Halifax, NS

10-minute presentation on artificial viscosity and conductivity for resolving high-Mach shocks in hydrodynamics simulations; Received third place award out of 14 talks in the astrophysics category;

### **2016 April | Deterministic and Stochastic Lotka-Volterra**

iSci Synthesis Conference; Hamilton, ON

Poster presentation to 120 peers and professors;

Demonstrated a working simulation and summarized results of the Stochastic Lattice Lotka-Volterra Model in poster format;

## **TEACHING EXPERIENCE**

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### **2024 Winter | Teaching Assistant: CSC 258 - Computer Organization**

Responsibilities include teaching labs, managing student online question board, and marking;

### **2023 Fall | Teaching Assistant: CSC 317 - Computer Graphics**

Responsibilities include teaching tutorials, marking student work, and proctoring exams;

### **2023 Winter | Teaching Assistant: CSC 336 - Numerical Methods**

Responsibilities include marking student work and proctoring exams;

### **2022 Fall | Teaching Assistant: CSC 317 - Computer Graphics**

Responsibilities include teaching tutorials, marking student work, and proctoring exams;

### **2022 Winter | Teaching Assistant: CSC 2521 - Topics in Geometry and Animation**

Graduate-level course on sketching and rendering; Responsibilities include assisting in lectures and marking student work;

### **2022 Winter | Teaching Assistant: CSC 317 - Computer Graphics**

Responsibilities include teaching tutorials, marking student work, and proctoring exams;

### **2021 Fall | Teaching Assistant: CSC 2504 - Topics in Computer Graphics**

Graduate-level course on physics-based animation; Responsibilities include assisting in lectures and marking student work;

### **2021 Fall | Lead Teaching Assistant: CSC 417 - Physics-Based Animation**

Upper-level course; Responsibilities include assisting in lectures and marking student work;

### **2019 Winter - 2020 Winter | Instructional Apprentice: CS 251 - Computer Organization & Design**

Held position for 5 consecutive terms;

Responsibilities include holding office hours, answering student questions regarding course material, monitoring online course message board, organizing marking TAs, and taking remark requests;

### **2018 Fall | Teaching Assistant: CS 115 - Introduction to Computer Science 1**

Responsibilities include marking student work and proctoring exams;

### **2016 Fall - 2017 Winter | Lead Teaching Assistant: ISCI 1A24 Physics**

Responsibilities include supervising labs, teaching tutorials, and marking student work;

## UNDERGRADUATE RESEARCH POSITIONS

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### **2017 | NSERC USRA: Numerical Methods in Hydrodynamics**

16-week summer research with Dr. James Wadsley;

Research into the application of central-upwinding schemes to meshless geometry, as well as methods for reducing numerical diffusion;

### **2016 | NSERC USRA: Hydrodynamics Simulations**

16-week summer research with Dr. James Wadsley;

Stability testing high-Mach shocks using test cases for Gasoline and GIZMO simulation code;

## UNDERGRADUATE PUBLICATIONS

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### **2016 | History of the Earth: Oceanography and Exploration**

Panuelos, J., and Nugent, M., 2016. Oceanography and Exploration. In: History of the Earth VI. Hamilton, ON: iSci Undergraduate Publications, pp.74–79. <http://hdl.handle.net/11375/20732>

One chapter in a student book publication;

### **2016 | What Would the World Be Like to a Borrower?**

Panuelos, J., and Green, L., 2016. Journal for Interdisciplinary Science Topics, 5.

Student paper in an undergraduate journal;

## VOLUNTEER EXPERIENCES

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### **2023 Mar | DGP Academy**

Assisted in organizing and running a week-long research-oriented camp aimed at introducing high school students to computer graphics;

Role involved designing two hands-on research projects, introducing relevant concepts to the students, and guiding them through the research process; Also was responsible for designing promotional material for the event;

### **2019-2020 | Computer Science Graduate Student Association (CSGSA) Publicity Officer**

Elected executive of the first governing board of the recently revived University of Waterloo CSGSA;

Responsible for working with the university's web services in creating the CSGSA website, handling social media accounts, creating event posters, and general promotions of upcoming events;

### **2019 | Waterloo Space Society Speaker**

Executive member of the University of Waterloo Space Society involved in event promotion as well as presenting talks regarding the use of numerical methods in astrophysics research;

### **2017-2018 | iScientist Promotions Manager**

Member of the Editorial Board for the iScientist student-run journal, responsible for performing webmaster duties as well as maintaining social media pages and developing promotional graphics;

Developed a new webpage using modern responsive design, available at <http://thescientist.com>;

### **2016-2018 | Mathematics and Physics Peer Tutor**

Volunteer tutor at the iSci Peer Mentorship program, providing help with first and second year math and physics content; Courses include ISCI 1A24 Math and Physics, ISCI 2A18 Math and Physics, MATH

1B03, MATH 2C03, MATH 2XX3, PHYSICS 2G03, PHYSICS 2B03;

**2017 | Student Ambassador: Ontario University Fair**

Volunteer ambassador representing the McMaster Integrated Science program at the Ontario University Fair 2017, wherein I spoke with and answered questions by prospective undergraduate students regarding the program;

**2017 | Synthesis Colloquium: Arduino Workshop Presenter**

Co-organized and presented a 2-hour introduction to Arduino workshop in McMaster's Thode Makerspace; Position involved sourcing required electronics components, preparing a PowerPoint presentation, and promoting the event via posters and social media;

**2017 | Synthesis Colloquium: 3D Printing Workshop Co-Organizer**

Coordinated with the Sherman Centre for Digital Scholarship to create an introduction to 3D printing workshop open to the public;

**2017 | Space Exploration Planetarium Mentor**

Gave guidance on the organization of the planetarium workshop, as well as held administrative duties involving event logistics;

**2016 | Synthesis Colloquium: Arduino Workshop Co-Organizer**

Organizer for a publicly open 1-hour introductory workshop to the Arduino hardware platform; Responsibilities included working with the colloquium organizers for time and room bookings, contacting and inviting a guest lecturer, and designing posters for event promotion;

**2016 | Highschool Workshop: Space Exploration Presenter**

Presented two 20-minute planetarium shows to a 25-student audience on interplanetary travel and the search for exoplanet life, highlighting various terrestrial bodies in the solar system;

**CURRICULUM RESEARCH PROJECTS**

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**2017 | Modern Astrophysics: An Application of Numerical Methods and Computing**

5-member group seminar;

Created two hour-long seminar presentations teaching basic numerical methods and their application in astronomy;

Responsible for teaching methods and for developing an interactive web exercise;

**2016 | Bubble Fizzics: Using Science to Enhance the Sparkling Wine Experience**

5-author 8-page magazine spread;

A review on the literature surrounding the physics of bubble formation in champagne, as well as its effects on the drinking experience;

Programmed a simple model for temperature-dependent CO<sub>2</sub> diffusion rate in C, as an analysis on the temperature-dependency of champagne effervescence;