MICHAEL ASTWOOD

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RESEARCH INTERESTS

Applied Differential Geometry, Mathematical Physics and Biophysics, and Fluid Mechanics.

EDUCATION

University of Waterloo, Waterloo, Canada *September 2017 - June 2021*
Honours Bachelor of Science (BSc), Mathematical Physics
Specialization in Astrophysics. Minor in Pure Mathematics.
Completed graduate level courses in Quantum Theory and Differential Geometry

Westwood Collegiate, Winnipeg, Canada *September 2013 - June 2017*
International Baccalaureate Diploma

EXPERIENCE

Research Assistant - Full Time *May 2020 - September 2020*
University of Waterloo Department of Applied Mathematics. Supervised by Dr. Henry Shum
Research in microscale fluid mechanics. Geometric control theory for particles and filaments in fluid, with applications to microswimmers and transport systems. Research supported by department grants.

Research Assistant - Part Time *September 2019 - Present*
Perimeter Institute for Theoretical Physics. Supervised by Dr. William Donnelly
Investigated BRST quantization for the Free Gross-Taylor String and similar systems. This has included readings in quantum field theory, gauge theory, and other topics of interest including topological field theories.

Research Assistant - Full Time *May 2019 - September 2019*
University of Waterloo Department of Applied Mathematics. Supervised by Dr. Brian Ingalls
Performed research in model based Optimal Experimental Design theory. The work involved investigating optimal designs for dynamical systems with bifurcations, particularly nonlinear models appearing in systems biology. Research supported by NSERC USRA.

Mathematics and Modelling Team Lead *February 2018 - Present*
University of Waterloo iGEM Synthetic Biology Team
Mentored and organized student lead research group in synthetic biology (the application of engineering to genetics and molecular biology). Projects involve extensive modelling of molecular systems with ordinary and partial differential equations as well as discrete and stochastic models.

TECHNICAL SKILLS

Programming Languages	MatLab, Python, C♯, Java, JavaScript, C++
Software & Tools	MS Office, FeNiCS, FireDrake, NumPy, SciPy, Gekko CasADI, MatLab Optimization Suite, Pandas, XML, HTML, CSS NodeJS, Cheerio, Express, Request, DiscordJS, jQuery, XNA
Graphic Design	LaTeX; Adobe Illustrator, Photoshop, and inDesign; InkScape

CONFERENCE POSTERS

An Optimal Experimental Design Software Package for Nonlinear Models in Biology (Co-Author) — SIAM Optimization 2020

Engineering Herbicide Tolerance in Rhizobia — BioTEC 2019, iGEM 2019

Characterization of Optimal Experimental Designs and Parameter Estimation Methods for a Genetic Toggle Switch — CUMC 2019

Dynamic Optogenetic Control of Co-Cultures — iGEM 2018

GRADUATE COURSEWORK

PMATH 965: Topics in Geometry and Topology (Gauge Theory) — *Winter 2020*
PHYS 785: Quantum Field Theory for Cosmology — *Winter 2020*
PHYS 701: Graduate Quantum Mechanics — *Fall 2019*
PMATH 465/665: Smooth Manifolds — *Fall 2019*

VOLUNTEER EXPERIENCE

President; Vice President; Media Officer; Editor; Librarian — *September 2017 - Present*
University of Waterloo Physics Club
Developed, budgeted, and ran a large number of student events at the University of Waterloo targeting hundreds of science students. As the seminar coordinator and librarian, personally gave seminars on topics in physics and mathematics, and began a now traditional weekly student seminar series for physics students at UW. Managed the executive team and delegated roles for 8 months as the Vice President and President. As media officer and editor, created posters and designed graphics and articles for the physics student newspaper *Dark Matter*.

Science Ambassador — *September 2018 - Present*
University of Waterloo

Third Year Class Representative — *September 2019 - April 2020*
University of Waterloo

Director — *May 2018 - September 2018*
Physics Interconnected

Creative Director — *May 2018 - September 2018*
University of Waterloo Science Society

Upper Tier Orientation Leader — *September 2018*
University of Waterloo
Trained in Standard First Aid, CPR Level C, and AED.