Jacob Dylan Bruney

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EDUCATION

University of North Carolina at Chapel Hill | Chapel Hill, NC Expected May 2022
Candidate for PhD in Applied Mathematics
Henry Owl Fellowship (previously the NC Excellence Award) Recipient

University of North Carolina at Chapel Hill, Honors College | Chapel Hill, NC May 2016
Bachelor of Science in Mathematics, Minor in Asian Studies, with Honors and Distinction (GPA: 3.72)
Honors Thesis: "The Mathematics of Sinking Through Sharply Stratified Liquids"

University of Melbourne | Melbourne, Australia Jan - Jun 2015
Leonard and Rozelia S. Herring Study Abroad Scholarship Recipient

Rowan-Cabarrus Early College High School & Community College| Salisbury, NC May 2013
Associate of Science, Honor of Valedictorian (GPA: 4.00)

Related Coursework: *Undergraduate:* Discrete Mathematics, Advanced Calculus, ODEs, PDEs, Linear Algebra, Combinatorics, Real Analysis, Mathematical Methods for Physical Sciences I & II, Euclidean and Non-Euclidean Geometry; *Graduate:* Scientific Computation I & II, Mathematical Modeling I & II, Numerical ODE/PDE I & II, Independent Study on Mean Particulate Flow, Fluid Dynamics, Applied Mathematical Methods I & II, Small-Scale Oceanic Physics

CURRENT UNC-CH DISSERTATION RESEARCH EXPERIENCE

***Primary Researcher* | Dr. R. Camassa | Cavity collapsing in stratified Eulerian fluids** Aug 2020
- Designed a novel experimental setup for studying a difficult initialization problem
- Analyzes the relationship of hyperbolic solutions against full DNS
- Collaborates with multiple numerical research teams to validate predictions

***Primary Researcher* | Drs. R. Camassa & R. McLaughlin | Dye transport via perturbed channel** Aug 2020
- Produces Monte Carlo and FEM simulations to model effective diffusivity
- Compares results to theory produced by center manifold and multiscale averaging
- Developed new technique for initializing dye distribution

***Primary Researcher* | Dr. A. Scotti | Internal wave energy dissipation via beam waves** Jan 2019
- Designed a novel experimental setup for producing beam waves via an organic topography
- Devised a new method of applying BOS (background-oriented Schlieren)
- Collaborates with current experts in the field in order to use new BOS processing algorithms

***Primary Researcher* | Dr. C. Falcon | Particle residence and bounce at sharp stratifications** Aug 2015
- Measures highly viscous fluids and analyzes data in DataTank, MatLab, and Python
- Incorporates lubrication theory into a numerical simulation to increase accuracy
- Executes experiments subject to strict constraints, needing to control and adapt for variability

***Research Assistant* | Drs. R. McLaughlin & R. Camassa | Multiple Projects** Aug 2015
- Mentors and educates undergraduate lab members on experimental setup, equipment, and execution
- Engineers different experimental setups for general fluid phenomenon

ADDITIONAL RESEARCH EXPERIENCE

***Summer Student Researcher* | Dr. J. Albright | Los Alamos National Labs | Lagrangian mesh solvers** Aug - Jun 2019
- Studied and tested different techniques for optimizing Lagrangian mesh solvers applied to various shock tube problems

TEACHING EXPERIENCE

***Course Instructor* | UNC-CH | MATH 110, 118, 130, 290, 383, 528, 528L** Aug 2018 – Present
- Designs lesson plans for and instructs lectures of 20-80 students two to three times a week

***Teaching Assistant* | UNC-CH | MATH 130, 232H, 233L, 528** Jun 2018 - Present
- Assists in course instruction, recitation/lab teaching, and grading duties

***Tutor* | UNC Athletics | UNC-CH** Aug 2016 – May 2017
- Tutored in a small group setting to provide individual attention to student athletes

PROFESSIONAL MEMBERSHIPS

Society of Industrial & Applied Mathematics Oct 2021 - Present
American Mathematical Society Aug 2017 – Present
Chayon-Ryu Martial Arts | Black Belt Member Aug 2013
Boy Scouts of America | Eagle Scout Member Jun 2012

TECHNICAL SKILLS

Programming Languages : Bash, C++, Fortran, Mathematica, MatLab, Python
Software: AmRex IAMR, ComSol, DataTank, IBAMR, NEK5000, VisIt
Lab Equipment: Viscometer, Fluid pumps, Densitometers, Conductivity meters, 3d Printers, Laser Printing, Thermal Baths