

Brett Tregoning, PhD

✉ bdtregoning@gmail.com
🌐 <http://bdtregoning.github.io/>
🌐 www.linkedin.com/in/bdtregoning
☎ 240-338-4496



Education

- 2016 – 2021 **Georgia Institute of Technology** School of Physics.
Thesis title: Investigation of spatiotemporal chaos using persistent homology
Doctor of Philosophy-Physics, President's Fellow
- 2012 – 2016 **Vanderbilt University**
Bachelor of Arts-Physics with Highest Honors
Thesis title: *Ps₂- in a magnetic field : structure and stability in the M=0 state.*
Bachelor of Arts-Mathematics

Research Publications

Publications

- 1 **Tregoning, B.**, Mukherjee, S., Suri, B., Mischaikow, K., Paul, M. R., & Schatz, M. F. (2021). Quantifying plume statistics in spatiotemporally chaotic Rayleigh-Bénard convection using persistent homology (in preparation).
- 2 **Tregoning, B.**, & Stewart, S. G. (2014). Predicting navigational error of visual binary stars. *Naval Engineering Journal*, 126.4, 169–172.
https://my.vanderbilt.edu/susanstewart/files/2015/05/Stewart_DEC2014.pdf

Theses

- 1 **Tregoning, B.** (2021). *Investigation of spatiotemporal chaos using persistent homology.*
- 2 **Tregoning, B.** (2016). *Ps₂- in a magnetic field : Structure and stability in the m=0 state.*
<http://hdl.handle.net/1803/7562>

Conference Proceedings and Talks

- 1 Schatz, M., **Tregoning, B.**, Barnett, J., Yoda, M., & Grigoriev, R. (2019). Experimental Study of Roll-Hydrothermal Wave Coexistence in Convection Driven by Buoyancy and Thermocapillarity, In *72nd Annual Meeting of the APS Division of Fluid Dynamics (APS DFD 2019)*, Seattle, Washington, USA.
<https://meetings.aps.org/Meeting/DFD19/Session/S08.3>
- 2 **Tregoning, B.**, Mukherjee, S., Levanger, R., Cyranka, J., Mischaikow, K., Paul, M., & Schatz, M. (2019). Characterizing Spatiotemporal Dynamics in Fluid Flows using Persistent Homology, In *Invited Seminar at Los Alamos National Labs*, Los Alamos, New Mexico, USA.
- 3 **Tregoning, B.**, Mukherjee, S., Levanger, R., Xu, M., Cyranka, J., Mischaikow, K., Paul, M., & Schatz, M. (2019). Using Persistent Homology to Compare Chaotic Dynamics Between Experiments on and Simulations of Rayleigh-Bénard Convection, In *72nd Annual Meeting of the APS Division of Fluid Dynamics (APS DFD 2019)*, Seattle, Washington, USA.
<https://meetings.aps.org/Meeting/DFD19/Session/G14.4>

- 4 **Tregoning, B.**, Levanger, R., Cyranka, J., Mukherjee, S., Paul, M., Mischaikow, K., & Schatz, M. (2018). Using topology to identify large Lyapunov vector magnitude in Rayleigh-Bénard convection, In *71st Annual Meeting of the APS Division of Fluid Dynamics (APS DFD 2018)*, Atlanta, Georgia, USA.
<http://meetings.aps.org/Meeting/DFD18/Session/G33.5>

Research Experience

Schatz Lab, Georgia Institute of Technology, School of Physics, Center for Non-linear Science

Advisors: Michael Schatz and Roman Grigoriev, 2016 –

- Uses topological data analysis to study spatio-temporally chaotic fluid flows.
- Predicts the evolution of dynamical systems using machine learning.
- Detects exact coherent structures in dynamical systems using persistent homology.

Varga Group, Vanderbilt University, Physics Department

Advisor: Kalman Varga, 2015

- Studied quantum few-body problems.
- Calculated stability of positron-electron systems using a variational method.

United States Naval Observatory

Advisor: Susan G. Stewart, 2014

- Studied navigational astronomy.
- Quantified visual navigational error of binary star systems.
- Studied weather effects on sky visibility.

Bolotin Group, Vanderbilt University, Physics Department

Advisor: Kirill Bolotin, 2013 – 2014

- Studied experimental condensed matter physics.
- Gained experience exfoliating graphene.
- Gained clean-room training and experience.


Employment History

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| 2016 – | ■ Graduate Student Researcher , Georgia Institute of Technology, School of Physics, Center for Non-linear Science. |
| 2014 – 2016 | ■ Tutor , Vanderbilt Physics Department. |
| 2015 Summer | ■ Undergraduate Research Assistant , National Science Foundation International Research Experiences for Students, McGill University. |
| 2014 Summer | ■ Undergraduate Research Assistant , United States Naval Observatory. |





Skills

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| Languages | ■ English (fluent), Spanish (comprehension) |
| Coding | ■ Python, MATLAB, Latex, R, C, C++, SQL |
| Scientific | ■ Statistical Methods, Machine Learning, Numerical optimization, Network Science, Data Science, Numerical Methods, Fluid Mechanics, Dynamical Systems, Topological Data Analysis |





Skills (continued)

Misc.  Teaching, tutoring, academic research, academic mentoring

Leadership Experience

2020 –  **Diversity, Equity, and Inclusion Task Force**, Georgia Tech School of Physics
2015 – 2016  **Music Director**, WRVU Vanderbilt College Radio
2014 – 2016  **President**, Vanderbilt Quiz Bowl
2013 – 2015  **Secretary**, Vanderbilt Society of Physics Students

Awards and Honors

2016  **President's Fellow**, Georgia Institute of Technology.
  **Highest Honors**, Vanderbilt University Physics Department.
2012,2014,2016  **Dean's List**, Vanderbilt University.
2014  **Sigma Pi Sigma Physics Honor Society**, Vanderbilt University Physics Department.

References

Available on Request