

# Bryan T. Weinstein

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## Education

- **Harvard University** Cambridge, MA  
*PhD in Applied Physics* Expected May 2018
  - Working Thesis Title: *Microbial Evolutionary Dynamics and Transport*
  - Advisors:
    - \* David R. Nelson: Professor of Physics and Applied Physics, Solomon Professor of Biophysics
    - \* Andrew W. Murray: Herschel Smith Professor of Molecular Genetics, Professor of Molecular and Cellular Biology, Director of FAS Center for Systems Biology
- **Harvard University** Cambridge, MA  
*PhD Secondary Field: Computational Science and Engineering (CSE)* Expected May 2018
  - Completed four advanced applied math and scientific computing courses
  - Learned state-of-the-art computational methods used in scientific research
  - **Capstone:** OpenCL GPU-powered Lattice Boltzmann fluid mechanics simulation utilizing OpenGL for real-time visualization.
- **Harvard University** Cambridge, MA  
*S.M. in Applied Physics* November 2014
  - Completed 12 courses: 4 physics core courses, 4 CSE courses, and 4 soft-matter/biophysics electives
  - GPA: 3.95/4.00
- **Case Western Reserve University** Cleveland, OH  
*Bachelor of Science in Engineering, Engineering Physics* May 2012
  - GPA: 4.00/4.00, Summa Cum Laude, Valedictorian
  - Engineering Concentration: Aerospace Engineering
  - Senior Project: Simulating Interactions between Confined Spins and Ferromagnetic Vortices
- **Fairport High School** Fairport, NY  
*High School* May 2012
  - GPA: 98.7/100, Class Valedictorian of 598 students

## Graduate Fellowships and Awards

- **Institute for Applied Computational Science Scholarship** Cambridge, MA  
*Graduate Student* September 2016 - September 2017
  - Wrote proposal and won a \$25,000 student scholarship from Harvard's Institute for Applied Computational Science (IACS)
  - Used funds to develop a GPU-powered Lattice Boltzmann fluid mechanics simulation
- **Department of Energy Office of Science Graduate Fellowship** Washington, D.C.  
*Graduate Student* September 2012 - September 2015
  - Wrote proposal to win competitive fellowship supporting students pursuing training in areas relevant to Department of Energy (DOE)
  - Selected out of 1,300 applicants; 50 fellowships awarded
  - Attended yearly conferences at National Laboratories; presented posters on my active research, networked with other DOE fellows and government officials

- **Harvard University Pierce Fellow**

*Graduate Student*

Cambridge, MA

*September 2012 - September 2015*

- Won fellowship awarded to the highest caliber PhD students accepted into Harvard’s School of Engineering and Applied Sciences (SEAS)
- Selected out of 150 students; 8 fellowships awarded

## Publications

- [1] Bryan T. Weinstein, Maxim O. Lavrentovich, et al. “Genetic Drift and Selection in Many-Allele Range Expansions”. Submitted. 2017. URL: <http://biorxiv.org/content/early/2017/06/07/145631>.

## Conferences and Invited Presentations

- [1] Severine Atis, Bryan T. Weinstein, et al. “Experimental Population Dynamics in Fluid Flows”. In: *American Physical Society March Meeting*. Presentation. American Physical Society. New Orleans Morial Convention Center, 2017.
- [2] Bryan T. Weinstein, Maxim O. Lavrentovich, et al. “Diffusion and Selection in Many-Allele Range Expansions”. In: *American Physical Society, March Meeting*. Presentation. American Physical Society. New Orleans Morial Convention Center, 2017.

## Summer Schools

- **Marine Biological Laboratory Physiology Course**

*Student*

Woods Hole, MA

*June 2014 - August 2014*

- Applied and accepted into intense 7 week course focused on intersection of experiment and theory in cellular physiology
- Learned how to use state-of-the-art microscopy to examine cellular behavior
- Interacted with leading cellular physiology researchers in daily lectures and seminars
- Course taught by Rob Phillips, Jennifer Lippincott-Schwartz, Wallace Marshall

## Graduate Research

- **Harvard University**

*David R. Nelson & Andrew Murray: Physics, Molecular and Cellular Biology*

Cambridge, MA

*Sept 2013 - Present*

- Combined nonequilibrium statistical mechanics and experimental molecular biology to quantify the evolutionary dynamics of microbial range expansions
- Learned experimental biology techniques (trained in Dr. Andrew Murray’s Lab)
- Captured images via microscopy; utilized Python and ImageJ extensively for analysis
- Devised algorithms to analyze and visualize large sets of biological data
- Developed agent-based and Lattice-Boltzmann simulations of range expansions in Python, C++, and OpenCL
- Used OpenFoam and the Lattice-Boltzmann technique to simulate fluid flows
- Created analytical models utilizing stochastic methods to predict experimental results

## Outreach

- **Science in the News Presentation**

*Physics of Evolution*

Cambridge, MA

*November 2014*

- Described how physics-based models can be used to predict evolutionary trajectories to the public in a 1.5 hour talk

- Presentation and was given to approximately 100 members of the public at Harvard Medical School
- Worked closely with teammates to create an effective presentation

## Specialized Skills

### • Computational

- Secondary Field in Computational Science and Engineering (PhD minor)
  - \* Significant experience optimizing programs to run on multiple processors, graphics processing units, and supercomputers.
  - \* Expert at analyzing and visualizing “Big-Data”
  - \* Excellent at designing and running simulations to gain insight into complicated problems
  - \* Knowledge of stochastic and probabilistic methods to solve high-dimensional problems
- Software:
  - \* Languages for Scientific Computing:
    - Python, Cython, OpenCL, CUDA, C, C++, Java, Matlab, Mathematica
  - \* Fluid Mechanics:
    - Lattice Boltzmann Method (custom-built code), OpenFOAM, SALOME
  - \* Image Analysis Tools:
    - ImageJ, Python, OpenCL, OpenCV, OMERO
  - \* Other Selected Languages & Programs :
    - Netlogo, Axiovision, Origin, Igor, Bash, L<sup>A</sup>T<sub>E</sub>X, Windows Powershell, Wordpress, HTML, CSS
- Hardware:
  - \* Build customized computers for scientific applications

### • Analytical

- Expert knowledge of Applied Mathematics, especially partial differential equations and stochastic methods
- Deep understanding of state-of-the-art equilibrium and nonequilibrium statistical physics methods
- Expert knowledge of applying Mathematica to solve complex physical problems
- Advanced knowledge of Bayesian inference in data analysis

### • Laboratory

- Microscopy
  - \* Trained to use state-of-the-art microscopy techniques at Woods Hole Physiology course
  - \* Deep conceptual understanding of microscopy from optics course
- Wet-lab
  - \* Significant laboratory experience
  - \* Basic cloning techniques
  - \* Tissue culture room experience
- Physics:
  - \* Signal analysis instrumentation
  - \* Spectroscopy, multi-channel analyzers, photomultiplier tubes
  - \* Ultra-high vacuum surface science
  - \* Ultrasonic methods to determine material properties
  - \* Experimental methods to analyze chaotic systems

## Certifications

### • Engineer in Training (EIT)

*Active*

Ohio

*September 2012*

- Successfully passed Fundamentals of Engineering Exam, the first step towards becoming a licensed engineer

## Professional Organizations

- Tau Beta Pi Engineering Honor Society

## Graduate References

- **Dr. David Nelson** Professor of Physics, Applied Physics, Biophysics  
*Harvard University*
  - *Relationship:* Current Research Advisor
  - *Email:* nelson@seas.harvard.edu
  - *Phone:* (617) 495-8852
- **Dr. Andrew Murray** Professor of Molecular Genetics, Molecular Cellular Biology  
*Harvard University*
  - *Relationship:* Current Research Advisor
  - *Email:* amurray@mcb.harvard.edu
  - *Phone:* (617) 496-1350

# Undergraduate CV

## Undergraduate Research

- **Rochester Institute of Technology** Rochester, NY  
*George Thurston: Physics* May 2010 - August 2012
  - Studied liquid crystal mixtures in the eye related to cataracts
  - Developed computer simulations and animations with Mathematica
  - Demonstrated how liquid crystal composition affects the refractive index of the eye
  - Validated simulations with experimental data
  - Prepared results for scientific publication
- **Case Western Reserve University** Cleveland, OH  
*Jesse Berezovsky: Physics* Aug 2010 - May 2012
  - Examined control of optically active nanocrystal quantum dots (QDs) at room temperature using microscopic ferromagnet magnetization dynamics
  - Studied novel combinations of QDs and microscopic ferromagnets using the “Object Oriented Micro-Magnetic Framework” developed by National Institute of Standards and Technology
  - Analyzed data from simulations with Matlab and other Linux-based tools
  - Created custom animations to visualize simulations
  - Identified ferromagnet-spin interactions relevant to room-temperature quantum computing
- **Princeton Plasma Physics Laboratory** Princeton, NJ  
*Harry Mynick: Theory and Computation Department* May 2011 - Aug 2011
  - Participated in “Science Undergraduate Laboratory Internship” through Department of Energy
  - Designed graphical front end for previously developed Mathematica program that calculated important plasma physics quantities
  - Utilized state-of-the-art computer cluster for scientific computing
  - Distributed redesigned program to plasma physicists for broad usage
- **Case Western Reserve University** Cleveland, OH  
*Corbin Covault: Physics* Sep 2009 - May 2010
  - Identified faulty equipment at the Pierre Auger Cosmic Ray Observatory by analyzing data collected by 1600 Cherenkov surface detectors
  - Created programs to monitor detector performance in real time
  - Used findings to design improved surface detectors being built at “Northern Auger Site” in Colorado
- **Case Western Reserve University** Cleveland, OH  
*Mark Gridley: SAGES department* Jan 2009 - Aug 2009
  - Designed a psychology study examining cross-modal perception of music
  - Administered study to over 50 participants and analyzed results
  - Co-authored a paper that was subsequently published in a peer-reviewed journal

## Undergraduate Awards

- **Case Alumni Association Prize** Cleveland, OH  
*Case Western Reserve University* 5/2012
  - Awarded to the graduating senior with the best academic record in the Case Western School of Engineering.
- **Elmer C. Stewart Memorial Award** Cleveland, OH  
*Case Western Reserve University* 5/2012

- Awarded to an outstanding senior in Physics who has demonstrated achievement in the applications of physics.
- **B.S. Chandrasekhar Prize** Cleveland, OH  
*Case Western Reserve University* 5/2011  
 – Received for demonstrating superior performance in physics.
- **Rochester Engineering Society Scholarship** Rochester, NY  
*Rochester Engineering Society* 5/2011  
 – Merit-based award recognizing outstanding engineering, engineering technology, science, or technology students from the Rochester area.
- **Outstanding Junior Award** Cleveland, OH  
*Case Western Reserve University* 5/2011  
 – Awarded to juniors with the best academic record at the end of five semesters in the Case School of Engineering.
- **National Edward O'Connor Scholarship** Cleveland, OH  
*Aerospace States Association* 8/2010  
 – Awarded to enterprising and innovative students planning to pursue career in Aerospace Engineering; only two scholarships given in the nation.
- **Case Alumni Scholarship** Cleveland, OH  
*Case Western Reserve University* 5/2010  
 – Competitive award given to undergraduates pursuing degree related to applied science.
- **Outstanding Sophomore Award** Cleveland, OH  
*Case Western Reserve University* 5/2010  
 – Awarded to sophomores with the best academic record at the end of three semesters in the Case School of Engineering.
- **Provost's Scholarship** Cleveland, OH  
*Case Western Reserve University* 8/2008  
 – Received when entering Case Western Reserve University based on high-school accomplishments (was high school valedictorian of class of 598 students).

## Undergraduate References

- **Dr. George Thurston** Professor of Physics  
*Rochester Institute of Technology*  
 – *Relationship:* Previous Research Advisor  
 – *Email:* georgemthurston@gmail.com  
 – *Phone:* (585) 475-4549
- **Dr. Jesse Berezovsky** Assistant Professor of Physics  
*Case Western Reserve University*  
 – *Relationship:* Previous Research Advisor  
 – *Email:* jab298@case.edu  
 – *Phone:* (216) 368-4034
- **Dr. Walter Lambrecht** Professor of Physics  
*Case Western Reserve University*  
 – *Relationship:* Undergraduate Academic Advisor  
 – *Email:* walter.lambrecht@case.edu  
 – *Phone:* (216) 368-6120
- **Dr. Harry Mynick** Principal Research Physicist  
*Princeton Plasma Physics Laboratory*  
 – *Relationship:* Previous Research Advisor  
 – *Email:* hmynick@pppl.gov  
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