

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
 - *PhD Secondary Field: Computational Science and Engineering (CSE)*
 - * 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.

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)
 - Engineering Concentration: Aerospace Engineering
 - Senior Project: Simulating Interactions between Confined Spins and Ferromagnetic Vortices

Fellowships

- **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** Cambridge, MA
Graduate Student 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

Summer Schools

- **Marine Biological Laboratory Physiology Course** Woods Hole, MA
Student 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** Cambridge, MA
David R. Nelson & Andrew Murray: Physics, Molecular and Cellular Biology 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
- **Harvard University** Cambridge, MA
Phillipe Cluzel: Applied Physics, Molecular and Cellular Biology Jan 2013 - Sept 2013
 - Applied previous model to predict how spherical tumors respond to pairwise combinations of drugs
 - Learned tissue culture techniques and grew multiple tumor cell lines
 - Imaged tumors using standard microscopy techniques; used ImageJ to determine their sizes
 - Created high-content-screening pipeline to quantify hundreds of images using an OMERO server
- **Harvard University** Cambridge, MA
Joanna Aizenberg: Materials Science, Chemistry, Chemical Biology Sept 2012 - Jan 2013
 - Studied the mechanism by which water droplets coordinate their motions and form patterns on biomimetic hydrophobic surfaces
 - Tracked motion of hundreds of randomly moving and merging droplets using ImageJ
 - Created simulation in C++ to model droplet motion and compared with experimental results

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.

Outreach

- **Science in the News Presentation** Cambridge, MA
November 2014
Physics of Evolution
 - 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^AT_EX, 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)** Ohio
Active *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
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