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 coupled with 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:** GPU-powered Lattice Boltzmann fluid-mechanics simulation utilizing OpenCL & 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 to develop my 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
  - 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. "Diffusion and Selection in Many-Allele Range Expansions". Submitted. 2017.

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
  Physics of Evolution *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 methods to solve high-dimensional problems
  - Software:
    - Languages for Scientific Computing:
      - Python, C, C++, OpenCL, CUDA, Matlab, Mathematica, Java
    - Image Analysis Tools:
      - ImageJ, Python, OpenCL, OpenCV, OMERO
    - Other Selected Languages & Programs :
      - Netlogo, Axiovision, Origin, Igor, Bash, LaTeX, 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
    - Basic 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
  - *Email*: hmynick@pppl.gov
  - *Phone*: (609) 243-2769