Bryan T. Weinstein

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Work Experience

- **MITRE** Bedford, MA
  Senior Modeling and Simulation Engineer/Analyst *September 2018*
  - **September 2018 - October 1st 2019**
    * Recruited many students for MITRE at career fairs through academic engagement, and drew people to CUIC team (at least 3 people hired or interned; Nathan Einstein, Min Kim, Kevin Weinstein). Played an active role on many interview panels.
    * Helped to start a relationship between Harvard's Institute for Applied and Computational Sciences (IACS) and MITRE, especially CUIC. That will be a great pool of talent for students in the future. We got Nathan Einstein, and we may get David Zhang.
    * Identified that the technical approach to enable experimentation for the MDC2 Functional Architecture project did not seem to be working and consequently led a small team with a very tight deadline to recreate it in AFSIM. The approach seems to be bearing fruit, and we are able to conduct experiments. Hopefully we will be able to get operators in the loop to play with the prototype.
    * Worked with individuals outside CUIC to pioneer the approach to link AFSIM to Reinforcement Learning algorithms to enable machine learning experimentation.
    * Learned AFSIM with no prior knowledge before MITRE and then started the AFSIM user community at MITRE. Helped create a website, have biweekly meetings with presentations, and made this an core part of Bob Coury's Effects Chain Analysis Platform (ECAP). Positioned CUIC at the center of this effort. The group now contains over 150 members across MITRE.
    * Became much more comfortable talking to sponsors. The highlight was probably giving the MDC2 flip the script talk to Preston Dunlap, Chief Architect of the Airforce, and the AFWIC general. The talk seemed well received. Also flew out to DC to give a similar high pressure talk to a Board of Trustees member. Also gave a similar MDC2 Experimentation talk to members from the Chief Architect's office.
    * Gave talk at AFSIM Usergroup meeting in Ohio about MITRE Platforms / MDC2 Base Types, spread information about MITRE's work. MITRE now plays a lead role in AFSIM's standard's working group.
    * Mentored Fiona Henry and Min Kim, two young undergraduates, and helped them play an important role on projects very quickly.
    * Maintained S/TS security clearance; going up for SCI now.
    * Created a Python software package utilizing the MAKO templating language to change many parameters in AFSIM experiments.
    * Created a Python library to simulate abstract wargames for the BIGMAC project
    * Created a repository of unclassified blue platforms in AFSIM that are used throughout CUIC to support AFSIM experimentation and may be distributed outside of MITRE. More generally, helped maintain and develop synergy between members of CUIC by developing and maintaining online repositories

Education

- **Harvard University** Cambridge, MA
  PhD in Applied Physics *May 2018*
  - Thesis Title: *Microbial Evolutionary Dynamics and Transport on Solid and Liquid Substrates*
  - 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
  - Additional members of thesis committee:
    - Christopher Rycroft
    - Michael Brenner

- **Harvard University** Cambridge, MA
  PhD Secondary Field: Computational Science and Engineering (CSE) *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
  Harvard University 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

- **Certificate of Distinction in Teaching** Cambridge, MA
  Bok Center, Harvard University *September - May 2016*
  - Won a teaching award based on my high reviews of "Introduction to Applied Mathematics" taught to undergraduates; obtained a 4.86/5.00

- **Department of Energy Office of Science Graduate Fellowship** Washington, D.C.
  Harvard University 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
  Harvard University 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

Publications

[1] Severine Atis, Bryan T. Weinstein, et al. *Rocket yeast*. Video. Milton van Dyke Award as part of the DFD Gallery of Fluid Motion. Nov. 2021. DOI: 10.1103/physrevfluids.6.110507. URL: https://doi.org/10.1103/PhysRevFluids.6.110507.

[2] B. T. Weinstein, S. Atis, et al. "Microbial Range Expansions on Liquid Substrates". In: *Physical Review X* 9.2 (June 2019). Equal first co-author. DOI: 10.1103/physrevx.9.021058. URL: https://doi.org/10.1103/PhysRevX.9.021058.

[3] Bryan T. Weinstein, Maxim O. Lavrentovich, et al. "Genetic Drift and Selection in Many-Allelle Range Expansions". In: *PLOS Computational Biology* 13.12 (Dec. 2017). Article chosen for journal cover photo, e1005866. DOI: 10.1371/journal.pcbi.1005866. URL: http://dx.plos.org/10.1371/journal.pcbi.1005866.

Conferences and Invited Presentations

[1] Bryan T. Weinstein. "MDC2 Base Types: a repository of platforms that makes AFSIM more user friendly". In: *Spring AFSIM User's Conference*. Presented a talk on creating an unclassified repository of blue assets for AFSIM. Beavercreek, Ohio, Mar. 2019.

[2] Bryan T. Weinstein. "Strike Task Broker". In: *Multi-Domain Command and Control Advanced Battle Management System: Flip the Script Pitch Event*. Presented to Chief Architect of Airforce, Preston Dunlap, and 1-star general about work. John Hopkins University Applied Physics Laboratory, June 2019.

[3] S. Atis, B. T. Weinstein, et al. "On Growth and Form of Range Expansions at Liquid Interfaces". In: *Bulletin of the American Physical Society*. American Physical Society. Los Angeles, CA, Mar. 2018.

[4] Severine Atis, Bryan T. Weinstein, et al. "Experimental Population Dynamics in Fluid Flows". In: *American Physical Society, March Meeting*. Presentation. New Orleans Morial Convention Center, Mar. 2017.

[5] Bryan T. Weinstein, Maxim O. Lavrentovich, et al. "Diffusion and Selection in Many-Allele Range Expansions". In: *Bulletin of the American Physical Society*. Presentation. New Orleans Morial Convention Center, Mar. 2017.

[6] Bryan T. Weinstein, Severine Atis, et al. "Experimental Population Dynamics in Fluid Flows". In: *Annual Meeting of the International Physics of Living Sytems (iPoLS) Network*. Poster Presentation. Harvard University, July 2016.

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

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.
    - 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
    - Tools for Fluid Mechanics Simulations:
      - Lattice Boltzmann Method (custom-built code), OpenFOAM, SALOME
    - Image Analysis Tools:
      - ImageJ, Python, OpenCL, 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
- **Laboratory**
  - 4 years of research in an experimental molecular biology laboratory; experienced at designing and conducting experiments
  - Significant experience using microscopy to image microbes

Certifications / Clearances

- **Engineer in Training (EIT)** — Ohio
  Active — *September 2012*
  - Successfully passed Fundamentals of Engineering Exam, the first step towards becoming a licensed engineer
- **Secret Clearance** — MITRE, Bedford MA
  Active — *September 2018*
- **Interim Top Secret Clearance** — MITRE, Bedford MA
  Active — *April 2018*

Professional Organizations

- Tau Beta Pi Engineering Honor Society
- American Physical Society

Teaching Experience

- **Introduction to Applied Mathematics** Harvard University
  Teaching Fellow *September – May 2016*
  - Undergraduate course taught by Christopher Rycroft. I obtained a 4.86/5.00 on teaching reviews
  - Won a teaching award, the Certificate of Distinction in Teaching from the Bok Center, for the high teaching reviews

- **Statistical Physics** Harvard University
  Teaching Fellow *Fall 2017*
  - Graduate course taught by David Nelson, my PhD advisor. I obtained a 4.35/5.00 on teaching reviews

Outreach

- **Adopt a Physicist** `https://www.adoptaphysicist.org/`
  Classroom Discussion Facilitator *October 2018*
  - Answered questions about being a physicist to high school physics classes in an online forum
  - Helped make students excited about physics

- **STEM Inspiration Organization (SIO)** Newton, MA
  Interview *October 2018*
  - Participated in hour long interview to organization supporting high school students interesting in pursuing careers in STEM fields
  - Discussed my career trajectory and life lessons that I learned along the way
  - Transcript of interview can be seen here

- **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

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