

William C. Gilpin

Education

Stanford University, PhD candidate in Applied Physics, Fall 2014
NSF Graduate Research Fellowship, Spring 2014

Princeton University, AB in Physics with High Honors, 2014

The Kusaka Memorial Prize in Physics, 2014

The Allen G. Shenstone Prize in Physics, 2013

Graduate Courses: Method and Logic in Molecular Biology, Seminar in Theoretical Astrophysics, Statistical Mechanics (received A+ via direct nomination by professor), Introduction to Theoretical Cosmology.

Undergraduate Departmental Courses: Electrodynamics, Nonlinear Dynamics, two semesters Quantum Mechanics, Biophysics, Thermal Physics, Cosmology, Plasma Physics, Complex Analysis, Advanced Optics Laboratory.

Pine View High School (Sarasota, FL), 2008-2010, Cascia Hall High School (Tulsa, OK), 2006-2008

Research

Princeton University. Advisor: Prof. Clifford Brangwynne, Chemical and Biological Engineering

- 2013-2014 (academic year) Senior Thesis: "Characterizing the mechanical properties of *Caenorhabditis elegans* using a novel microfluidic approach." Development of a new method of probing the bulk mechanics of tissues, development of a viscoelastic model for the response of *C. elegans* to mechanical stress. Methods: microfluidics, cell culturing, confocal fluorescent microscopy, digital image processing (MATLAB), solid and continuum mechanics models.
- 2012 (fall) Junior Paper: "Deriving a governing equation for the growth of *Caenorhabditis elegans*" Development of a Fokker-Planck model for growth in a population of *C. elegans*, high-throughput experiments to corroborate the model. Methods: Cell culturing, microscopy, image analysis (MATLAB), mathematics of stochastic systems.
- 2011-2012 (academic year): Development of various techniques for confining and continuously imaging *C. elegant* during its growth, with goal of developing a mechanical model for the growth of a single worm and a statistical model for the growth of many worms.

Harvard University. Advisor: Prof. Marko Lončar, Applied Physics and Electrical Engineering

- 2013 NSF REU: "Characterizing the electrical properties of diamond NV centers" Development of a Hall probe for studying the effect of annealing and doping on the charge carrier density in diamonds obtaining nitrogen vacancy centers. Methods: standard clean room protocol, reactive ion etching, tabletop confocal scanning microscopy, electron beam lithography, rapid thermal annealing, plasma generation, simulation of charge occupation (Lumerical FDTD, Silvaco ATLAS)
- 2012 NNIN/NSF REU: "Engineering the Charge Occupancy of Nitrogen Vacancies in Diamond." Manufactured nanowires in diamond and applied various surface treatments, with a goal of stabilizing the fluorescence of single nitrogen vacancy centers photonicly coupled to the nanowires; design and synthesis of a MOSFET device to actively control charge occupation of NV centers using an applied electric field. Methods: standard clean room protocol, electron beam lithography, reactive ion etching, photolithography, atomic layer deposition, sputtering, simulation of surface states (Lumerical FDTD/COMSOL, ATLAS), design of lithograph masks (AutoCAD).

Princeton University. Advisor: Prof. Curt Callan, Physics

- 2013 (spring) Junior Paper: “Modeling computation in biological sensing networks.” Used recent results in nonequilibrium statistical mechanics to search for Markov network topologies that effectively modeled and predicted the energetic limits of biological sensing processes, like chemotaxis. Methods: information theory, statistical physics, numerical methods in MATLAB, approximation of symbolic results in Mathematica, distributed computing.

Mote Marine Laboratory. Advisor: Dr. Gary Kirkpatrick, Phytoplankton Ecology

- 2011 NSF REU: “Mathematical methods for optical discrimination of Phytoplankton taxa.” Developed several new analysis and reconstruction routines for absorption spectra collected by an automated probe in the Gulf of Mexico; the spectra are analyzed to infer the community structure of phytoplankton blooms. Methods: Data processing in Java/Mathematica, culturing of live *Karenia brevis*, participation in a research cruise to collect wild samples.

Publications

K. Bayat, M. Baroughi, **W. Gilpin**, W. Sun, J. Choy, M. Lončar “Formation of nitrogen vacancy center ensembles in diamond nanowires” *Submitted, 2014*.

Bayat, K., Sun, W. K. C., **Gilpin, W.**, Farrokh Baroughi, M., & Lončar, M. . “Formation of Nitrogen vacancy center ensembles in Diamond Nanowires.” CLEO: Science and Innovations. Optical Society of America, 2014. [\[url\]](#)

Gilpin, W. “Engineering the Charge Occupancy of Nitrogen Vacancies in Diamond.” NNIN REU Convocation, 2012. [\[url\]](#)

Image from report selected for cover of proceedings. [\[url\]](#)

Posters & Talks

2013 Harvard REU Convocation: Poster and talk by W. Gilpin “Manipulating the charge state of nitrogen vacancy centers in diamond.” Talk presented to 50 students and 8 principal investigators.

2012 NNIN REU Convocation: Poster and talk by W. Gilpin “Controlling the charge occupancy of nitrogen vacancy centers in diamond” Talk presented to 40 students and 10 principal investigators. Talk: [\[url\]](#)

2012 Harvard REU Convocation: Poster and talk by W. Gilpin “Controlling the charge occupancy of nitrogen vacancy centers in diamond.” Presented to 80 students and 5 principal investigators during 2012 Harvard REU Convocation.

2011 Mote Laboratory REU Convocation: Poster by W. Gilpin “Improving taxal resolution in the Optical Phytoplankton Discriminator” Presented to 15 students, 10 principal investigators, and laboratory president.

Awards

NSF Graduate Research Fellowship, topic area “The Physics of Living Systems,” 2014.

Kusaka Memorial Prize, top graduating seniors in Princeton physics, 2014.

Allen G. Shenstone Prize, top juniors in Princeton physics, 2013.

ODOC Senior Thesis Funding, competitive grant for Princeton undergraduate research, 2013.

Class of 1984 Memorial Fund Fellowship, a competitive Princeton grant (5 awards total) to support research, 2013.

The Fred Fox Fellowship, a competitive Princeton grant to support research, 2013.

“Art of Science” Competition acceptee at Princeton University. Refereed exhibition of images taken in the course of scientific research. Competition open to all University alumni, students, faculty, and research staff. 2013. [\[url\]](#)

Sarasota Area Ivy League Scholarship, 2010 - 2014.

Other Work

Venice Theatre Technical Apprentice Program: A 3 Year (1,500 hour) Apprenticeship, nationally certified as a Stage Technician by the U. S. Department of Labor, Bureau of Apprenticeship and Training. Completed three professional technical courses certified by the Florida Department

of Education. Travelled to Ontario, Canada for a one week work-study at the Stratford Shakespeare Festival. Skills: DMX programming for robotic lights, ETC Console programming and patching, hardware support for standard ETC fixtures. March 2008 – April 2010.

- Film lighting director for student films in the Princeton Visual Arts program. February 2012, ongoing.
- Lighting technician at Princeton Lewis Center for the Arts. September 2010, ongoing.
- Assistant technical director at Princeton Theatre Intime; oversaw entire electrical system, trained/supervised outside designers, programmed/hung lights, and managed budget and inventory. December 2010 – May 2011.

Freelance design work for various campus organizations. Skills: Adobe Illustrator, Photoshop, InDesign, AutoCAD.

- General logo and web designer for Voices of Change, a journalism organization with branches at Princeton, Yale, McGill, Oberlin, and Columbia. June 2012 - August 2013.
- Lead designer for Princeton UFO+ undergraduate film club; design club logos and weekly movie posters. September 2011 - September 2012.

Outreach

Princeton peer tutor, 2010-2014

NanoDays science demonstrator and educator for Brangwynne Group (March 2012, 2013) and Harvard SEAS (June 2012, 2013).[\[url\]](#)

Maintain a personal science blog with discussions of journal articles and tutorials on simple projects like Tesla coils, 40,000 unique visitors to date. Summer 2010, ongoing.

Other interests

Gem and fossil collecting since elementary school; collection currently has 3000 fossil shark teeth, 400 other fossils, and 200 unique fossil rocks/ fluorescent minerals. Former member of Tulsa Rock Mineral Society, current member of Sarasota Area Rockhound club.

Hobby photography in addition to paid design work. Photographs and artwork accepted into The Nassau Literary Review, a juried campus publication, and "plain china," a juried nationwide literature and art magazine. [\[url\]](#)

Two years of Latin in college and a variety of other upper-level courses pertaining to ethics and philosophy; received an A+ in a normative ethics seminar taught by Professor Kwame Appiah.

Certified HAM radio operator, call sign KJ4NLQ.

Contact

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References

Professor Clifford Brangwynne, Princeton University: cbrangwy@princeton.edu

Professor Marko Lončar, Harvard University: loncar@seas.harvard.edu