# Lulu Liu

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## AREAS OF INTEREST

Optics, physics, scientific instrumentation, microscopy, solar energy, astrophysics, space, high-precision measurements.

## EDUCATION

**Ph.D. Applied Physics - Optics** *Aug 2011 - present*
*Harvard University*, Cambridge MA

**M.A. Physics** *Received May 2014*
*Harvard University*, Cambridge MA

**B.S. Physics - GPA 3.8/4.0** *Aug 2005 - Jun 2009*
*Massachusetts Institute of Technology*, Cambridge MA

## RESEARCH OVERVIEW

**Harvard University** Aug 2011 - Present
*Graduate Student Researcher* *Cambridge, MA*

- Designed and built microscopy apparatus for optical trapping/sensing to affect and detect angstrom scale displacements of micron-size particles. First measurement of sub-femtonewton optical forces in fluid. Apparatus enables very precise and contact-free manipulation of small matter probes for the investigation of surface and optical forces.
- Mentored undergraduates and graduate students as the lead on the project.

**Stanford University - Astrophysics/Cosmology Center (KIPAC)** Sept 2009 - Oct 2010
*Research Assistant* *Palo Alto, CA*

- Developed statistical ensemble approach to investigation of deep-space objects with inadequate redshift information. Used this approach to determine the abundance of large satellites around Milky-Way sized galaxies and confirm its statistical agreement with numerical simulations running LCDM cosmological models.

**NASA - Transiting Exoplanet Survey Satellite (TESS)** May 2007 - Jun 2009
*Intern* *Mountain View, CA*

- Worked on the core science team of a space-based planet-finder mission scheduled for launch in 2017. Designed a concept of operations. Tested the reaction wheel assembly. Performed communications systems analysis. Characterized and improved the sensitivity of the main CCD array for the spacecraft.

**MIT - Laser Interferometer Gravitational Wave Observatory (LIGO)** May 2006 - Sept 2006
*Student Researcher* *Cambridge, MA*

- Joined the waveform-simulations team of the LIGO collaboration at MIT. Wrote code to inject and discriminate test signals from the noisy background environment.

## GRANTS, AWARDS, AND HONORS

**Paper Selected for Editor's Suggestion,** Physical Review Letters 2016
**Bok Center Certificate of Distinction in Teaching Award,** Harvard University 2016
**Kao Fellowship,** Harvard University 2013 - present
**Graduate Research Fellowship,** NSF 2011 - present
**2010 Mass Media Fellowship for Science Writing,** AAAS May 2010

## SELECTED PUBLICATIONS AND PRESENTATIONS

I have published first-author papers in various high profile journals such as the Proceedings of the National Academy of Sciences and Physical Review Letters, including a paper which was highlighted as an "Editor's Suggestion" in PRL and the subject of a Physics Focus article. I have given talks at conferences in optics, physics, and metamaterials and have been an invited speaker on two occasions. Additionally, in the capacity of a science journalist, I have published stories and essays in Sacramento Bee, APS News, and Technology Review.

**Sub-femtonewton Force Spectroscopy at the Thermal Limit in Liquids** Jun 2016
*L. Liu, S. Kheifets, V. Ginis, F. Capasso* *Physical Review Letters*

**Absolute position total internal reflection microscopy with an optical tweezer** Dec 2014
*L. Liu, A. Woolf, A. Rodriguez, F. Capasso* *PNAS*

**Mind the Gap: The Science Communication Problem** Feb 2013
*Essay* *Technology Review*

**How Common are the Magellanic Clouds?** May 2011
*L. Liu, B. Gerke, R. Wechsler, P. Behroozi, M. Busha* *The Astrophysical Journal*

**CCD Photometric Precision for the Transiting Exoplanet Survey Satellite** May 2009
*Senior thesis on TESS - an ongoing satellite project* *MIT / NASA*

## NON-ACADEMIC EMPLOYMENT AND EXPERIENCE

I have industry experience in solar metrology, and an substantial teaching, writing, and arts background.

**Alta Devices** Sept 2010 - Aug 2011
*Metrology Engineer* *Santa Clara, CA*

- Worked directly under chief technologist to design and build complete metrology solutions for characterizing solar film quality at the thin film solar start-up.
- Completed tools included both hardware (automated inspection tools, photoluminescence and quantum efficiency measurement stations) and software tools (image recognition for defects, layout tool for documentation of key characteristics of individual production samples).

**Sacramento Bee Newspaper** May 2010 - Aug 2010
*Science Reporter* *Sacramento, CA*

- Intern science writer at the Sacramento Bee newspaper. Published 10 stories in all including 3 front page features.

## VOLUNTEER, OUTREACH, LEADERSHIP

**Climate Change National Forum,** Columnist Jan 2013 - present
**Technology Review,** Contributor Feb 2013 - present
**UC Santa Cruz,** Lecturer for 5L and 6L Physics Courses Sep 2009 - Dec 2009
**MIT Lit / Art Magazine (Rune),** Editor-in-Chief Sept 2006 - Jun 2009

## TECHNICAL STRENGTHS

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|---|---|
| **Computer Languages** | MATLAB, Python, Javascript, D3, HTML/CSS, Unix, Mathematica, Scheme, IDL, Labview, Igor Pro, MySQL |
| **Tools/Skills** | Nanofabrication, Numerical Simulations, SVN, COMSOL, Lumerical, STK, CAD, LaTeX |

Nationality: USA