THERESA W. LYNN

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EDUCATION

Ph.D., Physics 2003
California Institute of Technology
Thesis "Measurement and Control of Individual Quanta in Cavity QED"
Advisor Professor H. J. Kimble

M.S., Physics 1999
California Institute of Technology

B.A., Physics, *summa cum laude* 1995
Harvard-Radcliffe Colleges

RESEARCH EXPERIENCE

Staff Scientist, Kellogg Radiation Laboratory 2004 – 2006
California Institute of Technology, Pasadena, CA
Project Coordinator, California HIgh school Cosmic ray ObServatory (CHICOS)
Deployed and maintained large-scale array of 90 scintillation detectors for observation of ultra-high energy cosmic ray air showers. Created data analysis and calibration tools for the growing CHICOS dataset. Conducted educational outreach and teacher training programs. Oversaw research by undergraduates and by students at participating high schools across the Los Angeles area. Developed collaborations and pursued funding for expansions of the project.

Postdoctoral Scholar, Kellogg Radiation Laboratory 2003 – 2004
California Institute of Technology, Pasadena, CA
Project Coordinator, California HIgh school Cosmic ray ObServatory (CHICOS)
Deployed and maintained CHICOS detector array. Developed instrumentation and data analysis tools, conducted educational outreach and teacher training programs, and oversaw student research.

Graduate Research Assistant 1996 – 2003
California Institute of Technology, Pasadena, CA
Experimental observations of single-atom, single-photon interactions in an optical cavity.
Studied a simple quantum system (one atom coupled to a one-photon light field) interacting weakly with the environment. Observed experimental signatures of non-classical interactions.
Trapping of single atoms with single photons: the “atom-cavity microscope.”
Bound single atoms in orbit around light fields in an optical resonator, and observed atomic motion with high signal-to-noise in real time. Performed detailed simulations of the experiment for qualitative and quantitative characterization of trapped-atom dynamics.
New experimental apparatus for active feedback to motion of a single atom.
Designed and constructed high-finesse Fabry-Perot microcavities with state-of-the-art mirror coatings and high mechanical stability. Implemented servos for simultaneous frequency stabilization of several lasers and optical cavities. Worked with field-programmable gate array (FPGA) for digital feedback protocols.
Algorithms for real-time control of single-atom motion in cavity quantum electrodynamics.
Developed algorithms for feedback control of single-atom motion, and identified appropriate figures of merit to describe their performance. Simulated feedback performance under real and idealized conditions. Pursued applications to quantum logic and error correction.

TEACHING EXPERIENCE

Assistant Professor of Physics 2006 – present
Harvey Mudd College, Claremont, California
- Teach introductory and upper-level courses, offer research opportunities for students.

Adjunct Assistant Professor 2004 – 2006
Harvey Mudd College, Claremont, California
- Teach freshman (mechanics) and sophomore (E&M, optics) laboratory courses.
- Spring 2005, taught one section of introductory quantum mechanics (for sophomore majors).

Writing Tutor 2002 – 2003
Hixon Writing Center, California Institute of Technology
- Conducted one-on-one writing consultations with undergraduate and graduate students.
- Provided advice and editing for scientific writing, undergraduate humanities essays, and graduate and professional school applications.

Science Teacher 1995 – 1996
Concord Academy, Concord, Massachusetts
- Taught introductory physics classes at the high school level.
- Determined course content within general year-long syllabus guidelines.
- Developed original materials, *e.g.*, problems, inquiry-based labs, and research/writing assignments.
- Supervised an independent study course in astrophysics.

Course Assistant 1992 – 1993
Harvard University Mathematics Department
- Taught weekly discussion/review sections, held office hours, and graded problem sets in a linear algebra and real analysis class for first-year prospective math majors.

LEADERSHIP AND ACADEMIC SERVICE

Member 2005 – present
QuarkNet Advisory Group
- Guide program activities of the national, NSF-sponsored QuarkNet education/outreach project.
- QuarkNet, based at Fermilab, brings high-energy physics to high-school teachers and students through interactive web sites, a web-based student research network, and summer institutes at Fermilab and across the country. Local QuarkNet-affiliated programs have been hosted by faculty at UCLA and UCI.

Founding Member 2001 – 2003
Caltech Project for Effective Teaching
- Organized Teaching Assistant training, discussion lunches, and advanced topics seminars.
- Edited complete reorganization of Teaching Assistant handbook.

Resident Associate 1998 – 2003
Caltech Off-campus Undergraduate Housing
- Provided support and crisis intervention, planned group activities, and acted as a liaison between undergraduate residents and Caltech administrators.

Student Representative 1998 – 2001
Physics Graduate Student Issues Committee, Caltech
- Organized seminar series on careers outside academia.
- Participated in a substantial overhaul of the graduate program's course and exam requirements.
- Sponsored events to promote interaction between students and faculty across the department.

PUBLICATIONS

T. W. Lynn, K. Birnbaum, and H. J. Kimble, "Strategies for Real-Time Position Control of a Single Atom in Cavity QED," *J. Opt. B Quant. Semiclass. Opt.*, **7**, S215 (2005).

T. W. Lynn, E. Brobeck, B. E. Carlson, C. J. Jillings, M. B. Larson, R. D. McKeown, J. E. Hill, B. J. Falkowski, R. Seki, J. Sepikas, G. B. Yodh, D. Wells, K. C. Chan, "Studies of Air Showers above 10^{18} eV with the CHICOS Array," Proceedings of the 29th International Cosmic Ray Conference (ICRC), Pune, India, 2005. (available as astro-ph/0509256)

R. D. McKeown, B. E. Carlson, E. Brobeck, C. J. Jillings, M. B. Larson, **T. W. Lynn**, J. E. Hill, B. J. Falkowski, R. Seki, J. Sepikas, G. B. Yodh, "Search for Correlated High Energy Cosmic Ray Events with CHICOS (update)," Proceedings of the 29th International Cosmic Ray Conference (ICRC), Pune, India, 2005. (available as astro-ph/0509213)

B. E. Carlson, E. Brobeck, C. J. Jillings, M. B. Larson, **T. W. Lynn**, R. D. McKeown, J. E. Hill, B. J. Falkowski, R. Seki, J. Sepikas, G. B. Yodh, "Search for Correlated High Energy Cosmic Ray Events with CHICOS," *J. Phys. G* **31**, p. 409 (2005).

J. Ye and **T. W. Lynn**, "Applications of Optical Cavities in Modern Atomic, Molecular, and Optical Physics," *Advances in Atomic, Molecular, and Optical Physics* **49**, p. 1 (2003).

H. J. Kimble and **T. W. Lynn**, "Cavity QED with Strong Coupling: Toward the Deterministic Control of Quantum Dynamics," *Coherence and Quantum Optics VIII, Proceedings of the Eighth Rochester Conference on Coherence and Quantum Optics*, Plenum (2002).

A. C. Doherty, **T. W. Lynn**, C. J. Hood, and H. J. Kimble," Trapping of Single Atoms with Single Photons in Cavity QED," *Physical Review A* **63**, 013401 (2001).

C. J. Hood, **T. W. Lynn**, A. C. Doherty, A. S. Parkins, and H. J. Kimble, "The Atom-Cavity Microscope – Single Atoms Bound in Orbit by Single Photons," *Science* **287**, p. 1447 (2000).

C. J. Hood, M. S. Chapman, **T. W. Lynn**, and H. J. Kimble, "Real-Time Cavity QED with Single Atoms," *Physical Review Letters* **80**, p. 4157 (1998).

K. S. Johnson, A. Chu, **T. W. Lynn**, K. K. Berggren, M. S. Shahriar, and M. G. Prentiss, "Demonstration of a Nonmagnetic Blazed-Grating Atomic-Beam Splitter," *Optics Letters* **20**, p. 1310 (1995).

INVITED TALKS

Physics Department Colloquium, Harvey Mudd College (February 2006).
Keynote speaker, Expanding Your Horizons conference (April 2005).
Physics Department Colloquium, Harvey Mudd College (March 2005).
Bianchi Planetarium Lecture, California State University, Northridge (July 2004).
Science Lecture Series, Glendale Community College (May 2004).
Science Seminar, University of La Verne (March 2004).
Physics Department Seminar, Pomona College (February 2004).
Physics Department Colloquium, California Polytechnic University at Pomona (January 2004).
American Association of Physics Teachers National Meeting (January 2004).
Fall Meeting, Southern California AAPT, Caltech (October 2003).
Quantum Lunch, Theoretical Division, Los Alamos National Laboratory (March 2003).
Fifth Workshop on Laser Cooling, Awaji Yumebutai, Japan (January 2003).
Optical Society of America / Laser Science XVIII Annual Meeting (October 2002).
Southwest Quantum Information and Technology annual workshop (May 2000).
Quantum Information Workshop, ISI, Torino, Italy (July 1998).

HONORS AND AWARDS

2000	John Stemple Award for outstanding oral candidacy presentation (Caltech)
1999-2000	Schlumberger Graduate Fellowship (California Institute of Technology)
1996-1999	National Science Foundation Graduate Research Fellowship
1995	Thomas Temple Hoopes Prize for senior thesis work (Harvard University)
1994	Phi Beta Kappa (Radcliffe College)
1993-95	Barry Goldwater Scholarship
1993	Derek Bok Prize for excellence in teaching (Harvard University)