CURRICULUM VITAE

RICH LOUIE

Experience/Employment

Professor of Physics Pacific Lutheran University, Tacoma, WA, 2011 - present.

Associate Professor of Physics Pacific Lutheran University, Tacoma, WA, 2003 - 2011.

Lead Faculty Participant, physics textbook and labs Kinetic Books/Perfection Learning, Seattle WA, 2003 - present.

Assistant Professor of Physics Pacific Lutheran University, Tacoma, WA, 1997 - 2003.

TA Development Program Cornell University, Ithaca, NY, 1995, College of Engineering.
Program Coordinator: Dr. V. Carlson.
Developed workshops and taught in the TA Development Program, a course designed to help new TAs become more effective teachers. The program encourages them to think critically about teaching, through active participation in exercises and guided discussions with each other and with experienced TAs.

Teaching Assistant Cornell University, Ithaca, NY, 1990-1992.
Courses: Physics 112 (Mechanics), Physics 214 (Optics, Waves, and Particles), Physics 443 (Introductory Quantum Mechanics), Physics 315 (Modern Physics).
Taught reviews, weekly sections and labs. Provided supplementary problems and solutions, wrote and administered quizzes..

Teaching Fellow Harvard University, Cambridge, MA, 1990.
Physics 5: "Mechanics and E&M."
Course Instructor: Senior Lecturer P. Bamberg.
Taught review and weekly sections and lab. Provided supplementary problems and solutions. Took shifts in the Physics Question Center.

Course Assistant Harvard University, Cambridge, MA, 1988-1989.
Mathematics 1b: "Calculus 2."
Course Instructors: Dr. R. Gottlieb, L. Hunsberger, D. Fry. Taught review and weekly sections. Provided supplementary problems and solutions.

Special Skills

Thin film deposition: Design, assembly, and use of a physical vapor deposition system (electron gun, thermal boats). DC and RF magnetron sputtering with magnetic and nonmagnetic targets.
Nanofabrication: Extensive use of the Cornell Nanofabrication Facility, including optical and electron-beam lithography, resist selection and development, wet and dry etching.

Vacuum techniques: High and ultrahigh vacuum system design and use. Leak detection. Turbopumps, oil diffusion pumps, rotary pumps. Pressure gauges.
Computers: C, LabVIEW data acquisition software, Maple, Mathematica, Pascal.
Low temperature techniques: Design, construction and use of low temperature dippers for use at 77 K, 4.2 K and below. Operation and maintenance of a dilution refrigerator. Experience with superconducting high field magnets.
Low-noise electrical measurements: Lock-in detection, resistance bridges, and basic analog electronics.
Machine Shop: Extensive use of mills, lathes, drill press, and other metalworking apparatus.
Atomic force microscopy: experience with Park Instruments, Thermomicroscopes and Digital Instruments Multi-Mode Scanning Probe Microscopes.
X-ray Photoelectron Spectroscopy: used in analyzing etched silicon and gallium arsenide.
Foreign Language: Cantonese.

Professional Societies

American Physical Society
American Association of Physics Teachers
Materials Research Society

Research Experience

Faculty Fellow NASA Langley Research Center, Hampton, VA, 2001, 2002
Structures and Materials Competency, Non-Destructive Evaluation Sciences Branch
Co-investigator: Dr. Russell Wincheski.
Currently evaluating giant magnetoresistive (GMR) devices to replace devices based on conventional pickup coils. This project facilitates the detection of deeply buried flaws in conducting materials, e.g., airline skins, and therefore has great practical applications. The use of giant magnetoresistance (GMR) sensors in electromagnetic (EM) nondestructive evaluation has been increasing rapidly. For example, here at LaRC a rotating GMR probe has been incorporated into a product to detect deeply buried flaws in aerospace structures, specifically at rivet joints. A spatial filtering scheme was developed that enhances the output, while not significantly increasing the number of false alarms. For this application and for many similar ones, research to create smaller, sensitive and more energy-efficient EM sensors should be aggressively pursued.
Recent theoretical and experimental work on spin coherent transport supports the feasibility of carbon nanotube based magnetic tunnel junctions. Such devices contain single-walled carbon nanotubes that connect two ferromagnetic electrodes. The ability to model the electrical behavior of such junctions, for realistic system sizes, has been developed at Langley, and these tight-binding model calculations have been extended. We use junction fabrication methods that take advantage of NESB's new e-beam lithography and nano-manipulation capabilities.

Faculty Fellow University of Washington, Seattle, WA, 1999, 2000
Department of Materials Science.
Co-investigator: Professor F. Ohuchi.
Studied NF3 plasma as an etchant on Si. Used a MKS 252C valve controller with a throttle valve to greatly stabilize the etching plasma pressure. Performed all of the etches, varying processing

conditions such as plasma energy, ratio of NF3 to diluent (argon or helium), and total chamber pressure. Etch rates were obtained for each etch, using a physical mask and an Alphastep profilometer. Used a Digital Instruments Multi-Mode Scanning Probe Microscope to characterize the roughness and size distribution of surface features. Also studied NF3 Etching Reaction with GaAs(100) using X-ray Photoelectron Spectroscopy.

Visiting Scholar University of Washington, Seattle, WA, 1998
Department of Physics.
Co-investigator: Professor S. Fain.
Located carbon nanotubes and attached them to AFM cantilevers for high-spatial-resolution imaging of biological molecules (DNA-protein complexes) of interest to Prof. Ruedi Aebersold of Molecular Biotechnology. Electron microscope images of tips with attached nanotubes are posted under "research interests." A hard silicon grid and some lambda DNA were successfully imaged, but the tips did not outperform conventional ones in imaging DNA.

Graduate Research Assistant Cornell University, Ithaca, NY, 1992 - 1997.
Department of Applied Physics.
Thesis supervisor: Professor R. A. Buhrman.
Produced metal constrictions with diameters as narrow as 3 nm which can determine the energy dependence of electron scattering through the voltage dependence of the device resistance. Studied giant magnetoresistance materials, in both multilayer and co-evaporated materials, using this method of "point contact spectroscopy". Developed a data acquisition system using a 16 bit A/D board and the LabVIEW software package. Learned nanofabrication techniques at the Cornell Nanofabrication Facility. Used ultrahigh vacuum systems, physical vapor deposition and sputtering techniques, a dilution refrigerator, and other low temperature apparatus.

Short Courses

Participant Operation of Machine Tools, Cornell University, Ithaca, NY, 1991. This is a hands-on course, with twenty-five hours of instruction over 10 weeks.

Participant Nanocourses, National Nanofabrication Facility, Cornell University, Ithaca, NY, 1991. This is a lecture course, with fifteen hours of instruction over 5 weeks.

Participant Third Annual Japan Association for Mathematical Sciences Seminar, Komagane, Japan, 1989.

Publications

(* = peer reviewed journal) (** = reviewed conference proceedings)

26. **Fast Electronic Switching of Ultrathin Films of Phase-Change Materials Renders Nonvolatile Color Changes.** Rich Louie, Materials Research Society Bulletin, Volume 39, Number 9, 760-761 (2014).

25. **Porous Graphene Sieve Selectively Passes Molecules.** Rich Louie, Materials Research Society Bulletin, Volume 38, Number 1, 6-7 (2013).

24. **Nanomechanical Mass Sensor Boasts Yoctogram Resolution.** Rich Louie, Materials Research Society Bulletin, Volume 37, Number 6, 543 (2012).

23. **Hydrogen at Room Temperature is Squeezed to Become a Metal.** Rich Louie, Materials Research Society Bulletin, Volume 37, Number 2, 104-105 (2012).

22. **Friction Depends on Thickness and Adherence of Atomically Thin Layers.** Rich Louie, Materials Research Society Bulletin, Volume 35, Number 6, 411-412 (2010).

21. **Chemically Modified Graphene Stars as New Electrode Material in Ultracapacitor Cell.** Rich Louie, Materials Research Society Bulletin, Volume 33, Number 12, 1133 (2008).

20. **Nanoimprint Mold and Direct Imprinting Technique Creates Single Sub-20 nm wide, cm-long Nanofluidic Channel.** Rich Louie, Materials Research Society Bulletin, Volume 33, Number 1, 4 (2008).

19. **Submicrometer Technique Etches Curvilinear Silicon and Glass Patterns with HF-Saturated Hydrogel Stamps.** Rich Louie, Materials Research Society Bulletin, Volume 31, Number 11, 856 (2006).

18. **Hot-Drawing Process Aligns and Toughens Carbon Nanotube Fibers.** Rich Louie, Materials Research Society Bulletin, Volume 31, Number 1, 12-13 (2006).

17. **Doped PMMA Used for 3D Multilayered Optical Memory.** Richard Louie, Materials Research Society Bulletin, Volume 30, Number 5, 332 (2005).

16. **Microscale Cantilever Beam Resonators "Weigh" Individual Virus Particles.** Richard Louie, Materials Research Society Bulletin, Volume 29, Number 4, 224-225 (2004).

* 15. **Response of Fe Powder, Purified and As-Produced HiPco Single-walled Carbon Nanotubes to Flash Exposure**. Jan Smits, Buzz Wincheski, Min Namkung, Roy Crooks, Richard Louie, Materials Science and Engineering A358, 384-389 (2003).

14. **X-rays Generated Using Graphite Nanofiber Cold Cathode with Copper Anode.** Richard Louie, Materials Research Society Bulletin, Volume 28, Number 4, 256-257 (2003).

13. **Simple Neutron Microscope Uses Refractive Aluminum Lenses.** Richard Louie, Materials Research Society Bulletin, Volume 28, Number 1, 4-5 (2003).

12. **Nanomanipulation and Lithography: The Building (and Modeling) of Carbon Nanotube Magnetic Tunnel Junctions**. Richard N. Louie, in NASA Contractor's Report CR-2002-211234, 57 (2002).

11. **Nanoscale Technique Prints Metal Films With Reusable Stamps and Tailored Surface Chemistry.** Richard N. Louie, Materials Research Society Bulletin, Volume 27, Number 8, 584 (2002).

** 10. **Nanomanipulation and Lithography for Carbon Nanotube Based Nondestructive Evaluation Sensor Development.** Buzz Wincheski, Jan Smits, Min Namkung, JoAnne Ingram, Neal Watkins, Jeffrey D. Jordan, Richard Louie, Proceedings of the 2002 Society for Experimental Mechanics Annual Conference and Exposition on Experimental and Applied Mechanics, Session 44, Number 58, 1-4 (2002).

9. **Simple Method Can Suspend Individual Nanofibers.** Richard N. Louie, Materials Research Society Bulletin, Volume 27, Number 4, 285 (2002).

8. **One-dimensional Heterostructures Fabricated in InAs/InP Nanowhiskers.** Richard N. Louie, Materials Research Society Bulletin, Volume 27, Number 2, 84 (2002).

* 7. **Development of Giant Magnetoresistive (GMR) Inspection System for Detection of Deep Fatigue Cracks under Airframe Fasteners.** Russell Wincheski, Min Namkung, Dan Perey, John Simpson, Ed Scales and Richard Louie, Review of Progress in Quantitative NDE, Volume 21A, AIP, 1007, 2002.

* 6. **Measuring Average Tip-sample Forces in Intermittent-Contact (Tapping) Force Microscopy in Air.** S. C. Fain, Jr., K.A. Barry, M. G. Bush, B. Pittenger, and R. N. Louie, Applied Physics Letters, Volume 76, Number 7, 930-932 (2000).

* 5. **Current-Induced Switching of Domains in Magnetic Multilayer Devices.** E. B. Myers, D. C. Ralph, J. A. Katine, R. N. Louie, and R. A. Buhrman, Science, Vol. 285, 867-870 (1999).

* 4. **Spin Filtering by Ultra-Thin Ferromagnetic Films** Shashi K. Upadhyay, Richard N. Louie, and R. A. Buhrman, Applied Physics Letters, Volume 74, Number 25, 3881-3883 (1999).

* 3. **Probing Ferromagnets with Andreev Reflection.** Shashi K. Upadhyay, Akilan Palanisami, Richard N. Louie, and R. A. Buhrman, Physical Review Letters, Volume 81, Number 15, 3247-3250 (1998).

* 2. **Two-Channel Kondo Model I: Review of Experimental Evidence for its Realization in Metal Nanoconstrictions.** Jan von Delft, Dan Ralph, Robert A. Buhrman, Shashi K. Upadhyay, Richard N. Louie, Andreas Ludwig, and Vinay Ambegaokar, Annals of Physics, Volume 263, Number 1, pages 1-55 (1998).

* 1. **Low Energy Restoration of Fermi-liquid Behavior for Two-Channel Kondo Scattering.** Shashi K. Upadhyay, Richard N. Louie, and R. A. Buhrman, Physical Review B, Volume 56, Number 19, 12033-12037 (1997).

Selected Presentations

1. **Nanomanipulation and Lithography for Carbon Nanotube Based Nondestructive Evaluation Sensor Development.** Buzz Wincheski, Jan Smits, Min Namkung, Joanne Ingram, Neal Watkins, Jeffrey D. Jordan and Richard Louie, Society for Experimental Mechanics Annual Conference (theme: Measurements in Advanced Materials and Systems), June 10-12, 2002, Milwaukee, Wisconsin. (presented by Buzz Wincheski)

2. **Nanomanipulation and Lithography: The Building (and Modeling) of Carbon Nanotube Magnetic Tunnel Junctions.** 2001 American Society for Engineering Education Best Research Presentation Competition, August 8, 2001, Hampton, VA.

3. **Development of Giant Magnetoresistive (GMR) Inspection System for Detection of Deep Fatigue Cracks under Airframe Fasteners.** Russell Wincheski, Min Namkung,, Dan Perey, John Simpson, Ed Scales and Richard Louie, 2001 Review of Progress in Quantitative Nondestructive Evaluation, July 30, 2001, Brunswick, ME. (presented by Russell Wincheski)

4. **Nanocontact Measurements of Electron Spin Filtering and Spin Transport.** S.K. Upadhyay, P. Chalsami, R.N. Louie and R.A. Buhrman. Materials Research Society Spring meeting, April 5, 1999, San Francisco, CA. (presented by SK Upadhyay)

5. **Atomic Force Microscopy, Carbon Nanotubes, and the Imaging of Protein Binding Sites in DNA.** Pacific Lutheran University, Physics Department Seminar, October 7, 1998, Tacoma, WA.

6. **Nanocontact Studies of Magnetic Field and Energy Dependent Electron Transport in Cu/Co Composites and Multilayers.** Richard N. Louie, Shashi K. Upadhyay, and R. A. Buhrman, 7th Joint Magnetism and Magnetic Materials (MMM)-Intermag Conference, January 9, 1998, San Francisco, CA. (presented by R. A. Buhrman)

7. **Electron Transport Studies of Magnetic Multilayers Using Nanofabricated Point Contacts.** R. N. Louie, S. K. Upadhyay, and R. A. Buhrman, 43rd National Symposium of the American Vacuum Society, October 15, 1996, Philadelphia, PA.

8. **Electron Transport Studies of Sputtered Magnetic Multilayers Using Nanofabricated Point Contacts.** Richard Louie, Shashi Upadhyay, and R. A. Buhrman, 1996 March Meeting of the American Physical Society, March 19, 1996, St. Louis, MO.

9. **Asymmetry Effects in 2-level Tunneling Systems and Two-Channel Kondo Scattering.** Shashi K. Upadhyay, Richard N. Louie, and R. A. Buhrman, 1996 March Meeting of the American Physical Society, March 18, 1996, St. Louis, MO. (presented by S. Upadhyay)

10. **Transport Studies of Superconducting Nanoconstrictions.** Shashikant Upadhyay, Richard Louie, and R. A. Buhrman, 1995 March Meeting of the American Physical Society, March 21, 1995, San Jose, CA. (presented by S. Upadhyay)

11. **Electron Transport Studies of Granular Magnetic Materials Using Nanofabricated Point Contacts.** Richard Louie, Shashikant Upadhyay, and R. A. Buhrman, 1995 March Meeting of the American Physical Society, March 20, 1995, San Jose, CA.

12. **Electron Transport Studies of Ferromagnet/Noble Metal Interfaces Using Nanofabricated Point Contacts.** R. Louie, D. C. Ralph, and R. A. Buhrman, 1994 March Meeting of the American Physical Society, March 23, 1994, Pittsburgh, PA.

13. **Seven Curiosities in Mathematics.** Richard Louie, Third Annual Japan Association for Mathematical Sciences Seminar, July 1989, Komagane, Japan.

Grants

Co-PI for National Science Foundation Grant, "Adapting WeBWorK Internet-Based Gateway Exams and Maple PowerTools to Introduce Appropriate Use of Technology in the First Two Semesters of Calculus," DUE-0311745, 2003-2006, $141,602.

Petroleum Research Fund of the American Chemical Society, "Surface Science Examinations of NF3 Plasma-Silicon Surface Interactions", 1999-2000, $13000.

PLU's Center for Teaching and Learning (CTL), funding for "Institutionalizing Undergraduate Research" workshop, March 1999, $1000.

Honors/Awards

Diversity Advocate Award (from PLU Diversity Center), 2004
Winner, American Society for Engineering Education Best Research Presentation Competition, NASA Langley Research Center, 2001.
Center for Teaching and Learning Faculty Teaching Award, 2000.
Cornell University Clark Teaching Award, 1992.
Department of Education Fellowship, 1992-1994.
John Harvard Scholarship (Dean's List), Harvard University.
National Merit Scholarship Finalist.