

Rensselaer Physics Department Activities

January 2009 – March 2009

(Rensselaer Students are underlined)

HONORS AND AWARDS

Lu

- "The Facile Surface Modification of Ultrathin poly(p-xylylene)'s Films", J. Senkevich and T.-M. Lu, US Patent No. 7,501,154

Newberg

- Chair of Scientific Organizing committee for SEGUE Collaboration meeting, University of Chicago, August 19, 2008
- Co-chaired the LAMOST-PLUS Galactic Structure Workshop, Chinese Academy of Sciences, Beijing, China, October 19-24, 2008

INVITED TALKS

Giedt

- 1/12, Jefferson Lab High Energy Theory Seminar "Lattice super-Yang-Mills"
- 1/26, Northeastern U. High Energy Theory Seminar, "Gaugino condensation: 32k CPUs weigh in"

Newberg

- "Milkyway Substructure," International Symposium, The Sloan Digital Sky Survey: From Asteroids to Cosmology, Chicago, IL, August 16, 2008
- "Galactic Structure from LAMOST," Kavli Institute for Astronomy and Astrophysics, Peking University, September 18, 2008, Beijing, China
- "Galactic Structure from SEGUE and LAMOST," Back to the Galaxy II Conference, Kavli Institute for Theoretical Physics, October 2, 2008

XC Zhang

- Lectures in Malaysia National Colloquium on THz Wave, Kuala Lumpur, Malaysia, Feb. 18 – 19, (2009).

MEETING ATTENDANCE

Newberg

- International Symposium, The Sloan Digital Sky Survey: From Asteroids to Cosmology, Chicago, IL, August 15-18, 2008
- LAMOST Galactic Structure Survey Working Group meeting, Sept. 16, 2008, Beijing, China
- "Back to the Galaxy II" Conference, Kavli Institute for Theoretical Physics, September 29 – October 3, 2008
- 27th Annual Eastern Section STANYS Siena Conference, Siena College, Loudonville, NY, October 10, 2008
- LAMOST-PLUS Galactic Structure Workshop, Chinese Academy of Sciences, Beijing, China,

October 19-24, 2008

XC Zhang

- University THz program in Singapore National University, Singapore, Feb. 16, (2009).
- Government THz program in Singapore, A-STAR, Singapore, Feb. 22, (2009).

OTHER PROFESSIONAL TRAVEL

Giedt

- 2/12, Visit collaborators at Syracuse U. Discussed lattice walking technicolor project. Discuss twisted N=4 super-Yang-Mills.

Newberg

- Sabbatical leave, 9/2008-5/2009, to set up an international collaboration with the Chinese LAMOST project
- Meeting with Norbert Christlieb to organize LAMOST target selection, December 8-12, 2008
- Co-Organized LAMOST PLUS workshop in Beijing, China, October 13-26, 2009
- Visited the LAMOST project at the Chinese Academy of Sciences, Beijing, China, September 13-19, 2008

Wang

- Review panelist for NIST Center for Nanoscale Science and Technology organized by Academy of Science, Feb. 22-25, 2009, Gaithersburg, MD.

PRESENTATIONS (presenter in bold)

Newberg

- "The Sloan Digital Sky Survey," Heidi Newberg, 27th Annual Eastern Section STANYS Siena Conference, Siena College, Loudonville, NY, October 10, 2008
- "The LEGUE Survey and PLUS Partnership," Heidi Newberg, LAMOST-PLUS Galactic Structure Workshop, Chinese Academy of Sciences, Beijing, China, October 22, 2008
- "Real World Astronomy for Earth Science Teachers," Teacher Training, Capital Region BOCES, November 13, 2008
- "LAMOST Galactic Structure Survey," Deng, L., et al., International Symposium, The Sloan Digital Sky Survey: From Asteroids to Cosmology, Chicago, IL, August 15-16, 2008

PAPERS PUBLISHED

Ciolek

- "Magnetically-regulated fragmentation induced by nonlinear flows and ambipolar diffusion" by Shantanu Basu (U. Western Ontario), Glenn E. Ciolek (RPI), Wolf E. Dapp (U. Western Ontario), and James Wurster (U. Western Ontario) 2009, in *New Astronomy*, Vol. 14, Issue 5, p. 483 - 495 (doi:10.1016/j.newast.2009.01.004)

Giedt

- in press: "Progress in four-dimensional lattice supersymmetry," Joel Giedt, *International Journal of Modern Physics A*.

Lu

- "Low Temperature Wafer Bonding by Copper Nanorod Array", Pei-I Wang, Sang Hwui Lee, Thomas C. Parker, Michael D. Frey, Tansel Karabacak, Jian-Qiang Lu, and Toh-Ming Lu, *Electrochemical and Solid-State Letters* 12, H138 (2009).
- "Size control of Cu nanorods through oxygen-mediated growth and low temperature sintering", Pei-I Wang, Thomas C Parker, Tansel Karabacak, G-C Wang, and T-M Lu, *Nanotechnology*

- 20, 085605 (2009).
- “Effect of Tip Geometry on Photo-Electron-Emission from Nanostructures”, Ranganath Teki, Toh-Ming Lu, and Nikhil Koratkar, *Journal of Nanoscience and Nanotechnology* 9, 1749 (2009)
 - “Introduction of molecular scale porosity into semicrystalline polymer thin films using supercritical carbon dioxide”, Peter Gin, Mitsunori Asada, Maya K. Endoh, Cynthia Gedelian, Toh-Ming Lu, and Tadanori Koga, *Appl. Phys. Lett.* 94, 121908 (2009).
 - “Sputter-Deposited Pt PEM Fuel Cell Electrodes: Particles vs Layers”, M. D. Gasda, R. Teki, T.-M. Lu, N. Koratkar, G. A. Eisman, and D. Gall, *Journal of The Electrochemical Society*, 156, B614 (2009).
 - “Mechanical properties of porous methyl silsesquioxane (MSQ) and nanoclustering silica (NCS) films using atomic force microscope”, C. Gaire, Y. Ou, R. C. Picu, G.-C. Wang, and T.-M. Lu, *Journal of Porous Materials* 23(2), 328 (2008).
 - “Passive Microfluidic device for Sub Millisecond Chaotic Mixing”, Z. Lu, J. McMahon, H. Mohamed, D. Barnard, T. R. Shaikh, C. A. Mannella, T. Wagenknecht, and T. Lu, *Sensors and Actuators B: Chemical*, submitted.
 - “Monolithic Microfluidic Mixing-Spraying Devices for Time-Resolved Cryo-Electron Microscopy”, Zonghuan Lu, Tanvir R. Shaikh, David Barnard, Xing Meng, Hisham Mohamed, Aymen Yassin, Carmen A. Mannella, Rajendra K. Agrawal, Toh-Ming Lu, and Terence Wagenknecht, *Journal of Structural Biology*, submitted.
 - “Nanostructured Silicon Anodes for Li-ion Rechargeable Batteries”, Ranganath Teki, Moni K. Datta, Rahul Krishnan, Thomas C. Parker, Toh-Ming Lu, Prashant N. Kumta and Nikhil Koratkar, *Small*, submitted.
 - “High Temperature Metal Coating for Modification of Photonic Band Edge Position,” T. A. Walsh, J. Bur, T.-M. Lu, and S.Y. Lin, submitted to *J. Opt. Soc. Am. B*
 - “Dielectric breakdown characteristics of porous low-k with chemical vapor deposited Parylene-N as pore sealant”, J. S. Juneja, Y. Ou, P.-I. Wang and T.-M. Lu, *Thin Solid Films*, submitted.
 - “Coherent Acoustic Vibrations in Silicon Submicron Spiral Arrays”, Masashi Yamaguchi, Jianxun Liu, Dexian Ye, and Toh-Ming Lu, *J. Appl. Phys.*, submitted.

Newberg

- “Improved Cosmological Constraints from New, Old, and Combined Supernova Data Sets,” Kowalski, M., and 69 co-authors, *The Astrophysical Journal*, 686, 749-778, 2008
- “The SEGUE Stellar Parameter Pipeline. I. Description and Comparison of Individual Methods,” Lee, Y.S., Beers, T.C., Sivarani, T., Allende Prieto, C., Koesterke, L., Wilhelm, R., Re Fiorentin, P., Bailer-Jones, C.A.L., Norris, J.E., Rockosi, C.M., Yanny, B., Newberg, H.J., Covey, K.R., Zhang, H.-T., and Luo, A.-L., *The Astronomical Journal*, 136, 2022-2049, 2008
- “The SEGUE Stellar Parameter Pipeline. II. Validation with Galactic Globular and Open Clusters,” Lee, Y.S., Beers, T.C., Sivarani, T., Johnson, J.A., An, D., Wilhelm, R., Allende Prieto, C., Koesterke, L., Re Fiorentin, P., Bailer-Jones, C.A.L., Norris, J.E., Yanny, B., Rockosi, C., Newberg, H.J., Cudsworth, K.M., and Pan, K., *The Astronomical Journal*, 136, 2050-2069, 2008
- “Effect of Night Laboratories on Learning Objectives for a Nonmajor Astronomy Class,” Jacobi, I.C., Newberg, H.J., Broder, D., Finn, R.A., Milano, A.J., Newberg, L.A., Weatherwax, A.T., and Whittet, D.C.B., *The Astronomy Education Review*, 7, 66-73, 2009
- “SEGUE: A Spectroscopic Survey of 240,000 stars with $g=14-20$,” Yanny, B., Rockosi, C., Newberg, H.J., Knapp, J., et al., *The Astronomical Journal*, submitted
- “An Orbit Fit for the Grillmair Dionatos Cold Stellar Stream,” Willett, B.A., Newberg, H.J., Zhang, H., Yanny, B., and Beers, T.C., *The Astrophysical Journal*, in press
- “The Big Toe of Hercules, a Moving Group 44 kpc from the Sun,” Harrigan, M.J., Newberg,

H.J., Yanny, B., Beers, T.C., Lee, Y.S., and Re Fiorentin, P., The Astrophysical Journal, submitted

- “Effect of Night Laboratories on Learning Objectives for a Non-Major Astronomy Class,” Jacobi, I.C., Newberg, H.J., Broder, D., Finn, R.A., Milano, A.J., Newberg, L.A., Weatherwax, A.T., and Whittet, D.C.B, arXiv:0809.3817, 29 pages, 2008

Shubert

- Jiuru Xu, Martin F. Schubert, Ahmed N. Noemaun, Di Zhu, Jong Kyu Kim, E. Fred Schubert, Min Ho Kim, Hun Jae Chung, Sukho Yoon, Cheolsoo Sone, and Yongjo Park “Reduction in efficiency droop, forward voltage, ideality factor, and wavelength shift in polarization-matched GaInN/GaN multi-quantum-well light-emitting diodes” Applied Physics Letters 94, 011113 (January 2009)
- Di Zhu, Jiuru Xu, Ahmed N. Noemaun, Jong Kyu Kim, E. Fred Schubert, Mary H. Crawford, and Daniel D. Koleske, “The origin of the high diode-ideality factors in GaInN/GaN multiple quantum well light-emitting diodes” Applied Physics Letters 94, 081113 (February 2009)
- Martin F. Schubert, Jiuru Xu, Qi Dai, Frank W. Mont, Jong Kyu Kim, and E. Fred Schubert “On resonant optical excitation and carrier escape in GaInN/GaN quantum wells” Applied Physics Letters 94, 081114 (February 2009)

Wang

- “Mechanical properties of porous methyl silsesquioxane (MSQ) and nanoclustering silica (NCS) films using atomic force microscope”, C. Gaire, Y. Ou, R. C. Picu, G.-C. Wang, and T.-M. Lu, Journal of Porous Materials 23(2), 328 (2008).
- Size control of Cu nanorods through oxygen-mediated growth and low temperature sintering, Pei-I. Wang, T.C. Parker, T. Karabacak, G.-C. Wang, T.-M. Lu, Nanotechnol. 20 (8), 085605 (2009).

XC Zhang

- Nicholas Karpowicz and X.-C. Zhang, “Coherent terahertz echo of tunnel ionization in gases,” Phys. Rev. Letts., 102, 093001 (2009).
- Y. W. Chen, P. Y. Han and X.-C. Zhang, “Tunable Broadband Anti-Reflection Structures for Silicon at Terahertz Frequency,” Appl. Phys. Letts., 94, 041106 (2009).
- Jianming Dai and X.-C. Zhang, “Terahertz wave generation from gas plasma using a phase compensator with attosecond phase-control accuracy,” Appl. Phys. Letts., 94, 021117 (2009).
- N. Karpowicz, J.M. Dai, X.-C. Zhang, L.L. Zhang, C.L. Zhang, “Recent development in broadband THz spectroscopy,” International Journal of High Speed Electronics and Systems, 18, 1005 – 1012 (2009).
- Albert Redo-Sanchez, Gurpreet Kaur, Xi-Cheng Zhang, Federico Buergens, and Roland Kersting, “Two-dimensional acoustic phase imaging with millimeter wave radiation,” IEEE Transactions on Microwave Theory and Techniques, 57, 589, 2009.
- Qian Song, P.Y. Han, Nicholas Karpowicz and X.-C. Zhang, “Temperature dependent terahertz spectroscopy of allopurinol”, Journal of Infrared, Millimeter, and Terahertz Waves, 30, 461 (2009).

PROPOSALS (SUBMITTED or GRANTED)

Lu

- “Biaxial Semiconductor Films on Glass Substrates for Solar Energy Conversion”, I. Bhat, G.-C. Wang, and T.-M. Lu, NSF, ~\$350K, submitted.
- MRI: Acquisition of Instrumentation for Nanoscale In-Situ Studies in Auger Electron and X-Ray Photoelectron Spectroscopy, Robert Hull, Ramanath, T.-M. Lu, G.-C. Wang, D. Duequette, ~\$500K, NSF, submitted.
- “Acoustic Spectroscopy and Phonon Transport in isolated Nanorod Arrays”, M. Yamaguchi and T.-M. Lu, ~\$300K, NSF, submitted.

Newberg

- “National Space Grant Supplement for 2008,” Heidi Newberg (PI, 100%), New York Space Grant Consortium, Cornell University, March 10, 2008 to December 31, 2008, \$9,998, 100%, granted
- “Planning US Partnership in Galactic Structure with the Chinese LAMOST Telescope,” Heidi Newberg (PI, 100%), National Science Foundation, 6/1/2008, 18 months \$144,107, granted
- “The Center for Galactic eScience,” preproposal, Heidi Newberg (PI, 30%), John Carter (co-PI), Deborah McGuinness (co-PI), Bolek Szymanski (co-PI), National Science Foundation, \$19,575,502, submitted
- “III: Medium: Astroinformatics using Generic Maximum Likelihood Estimation (GMLE) – Statistical Discovery of Milky Way Structure and Dynamics,” Malik Magdon-Ismael (PI-25%), Heidi Newberg (co-PI, 25%), Bolek Szymanski (co-PI, 25%), Carlos Varela (co-PI, 25%), submitted
- “CDI-Type II: Parameter Estimation for Scientific Statistical Models Using A Distributed Computational Framework,” preproposal, Bolek Szymanski (PI, 25%), Malik Magdon-Ismael (co-PI, 25%), Heidi Newberg (co-PI, 25%), Carlos Varela (co-PI, 25%), National Science Foundation, \$1,471,198, submitted

Wang

Proposal granted:

- REU in physics at Rensselaer, NSF, \$320K, 2009-2012.

Proposals submitted:

- MRI: Development of THz Wave Air-Plasma Photonics, X.-C. Zhang, M. Shur, G.-C. Wang, Dai, Yamaguchi, submitted to the NSF on Jan. 22, 2009, \$391,735.00.
- MRI: Acquisition of Instrumentation for Nanoscale In-Situ Studies in Auger Electron and X-Ray Photoelectron Spectroscopy, Robert Hull, Ramanath, T.-M. Lu, G.-C. Wang, D. Duequette, submitted to the NSF on Jan. 22, 2009, \$500,895.00.
- Nanorod arrays for generation of terahertz waves in gaseous media, PI: Yamguchi, co-PIs: Wang and Nayak, \$291K, Submitted to the NSF on Feb. 6, 2009.
- Biaxial semiconductor films on glass substrates for solar energy conversion, Ishwara Bhat, G.-C. Wang, and T.-M. Lu, \$351,451, submitted to the NSF on March 2nd, 2009.
- Studio Physics I - No Student Left Behind, Curriculum Development Support Grant Application, PIs: Gwo-Ching Wang (wangg@rpi.edu), Glenn Ciolek, Peter Persans, Jim Napolitano, Scott Dwyer, Dept. of Physics; Don Millard, ECSE Department; Students: Eric Allen (ECSE), Sara Brown (MANE), Devin Ellis (Physics), submitted to RPI, March 16, 2009.

XC Zhang

- “Science of Broadband THz Wave Generation and Detection with Gases”, DTRA, \$450,000, three years 2009-2011. Selected for funding.
- “THz ABCD spectrometer,” Navy DURIP \$300,000, one year 2009. Selected for funding.
- “THz microscope,” ARO. Additional \$100,000. Received.
- “Compact THz ABCD,” NSF SBIR Zomega THz Corp – ConnectionOne, \$90,000. Selected for funding.
- “THz electro-optic interferometer,” Idaho National Lab., \$4,500. 2009. Selected for funding.

SIGNIFICANT RESULTS OBTAINED OR NEW RESEARCH AFFILIATES

XC Zhang

- Yuting Chen’s recent paper “Tunable broadband antireflection structures for silicon at terahertz frequency” Applied Physics Letters 94, 041106 (2009) is featured in The Research Highlight by Nature Photonic, April issue. Yuting Chen is an IGERT student.

- Jingle Liu has demonstrated the use of radiation-enhanced-emission-of-fluorescence (REEF) to measure THz radiation. This newly developed method at Rensselaer provides a new way to measure pulsed THz signal for remote application.

VISITORS TO RENSSELAER

Giedt

- David Richards, Jefferson Lab High Energy Theory group, discuss and agreed to collaboration on lattice QCD project.

Newberg

- Licai Deng, collaboration on LAMOST planning, August 18-21, 2008
- Yueyang Zhang, graduate student at Chinese Academy of Sciences, Beijing, China, collaborate on Milky Way halo substructure and LAMOST planning, 10/24/2008-1/26/2009
- Licai Deng, collaboration on LAMOST planning, November 13-18, 2008
- Brian Yanny, Fermilab, 11/30/2008 – 12/4/2008, collaborated on scientific analysis

OTHER

Giedt

- Several rounds of grad admissions committee.
- Spring qualifying exam proctor/grading.
- Hosted colloquim speaker David Richards.
- Sigma Pi Sigma selection committee.