

# *Rensselaer Physics Department* *Activities*

**JULY 2009 – SEPTEMBER 2009**

(Rensselaer Students are underlined>

## **HONORS AND AWARDS**

### **Newberg**

- Chair, Session XXVII: Models of the Galactic Disk, *The Milky Way and the Local Group – Now and in the Gaia Era*, Zentrum für Astronomie der Universität Heidelberg, Germany, September 3, 2009

### **XC Zhang**

- US Patent #7557348, Method and system for imaging an object using multiple distinguishable electromagnetic waves transmitted by a source array, Jingzhou Xu and X.-C. Zhang, Issue Date: July 7, 2009.

## **INVITED TALKS**

### **XC Zhang**

- “Covering THz gap with pulsed THz wave photonics,” Plenary talk, Photonics and Optoelectronics Meeting 2009, Huazhong University of Science and Technology, Wuhan, China. August 8, 2009.
- “Physics and Potential Applications of Terahertz Air Photonics,” Jianming Dai, Nick Karpowicz, Jingle Liu, and X.-C. Zhang, Plenary Talk M2P, IRMMW-THz conference, Pusan, Korea, Sept. 22, 2009.
- “THz air photonics,” Post-Conference distinguished lecture on THz science and technology, Seoul National University, Seoul, Korea, Sept. 27, 2009.

## **MEETING ATTENDANCE**

### **Newberg**

- LAMOST-PLUS Workshop, National Academy of Sciences, Beijing, China, August 23-28, 2009
- “The Milky Way and the Local Group – Now and in the Gaia Era,” Zentrum für Astronomie der Universität Heidelberg, Germany, August 31 to September 4, 2009

## **OTHER PROFESSIONAL TRAVEL**

### **XC Zhang**

- Travel by David Brigada to deliver a replacement miniature time-domain terahertz spectroscopy system to Iris Vazquez-Ayala, NAVEODTECHDIV, US Naval Surface Warfare Center, Indian Head, MD, July 13–15, 2009; Aug. 18, 2009.

## **PRESENTATIONS (presenter in bold)**

## Newberg

- “Formation of the Universe,” Newberg, H.J., “Starry, Starry Night” teacher training, in collaboration with the Dudley Observatory, Children’s Museum of Science and Technology, August 13, 2009.
- “Orphan Stream lessons for LAMOST,” Newberg, H.J., LAMOST-PLUS Workshop, Beijing, China, August 27, 2009
- “Tidal Streams in the Galactic Spheroid,” Newberg, H. J., *The Milky Way and the Local Group – Now and in the Gaia Era*, Zentrum für Astronomie der Universität Heidelberg, Germany, Sept. 1, 2009
- “The LAMOST Spectroscopic Survey of Galactic Stars (LEGUE),” poster, Newberg, H. J., *The Milky Way and the Local Group – Now and in the Gaia Era*, Zentrum für Astronomie der Universität Heidelberg, Germany, Sept. 1, 2009

## XC Zhang

- **Pengyu Han**, X.-C. Zhang, “Near field THz imaging with sub-micron resolution”, Discover Study, DSRC/DARPA workshop, June 19, 2009.
- **Pengyu Han**, X.-C. Zhang, “T-ray: the next frontier”, REU seminar series, June 25, 2009.
- **Jianming Dai** and X.-C. Zhang, “Demonstration of 17 meters standoff THz wave generation,” Advances in Optical Sciences, Nonlinear Optics Conference, Honolulu, Hawaii, July 15, 2009.
- Xiaofei Lu, Nick Karpowicz and **X.-C. Zhang**, “Broadband THz detection with selected gases,” Advances in Optical Sciences, Nonlinear Optics Conference, Honolulu, Hawaii, July 15, 2009.
- **Brian Schulkin**, Ben Clough, David Brigada, Norman Laman, Thomas Tongue, and X.-C. Zhang, “Progress toward handheld THz spectrometry,” IRMMW-THz 2009. Pusan, Korea, Sept. 25, 2009.
- Hou Lei, **Hongkyu Park**, and X.-C. Zhang, “Broadband Detector Measures IR, Millimeter & THz Waves,” IRMMW-THz 2009. Pusan, Korea, Sept. 22, 2009.
- Jianming Dai, **Tom Tongue**, and X.-C. Zhang, “In-line phase compensator for THz wave standoff generation,” IRMMW-THz 2009. Pusan, Korea, Sept. 22, 2009.
- Pengyu Han, **Yuting Chen**, X.-C. Zhang, “Application of Silicon Photonic Devices as an Anti-reflection Layer for Terahertz Waves.” NANO-DDS 2009, Fort Lauderdale, FL, Sept. 30, 2009.

## PAPERS PUBLISHED

### Lu

- “Coherent Acoustic Vibrations in Silicon Submicron Spiral Arrays”, Masashi Yamaguchi, Jianxun Liu, Dexian Ye, and Toh-Ming Lu, J. Appl. Phys. **106**, 033517 (2009).
- “Silicon nanostructured films grown on templated surfaces by oblique angle deposition Technique”, Dexian Ye and Toh-Ming Lu, book chapter in “*Thin film growth physics, materials science and applications*”, edited by Zexian Cao, submitted.
- “Formation of vertically aligned biaxial tungsten nanorods using a novel shadowing growth technique”, R Krishnan, T Parker, T-M Lu and S Lee, Nanotechnology, submitted.
- “Ta ions drift into low  $k$  dielectrics under bias temperature stress”, Ming He, Ya Ou, Pei-I Wang, Hassaram Bakhru, and Toh-Ming Lu, Appl. Phys. Lett., submitted.
- “Low Hydrogen Containing Amorphous Carbon Films – Growth and Electrochemical Properties as Lithium Battery Anodes”, V. Subramanian, Tansel Karabacak, Charan Masarapu, Ranganath Teki, Toh-Ming Lu and Bingqing Wei, Langmuir, submitted.

## Newberg

- “A Study of the Sagittarius Tidal Stream Using Maximum Likelihood,” Cole, N., Newberg, H. J., Magdon-Ismail, M., Desell, T., Varela, C., and Szymanski, B., *ASP Conference Series*, 411, 221, 2009
- “Discovery of a New, Polar-Orbiting Debris Stream in the Milky Way Stellar Halo,” Newberg, H.J., Yanny, B., & Willett, B.A., *The Astrophysical Journal Letters*, **700**, 61, 2009
- “Tracing Sagittarius Structure with SDSS and SEGUE Imaging and Spectroscopy,” Yanny, B., Newberg, H.J., and 13 co-authors, *The Astrophysical Journal*, **700**, 1282, 2009
- “Statistical Properties of Blue Horizontal Branch Stars in the Spheroid: Detection of a Moving Group ~50 kpc from the Sun,” Harrigan, M., Newberg, H.J., Newberg, L.A., Yanny, B., Beers, T.C., Lee, Y.S., & Re Fiorentin, P., *Monthly Notices of the Royal Astronomical Society*, submitted, 2009
- “The Orbit of the Orphan Stream,” Newberg, H. J., Willett, B. A., & Yanny, B., *The Astrophysical Journal*, submitted, 2009
- “Robust Asynchronous Optimization for Volunteer Computing Grids,” Desell, T., Magdon-Ismail, M., Szymanski, B., Varela, C., Newberg, H., and Cole, N., eScience, accepted, 2009

### Wang

- Reflection high energy electron diffraction (RHEED) study of nanostructures: From diffraction patterns to surface pole figures, Fu Tang, Toh-Ming Lu and Gwo-Ching Wang, MRS spring 2009, Symp. GG Electron crystallography for materials research, April 13-14, 2009, San Francisco, CA, submitted.

### XC Zhang

- Maxim Nazarov, Alexander Shkurinov, Valery Tuchin, and X.-C. Zhang, “Terahertz Tissue Spectroscopy and Imaging,” Chapter 23, Handbook of Photonics for Biomedical Science. Submitted.
- X.-C. Zhang, R. Beigang, and K. Tanaka, "Terahertz Wave Photonics: Introduction" J. Opt. Soc. Am. B **26**, TW1 (2009).
- Jianming Dai, Nicholas Karpowicz, and X.-C. Zhang, “Coherent polarization control of terahertz waves generated from two-color laser-induced gas plasma,” Phys. Rev. Lett. **103**, 023001 (2009).
- Jian Chen, Pengyu Han, and X.-C. Zhang, “Terahertz-field-induced second-harmonic generation in a beta barium borate crystal and its application in terahertz detection,” Appl. Phys. Lett. **95**, 011118 (2009).
- Benjamin Clough, David Hurley, Pengyu Han, Jun Liao, Rena Huang, X. -C. Zhang, “Detection of terahertz pulses using a modified sagnac interferometer,” Sensing and Imaging: An International Journal, DOI 10.1007/s11220-009-0046-x, 2009.
- Jingle Liu and X.-C. Zhang, "Birefringence and absorption coefficients of alpha barium borate in terahertz range," J. of Appl. Phys. **106**, 023107 (2009).
- Jingle Liu and X.-C. Zhang, “Terahertz radiation-enhanced-emission-of-fluorescence from gas plasma,” Phys. Rev. Letts. (2009). Submitted.
- N. Karpowicz, Xiaofei Lu, and X.□C. Zhang, “The Role of Tunnel Ionization in Terahertz Gas Photonics,” Laser Physics, Vol. **19**, No. 8, pp. 1535–1539. (2009).
- Vyacheslav A. Trofimov, Svetlana A. Varentsova, Jian Chen, Xi-Cheng Zhang, “Identification of explosive media using their spectrum dynamics, under the action of THz pulse, SPIE Europe, 2009. Submitted.
- Jianming Dai, Nicholas Karpowicz, and X.-C. Zhang, “Optically Manipulating Terahertz Wave Polarization in Two-Color Laser-Induced Gas Plasma,” Optics in 2009, OPN, (2009). Submitted.

- Pengyu Han, Yuting Chen, and X.-C. Zhang, “Silicon Photonic Crystals for Anti-reflection of Terahertz Waves,” *Journal of Selected Topics in Quantum Electronics*, (2009). Submitted.

## **PROPOSALS (SUBMITTED or GRANTED)**

### **Lu**

- “Hydrogenation/dehydrogenation in Pd-coated ultrathin Mg nanoblades: Experimental study and first-principles calculations”, G.-C. Wang, T.-M. Lu, and S.B. Zhang, NSF, \$325 K, August 2009—August 2012, funded.
- “Architectural photonics for maximizing solar energy conversion”, S. Lin and T.-M. Lu, DOE, \$750K, Sept 2009—Sept 2012. Funded.
- MRI-R2: “Development of a Novel Reflection High-Energy Electron Diffraction (RHEED) Pole Figure Technique to Characterize Nanostructured Crystal Orientation”, NSF, \$650K, 3 years, PI: Wang, Co-PIs: Lu, Bhat (ECSE), Gall (Mat. Sci.), and Koratkar (MANE). Submitted on August 10, 2009.
- “Small angle grain boundary semiconductor substrates for solar cell applications”, PI: Toh-Ming Lu, Co-PIs: G.-C. Wang, I. Bhat (ECSE), S.B. Zhang, DOE ARPA-E, \$2.2M, 2 years, submitted on August 28, 2009.
- “Next Generation Li-Ion Rechargeable Batteries Featuring Nanoengineered anode architectures”, N. Koratkar, C. Picu, and T.-M. Lu, NSF, \$396K, August 2010—August 2013, submitted.
- “THz Acoustics and Nanomechanics in Nanorod Arrays”, M. Yamaguchi and T.-M. Lu, NSF, \$329, Feb 2010—Feb 2013, submitted.

### **Newberg**

- “NY Space Grant Fellowship Program,” Heidi Newberg (PI, 100%), New York Space Grant Consortium, Cornell University, April 1, 2009 to March 31, 2009, \$10,000, 100%, granted
- “Measuring the Shape of the Milky Way’s Stellar Halo using 150 Tflops of Computing Power from 23,000 Public Volunteers,” Heidi Newberg (PI, 100%), New York Space Grant Consortium, Cornell University, August 1, 2009 to March 31, 2009, \$10,000, 100%, granted
- “National Space Grant Supplement 2009,” Heidi Newberg (PI, 100%), New York Space Grant Consortium, Cornell University, August 1, 2009 to March 31, 2009, \$5,000, 100%, granted
- “SEI (AST): A Dynamic Grid for Astroinformatics: Data-Driven Discovery of the Milky Way Origin and Evolution from the Sloan Digital Sky Survey,” Magdon-Ismael (PI, 100%), Newberg (25%), Szymanski (25%), Varela (25%), NSF SEI supplement, 8/1/2009-7/31/2010, \$53,004.00, submitted and granted

### **Wang**

- Hydrogenation/dehydrogenation in Pd-coated ultrathin Mg nanoblades: Experimental study and first-principles calculations, G.-C. Wang, T.-M. Lu, and S.B. Zhang, NSF, \$325 K, submitted on Sept. 12, 2008. Funded in August 2009.
- MRI-R2: Development of a Novel Reflection High-Energy Electron Diffraction (RHEED) Pole Figure Technique to Characterize Nanostructured Crystal Orientation, NSF, \$650K, 3 years, PI: Wang, Co-PIs: Lu, Bhat (ECSE), Gall (Mat. Sci.), and Koratkar (MANE). Submitted on August 10, 2009.
- Small angle grain boundary semiconductor substrates for solar cell applications, PI: Toh-Ming Lu, Co-PIs: G.-C. Wang, I. Bhat (ECSE), S.B. Zhang, DOE ARPA-E, \$2.2M, 2 years, submitted on August 28, 2009.

### **Zhang**

- “Development of THz Wave Air-Plasma Photonics,” NSF-MRI, \$391k, two years. 2009-2010. Granted.
- “THz wave photonics,” NSF ECCS, \$300k. Three years, 2009-2011. Granted.
- “Non Destructive Thermal Analysis and In Situ Investigation of Creep Mechanism of Graphite and Ceramic Composites using Phase-sensitive THz Imaging & Nonlinear Resonant Ultrasonic Spectroscopy,” DOE-NEUP, \$342,236, three years. Granted.
- DOE Scholar fellowship. \$144,900 for three years (\$48,300/year). Granted.
- NATO SET124 THz Task Group Business Meeting, DHS-Northeastern Univ., \$10k. 2009. Granted.

## VISITORS TO RENSSELAER

### Newberg

- Brian Yanny, Fermi National Accelerator Laboratory, collaborate on Milky Way halo substructure, 7/19/2009-7/23/2009
- Ted von Hippel, Siena College, presented Astrophysics Seminar, Sept. 10, 2009
- Warren Brown, Smithsonian Astrophysical Observatory, presented Physics Department Colloquium, September 23, 2009
- Michael Richmond, Rochester Institute of Technology, presented Astrophysics Seminar, Sept. 24, 2009

## NON-PROFESSIONAL ACTIVITIES

### Zhang

- Four graduate students in Zhang’s group, Jingle Liu, Xiaofei Lu, Yuting Chen, Ben Clough receive Founders award.

## IMPORTANT ACTIVITIES OF STUDENTS

### Newberg

- Undergraduate students John Vickers and John Dellomo attended the LAMOST-PLUS workshop, Chinese Academy of Sciences, Beijing, China, August 23-28, 2009, and gave talks entitled:
  - “The effect of Perpendicularity on Cross Sectional Studies of the Sagittarius Dwarf Tidal Stream,” John Vickers, August 27, 2009
  - “Development of a Milky Way Substructure Catalog and Potential Dwarf Galaxy Detection,” John Dellomo, August 27, 2009
- Graduate student Ben Willett presented: “Simultaneous Orbit Fitting of Two Stellar Streams: Constraining the Galactic Dark Matter Halo,” at *The Milky Way and the Local Group – Now and in the Gaia Era*, Zentrum für Astronomie der Universität Heidelberg, Germany, Sept. 2, 2009