

# *Rensselaer Physics Department*

## *Activities*

**JAN 2004 – MAR 2004**  
(Rensselaer Students are underlined)

### **HONORS AND AWARDS**

#### **H. NEWBERG**

- Chaired the morning session of the SEGUE review, O'Hare Airport, IL, February 16, 2004.

#### **X.-C. ZHANG**

- "THz Pulse Measurement with an Optical Streak Camera", Z. Jiang and X.-C. Zhang, US patent No. 6690001, issued on February 10, 2004.
- Elected as the commissioner of the Sixth Editorial Board for the Chinese Journal of Infrared and Millimeter Waves (JIRMW), 2004.

### **INVITED TALKS**

#### **M. BELLIS**

- "A Partial Wave Decomposition of Gamma  $p \rightarrow p \pi^+ \pi^-$ ", NSTAR 2004, Grenoble, France, March 26, 2004.

#### **G. CIOLEK**

- "Propagation of Magnetohydrodynamic Waves and Shocks in Dusty Interstellar Clouds", Department of Astronomy, University of Illinois at Urbana-Champaign, February 24, 2004.

#### **H. NEWBERG**

- "Streams of Stars in the Halo of the Milky Way Galaxy", Williams Joint Physics and Astronomy Colloquium Series, Williamstown, MA, February 27, 2004.
- "The Plan to Extend the Sloan Digital Sky Survey to Find Galactic Structure", SEGUE project review, O'Hare Airport, IL, February 16, 2004.

## G.-C. WANG

- “Shadowing Growth of Nanostructures and Their Properties”, Physics Department Seminar, Queen's University, Kingston, Canada, March 11, 2004.

## D. WHITTET

- “Polarimetric Observations of Molecular Clouds”, Astronomical Polarimetry, Kona, Hawaii, March 15-19, 2004.

## I. WILKE

- “Time-Domain THz-Spectroscopy”, DOE-NSF-NIH Workshop on Opportunities in THz Science, Arlington, VA, February 12-14, 2004.
- “THz Wave Science and Technology”, Physics's colloquium SUNY Albany, March 12, 2004.

## X.-C. ZHANG

- “THz Wave Technology”, SPIE Photonics West, Video Recording for Long Distance Education, San Jose, CA, January 26, 2004.
- “THz Wave Technology and Applications”, SPIE Photonics West, Short Course SC547, San Jose, CA, January 27, 2004.
- “THz Imaging”, DOE-NSF-NIH Workshop on Opportunities in THz Science, Washington, DC, February 13, 2004.
- “Learning from Tragedy: Defect Detection with THz Radiation for Space Shuttle Applications”, THz Workshop, Freiburg, Germany, February 17, 2004.
- “Next Rays? T-Ray! Overview of the Science and Applications of Terahertz T-Ray”, Terahertz Applications Symposium: Bridging the Gap from R&D to the Marketplace, Southeast University Research Association, Washington, DC, March 16, 2004.
- “Recent Development of THz Wave Tomographic Imaging”, APS March Meeting, Development of Detectors/Sensors for Medical and Industrial Imaging, L5-5, Montreal, Canada, March 23, 2004.

## **MEETING ATTENDANCE**

### H. NEWBERG

- The American Astronomical Society Meeting, Atlanta, GA, January 4-8, 2004.
- SEGUE External Review, O'Hare Airport, IL, February 16, 2004.
- Sloan Digital Sky Survey (SDSS) Collaboration Meeting, New Mexico State University, March 15-17, 2004.

## I. WILKE

- DOE-NSF-NIH Workshop on Opportunities in THz Science, Arlington, VA, February 12-14, 2004.
- Spring Meeting of the American Physical Society, Montreal, Canada, March 21-26, 2004.

## OTHER PROFESSIONAL TRAVEL

### I. WILKE

- National Science Foundation Division of Electrical and Communications Systems Unsolicited Proposal Panel, Arlington, VA, January 22-23, 2004.

## PRESENTATIONS (presenter in bold)

### H. NEWBERG

- “Sloan Extension for Galactic Underpinnings and Evolution (SEGUE)”, **H. Newberg** & the Sloan Digital Sky Survey Collaboration, Bulletin of the American Astronomical Society, 203, #112.11, 2004.
- “The Kinematic Signature of the Sagittarius Dwarf Galaxy Tidal Debris from SDSS-DR1”, **R. Wilhelm**, T.C. Beers, C. Allende Prieto, H. Newberg, and B. Yanny, Bulletin of the American Astronomical Society, 203, #112.01, 2004.

### I. WILKE

- “Optically Excited THz Generation From InN Thin Films”, R. Ascazubi, **I. Wilke**, K. Denniston, H. Lu, and W. Schaff, contributed oral presentation, Spring Meeting of the American Physical Society, Focus Session: Semiconductor IR and THz Devices and Applications, Montreal, Canada, March 22, 2004.

## PAPERS PUBLISHED

### G. CIOLEK and W. ROBERGE

- “Multifluid, Magnetohydrodynamic Shock Waves with Grain Dynamics II. Dust and the Critical Speed for C Shocks”, G.E. Ciolek, W.G. Roberge, and T. Mouschovias (U. of Illinois), The Astrophysical Journal. Submitted.
- “Formation and Collapse of Nonaxisymmetric Protostellar Cores in Planar Magnetic Molecular Clouds”, S. Basu (U. of Western Ontario) and G.E. Ciolek, The Astrophysical Journal (Letters). Submitted.

## G. KORNISS

- “Competition-Driven Network Dynamics: Emergence of a Scale-Free Leadership Structure and Collective Efficiency”, M. Anghel, Z. Toroczkai, K.E. Bassler, and G. Korniss, Phys. Rev. Lett. 92, 058701, 2004.
- “Roughness Scaling for Edwards-Wilkinson Relaxation in Small-World Networks”, B. Kozma, M.B. Hastings, and G. Korniss, Phys. Rev. Lett. 92, 108701, 2004.

## H. NEWBERG

- “The Effects of the Sagittarius Dwarf Tidal Stream on Dark Matter Detectors”, K. Freese, P. Gondolo, H.J. Newberg, and M. Lewis, Phys. Rev. Lett., 92, 11, 111301, 2004.
- “New Resources to Explore the Old Galaxy: Mining the SDSS”, C. Allende Prieto, T.C. Beers, Y. Li, H.J. Newberg, R. Wilhelm, B. Yanny, Origin and Evolution of the Elements, from the Carnegie Observatories Centennial Symposia. Carnegie Observatories Astrophysics Series. Edited by A. McWilliam and M. Rauch, Pasadena: Carnegie Observatories, 2004.
- “The Sloan Digital Sky Survey Quasar Catalog. II. First Data Release”, D.P. Schneider, and 50 other authors, The Astronomical Journal, Volume 126, Issue 6, pp. 2579-2593, 2003.

## T. KARABACAK and T.-M. LU

- “A Continuum Model for Nanocolumn Growth During Oblique Angle Deposition”, E. Main, T. Karabacak, and T.-M. Lu, J. Appl. Phys., J. Appl. Phys., V.95, p.4346, 2004.
- Submitted Book Chapter: “Shadowing Growth and Physical Self-Assembly of 3D Columnar Structures”, in Handbook of Theoretical and Computational Nanotechnology, T. Karabacak and T.-M. Lu, American Scientific Publishers. In press.

## T. KARABACAK, T.-M. LU, and J.J. SENKEVICH

- “Photoluminescence of PPV Thin Film Coated on Tungsten Nano-Rods”, D. Jia, F. Fernandez, T. Karabacak, C. Wiegand, J.J. Senkevich, and T.-M. Lu, J. Appl. Phys. Submitted.

## T. KARABACAK, T.-M. LU, J.J. SENKEVICH, and G.-C. WANG

- “Stress Reduction in Tungsten Films Using Nanostructured Compliant Layers by Oblique Angle Sputter Deposition”, T. Karabacak, J.J. Senkevich, G.-C. Wang, and T.-M. Lu, J. Appl. Phys. Submitted.

- “Stress Reduction in Sputter Deposited Films Using Nanostructured Compliant Layers by High Working-Gas Pressures”, T. Karabacak, J.J. Senkevich, G.-C. Wang, and T.-M. Lu, J. Appl. Phys. Submitted.
- “Stress Reduction in Sputter Deposited Thin Films Using Physically Self-Assembled Nanostructures as Compliant Layers”, T. Karabacak, J.J. Senkevich, G.-C. Wang, and T.-M. Lu, SVC Proceedings. Submitted

## T. KARABACAK, T.-M. LU, and G.-C. WANG

- “Growth of Uniformly Aligned Nanorod Arrays by Oblique Angle Deposition with Two-Phase Substrate Rotation”, D.-X. Ye, T. Karabacak, B.K. Lim, G.-C. Wang, and T.-M. Lu, Nanotechnology. Submitted.

## X.-C. ZHANG

- “Ch. 8: T-Ray Sensing and Imaging”, S.P. Mickan and X.-C. Zhang, in Terahertz Sensing Technology: Electronic Devices Advanced Technology (World Scientific Publishing Company), D. Woolard, M. S. Shur & W. Leorop (eds), pp. 351–326; also reprinted as an article in “T-Ray Sensing and Imaging”, S.P. Mickan and X.C. Zhang, International Journal of High Speed Electronics and Systems, 13 (2)601–676, 2003.
- “Terahertz Emission from the Structures Containing Low-Temperature-Grown GaAs Layers”, A. Krotkus, K. Bertulis, K. Liu, J. Xu, and X.-C. Zhang, Semicond. Sci. Technol. 19 S452–S453, 2004.
- “Non-Destructive Defect Identification by Terahertz Tomography”, H. Zhong, J.Z. Xu, X. Xie, T. Yuan, R. Reightler, E. Madaras, and X.-C. Zhang, IEEE Sensors, 2004. Submitted.
- “Three-Dimensional Terahertz Wave Imaging”, X.-C. Zhang, Phil. Trans. R. Soc. Lond. A 362, 283-299, 2004.
- “Development of Terahertz Wave Microscopes”, T. Yuan, J.Z. Xu, and X.-C. Zhang, Infrared Physics and Technology, 2004.
- “Pulsed Terahertz Tomography”, S.H. Wang, B. Ferguson, and X.-C. Zhang, Journal of Physics D: Applied Physics, volume 37, issue 4, pages R1 - R36, 2004.
- “Label-Free Amplified Bioaffinity Detection Using Terahertz Wave Technology”, A. Menikh, S.P. Mickan, H. Liu, R. MacColl, and X.-C. Zhang, Bosensor and Bioelectronics, to be published, 2004.
- “Electrically Controlled Room Temperature Terahertz Phase Shifter with Liquid Crystal”, T.-R. Tsai, C.-Y. Chen, R.-P. Pan, C.-L. Pan, Senior Member, IEEE, and X.-C. Zhang, IEEE Microwave and Wireless Communication Components Letters, 14, 77, 2004.
- “Spectrum Determination of THz Sources Using Fabry-Perot Interferometer and Bolometer Detector”, Y. Deng, R. Kersting, V. Roytburd, J.Z. Xu, R. Ascazubi, K. Liu, X.-C. Zhang, and M.S. Shur, International Journal of Infrared and Millimeter Wave, 25, 215, 2004.

## PROPOSALS (SUBMITTED or GRANTED)

### G. KORNISS

- “QEIB: Spatial Ecologies Under Temporal Variation”, Co-PI G. Korniss, Collaboration with Tom Caraco at SUNY Albany, NSF, \$159,997, 7/1/04-6/30/07.

### T.-M. LU and G.-C. WANG

- “IMR: Acquisition of a Scanning Hall Probe Microscope for Studies of Magnetic Nano-Assemblies and Education”, G.-C. Wang, T.-M. Lu, and M. Shima, NSF, \$120K, January, 2003. Submitted.

### T.-M. LU, S. NAYAK, and G.-C. WANG

- “Fundamental Study of Ionization and Gas Breakdown Mechanisms Near Nanostructured Electrodes”, N. Koratkar, T.-M. Lu, G.-C. Wang, S. Nayak, T. Borca-Tasciuc, and P. Ajayan, DOE, \$380K, February 1, 2004. Submitted.

### G.-C. WANG

- NYSTAR faculty development proposal, J. Flaherty and G.-C. Wang, NY State, \$750K, February 17, 2004. Submitted.

### I. WILKE

- “EMSI: Molecular Mechanisms of Sequestration of Persistent Organic Pollutants”, PI :T.A. Abrajano, Co-PIs: C. Breneman, S. Garde, J.I.Hang, J.C. Kilduff, L. Schadler, A. Sharma, I. Wilke, NSF CHE - Special Projects: Chemistry Groups, Centers, and Collaboratives, \$7.4 Million. Submitted.

### X.-C. ZHANG

- “Development of Portable Terahertz System and Millimeter Wave Detection”, Lockheed Martin, \$160,000, 1 year, 2004. Granted.
- “IMRA Fellow”, \$150,000 for 3 years, 2004-2006. First payment (\$50,000 for year 2004) received.
- “Broadband Terahertz Emitter & Detector: <110> Oriented ZnTe Thin Crystal Mounted on <100> Oriented ZnTe Crystal”, PhD Student, Kai Liu (Supervisor X.-C. Zhang), \$10,000, Optoelectronics Industry Development Association, 2004. Granted.
- “Reflective Polarization Optics and Large Aperture Modulator for Sub-10 fs Lasers”, PhD Student, Tao Yuan (Supervisor X.-C. Zhang), \$10,000, Optoelectronics Industry Development Association, 2004. Granted.
- “THz Technology”, Army Benet Lab., \$10,500, 2004. Granted.
- “Non-Linear Dynamics in Electronic Systems and Devices Under Intense

Terahertz Radiation”, Australia Research Council Discovery Project, AU\$430,000, C. Zhang, R.A. Lewis, X.-C. Zhang, and R.E.M.Vickers, 2004-2006. Granted.

- “THz Wave Imagers”, DARPA/MTO, with MIT and Caltech. \$3,000,000 for 18 months. Submitted.
- “THz Technology”, with M. Shur, Boeing Co., \$300,000 (option \$500,000) for 18 months. Submitted.

## **VISITORS TO RENSSELAER**

### **X.-C. ZHANG**

- Dr. Yun-Sik Jin from Korea Electrotechnology Research Institute (KERI) will be visiting the Center for THz Research for 3 months.
- Prof. Haewook Han from Center for Terahertz Photonics POSTECH, Pohang, Korea, will be visiting the Center for THz Research for 6 months (sabbatical leave).
- Mr. Hongkyu Park from Center for Terahertz Photonics, POSTECH, Pohang, Korea, will be visiting the Center for THz Research for 3 months.

## **IMPORTANT ACTIVITIES OF STUDENTS**

### **H. GUCLU**

- “Statistics of Extreme Fluctuations in Small-World Synchronized Systems”, APS March Meeting, Montreal, Canada, March 26, 2004. (G. KORNISS)

### **B. KOZMA**

- “Roughness Scaling for the Edwards-Wilkinson Model on Small-World Substrates”, APS March Meeting, Montreal, Canada, March 26, 2004. (G. KORNISS)

### **K. LIU**

- Kai, Ph.D. student, was selected as first IMRA fellow at Rensselaer Polytechnic Institute. (X.-C. ZHANG)

### **M. NORDHAUS**

- Miranda won the Barry Goldwater Fellowship, March, 2004. (H. NEWBERG)

### **C. SHNEIDER**

- “Terahertz Emission From GaSb”, Rensselaer Summer Undergraduate Research Program, \$3000, proposal submitted. (I. WILKE)

## OTHER

### H. NEWBERG

- “If Seeking Dark Matter, Beware Spherical Cows”, Dallas Morning News, March 2, 2004.
- Channel 9 TV press coverage of “Design Your Future Day”, March 20, 2004.
- BBC radio interview with Roland Pease, *Science In Action*, March 25, 2004.
- Rensselaer Press Release “Dark-Matter Highway”, generating press on more than a dozen science news web sites in the United States and Germany, March 24, 2004.

### X.-C. ZHANG

- MIT Technology Review highlights T-rays in page 42 in February 2004 issue.
- A 20 minute story about THz on the History Channel on Monday, February 2, 2004 in program Modern Marvels and our THz program was interviewed.
- Newport Company agreed to support Rensselaer Polytechnic Institute Newport Award of Excellence (both the Center for THz Research and the Physics Department), starting in May, 2004.
- Coherent Laser Company agreed to support Rensselaer Polytechnic Institute Coherent Award to the Center for THz Research, starting in May, 2004.