

# *Rensselaer Physics Department*

## *Activities*

**APR 2005 – JUN 2005**  
(Rensselaer Students are underlined)

### **HONORS AND AWARDS**

J.-Q. LU

- School of Engineering Research Excellence Award, Rensselaer, Troy, NY, April 2005.

T.-M. LU

- Session Chair, International Interconnect Technology Conference, San Francisco, CA, June 6-8, 2005.

H. NEWBERG

- Chaired Stars Working Group meeting at the SDSS Collaboration Meeting, Portsmouth, UK, June 19, 2005.
- Elected to Stars and Galactic Structure working group chair for SDSS II, beginning June, 2005.

I. WILKE

- Session Chair, CLEO / QELS 2005 : Femtosecond X-Ray and EUV Spectroscopy.

X.-C. ZHANG

- Distinguished Visiting Scientist, Jet Propulsion Laboratory, California Institute of Technology, March – April, 2005.
- Topical Editor, Journal of Optical Society of America, B. 2005.
- Board of Editors, Chinese Optoelectronics Letters, 2005.
- Chairman, THz Technology Exploratory Team, NATO Sensor and Electronics Technology, 2005-2009.

## INVITED TALKS

### G. CIOLEK

- “A Signal-Limiting Speed for C Shocks in Dusty Interstellar Clouds”, Dept. of Astrophysical Sciences, Princeton University, Princeton, NJ, April 11, 2005.
- “The Effect of Dust on the Propagation of Magnetohydrodynamic Waves and Shocks in Interstellar Clouds”, Dept. of Astrophysics, American Museum of Natural History, April 25, 2005.

### J.-Q. LU

- “Future Chips using Wafer-Level 3D Hyper-Integration & Equipment Needs”, Seminar at Applied Materials, Inc., Santa Clara, CA, June 9, 2005.
- “Wafer-Level Hyper-Integration Technology for 3D ICs and Packaging”, 3D Architectures for Semiconductor Integration and Packaging, Tempe, AZ, June 13-15, 2005.
- “Wafer-Level 3D Hyper-Integration: Technology Platforms and Design”, Interconnect Focus Center Workshops, Albany, NY, June 23, 2005.

### T.-M. LU

- “Energy, Energy, Energy”, Keynote speaker, Math, Science and Technology Conference, Guilderland Central School, April 1, 2005.
- “Physical Self-Assembly and the Formation of 3D Nanostructures”, Keynote speaker, International workshop on interface disorder in nanosystems, Leiden, Netherland, June 20-25, 2005.

### H. NEWBERG

- “Your Universe”, Doane Stuart Middle School, Albany, NY, April 7, 2005.
- “The Structure of the Milky Way’s Stellar Halo”, Aspen Center for Physics, Aspen, CO, April 29, 2005.

### M. YAMAGUCHI

- “Polariton Based THz Spectroscopy and Its Applications”, Broadband IBM-THz Center workshop, Rensselaer, May 31, 2005.
- “Polariton Based-THz Spectroscopic Imaging for Chemical Detection”, ARO THz Deep Subwavelength Spectroscopic Imaging workshop, Atlanta, GA, June 28-30, 2005.

### X.-C. ZHANG

- “Technology Wave Science and Technology”, Laser and Electro-Optic Systems, Boeing, West Hills, CA, April 4, 2005.

- “THz Wave Sensing and Imaging Technology”, Joint Seminar: Biology - Engineering, Caltech, Pasadena, CA, April 18, 2005.
- “THz Wave Sensing and Imaging Technology”, Joint Seminar: Science - Technology, NASA Jet Propulsion Laboratory, Pasadena, CA, April 27, 2005.
- “THz Technology”, Short Course, SC164, CLEO, Baltimore, MD, May 23, 2005.
- “THz Wave Sensing and Imaging”, IBM-RPI THz Workshop, Rensselaer, Troy, NY, May 31, 2005.
- “THz Wave Sensing and Imaging”, Toyota Motor Corp – Aisin Corp - Rensselaer Meeting, Rensselaer, Troy, NY, May 31, 2005.
- “Recent Progress on THz Wave Sensing and Imaging”, SURA THz Application Meeting, Washington D.C., June 2, 2005.
- “Defense Applications of THz Technology: from Biochemical Sensing to Structural Material Damage Assessment”, David Dawes and X.-C. Zhang, THz Systems Conference, Alexandria, VA, June 13, 2005.
- “THz Wave Emission Microscope with Nano Scale Resolution”, ARO Deep Sub-wavelength Spectroscopic Imaging, Atlanta, GA, June 28, 2005.

## **MEETING ATTENDANCE**

### **G. CIOLEK**

- Gordon Conference on the Origins of Solar Systems, Connecticut College, New London, CT, June 26 - July 1, 2005.

### **J.-Q. LU**

- “DARPA BAA-05-27 Industry Briefing Day”, Arlington, VA, April 15, 2005.
- “NIBIB Grantsmanship Program”, Rensselaer, Troy, NY, April 20, 2005.
- “IBM DARPA 3-D Electronics Review Meeting”, IBM Thomas J. Watson Research Center, Yorktown Heights, NY, April 28, 2005.
- “Fifth Annual Rensselaer Colloquium on Teaching & Learning”, May 16-17, 2005.
- “2005 IEEE International Interconnect Technology Conference (IITC05)”, June 6-8, 2005.
- “Workshop for ITRS Roadmap for 3D Integration”, San Francisco, CA, June 10, 2005.
- “3D Architectures for Semiconductor Integration and Packaging”, Tempe, AZ, June 13-15, 2005.
- “Workshop for Molecular Electronics and Devices for Hyperintegration”, University at Albany, NY, June 22, 2005.
- “Interconnect Focus Center Workshops”, University at Albany, NY, June 23, 2005.

## H. NEWBERG

- Physics at the End of the Galactic Cosmic Ray Spectrum in Aspen, CO, April 26-30, 2005.
- SDSS Collaboration Meeting, U. of Portsmouth, Portsmouth, UK, June 18-20, 2005.

## I. WILKE

- CLEO/QELS 2005 (Conference on Electro-Optics / Quantum Electronics and Laser Science Conference), Baltimore, MD, May 22-27, 2005.

## M. YAMAGUCHI

- "SURA THz Application Symposium", Washington D.C., June 2-3, 2005.

## **OTHER PROFESSIONAL TRAVEL**

### J.-Q. LU

- Visit to U.S. Army Research Laboratory for possible collaboration in 3D integration, Adelphi, MD, June 2, 2005.
- AMAT visit for possible collaboration in 3D integration, Applied Materials, Inc., Santa Clara, CA, June 9, 2005.

## H. NEWBERG

- Scientific collaboration, Fermilab, Chicago, IL, April 2-5, 2005.

## G.-C. WANG

- IGERT project meeting for all IGERT directors and selected IGERT students, Washington D.C., May 18-20, 2005.
- Visited NSF program managers, May 18-20, 2005.

## X.-C. ZHANG

- "Advanced Sensor Payloads for Unmanned Aerial Vehicles", NATO symposium, Lisbon, Portugal, May 2-3, 2005, and North Atlantic Treaty Organization Sensors & Electronics Technology Panel's 15<sup>th</sup> Business Meeting, Lisbon, Portugal, May 4-6, 2005.

## PRESENTATIONS (presenter in bold)

J.-Q. LU

- “Wafer-Level Hyper-Integration Technology for 3D ICs and Packaging”, **J.-Q. Lu**, at 3D Architectures for Semiconductor Integration and Packaging, Tempe, AZ, June 13-15, 2005.
- “Wafer-Level 3D Hyper-Integration: Technology Platforms and Design”, **R.J. Gutmann** and **J.-Q. Lu**, Interconnect Focus Center Workshops, University at Albany, NY, June 23, 2005.
- “Wafer Bonding of Damascene-Patterned Metal/Adhesive Redistribution Layers for Via-First Three-Dimensional (3D) Interconnect”, **J.J. McMahon**, J.-Q. Lu and R.J. Gutmann, IEEE 55th Electronic Components and Technology Conference (ECTC 2005), Florida, May 31-June 3, 2005.
- “Die-on-Wafer and Wafer-Level 3D Integration for MM-Wave Smart Antenna Transceivers”, **M.M. Hella**, J.-Q. Lu, S. Devarajan, K. Rose, and R.J. Gutmann, 7th annual IEEE Wireless and Microwave Technology Conference (WAMICON 2005), Clearwater, FL, April 7 & 8, 2005.
- “Low-Temperature Silicon Wafer Bonding with Titanium”, **J. Yu**, Y. Wang, J.-Q. Lu, and R.J. Gutmann, 8th International Symposium on Semiconductor Wafer Bonding: Science, Technology, and Applications, at the 207th Meeting of The Electrochemical Society, Quebec City, Canada, May 15-20, 2005.
- “Copper Metallization Needs for Wafer-Level Three-Dimensional Integration”, **R.J. Gutmann**, J.-Q. Lu, J. Yu, K.-N. Chen, and R. Reif, Symposium F1: Electrochemical Processing in ULSI Fabrication and Electrodeposition of and on Semiconductors VI, the 207th Meeting of The Electrochemical Society, Quebec City, Canada, May 15-20, 2005.
- “Wafer Bonding with Partially-Cured Benzocyclobutene (BCB) for 3D Integration Applications”, **R.J. Kumar**, F. Niklaus, J. Yu, J. J. McMahon, J.-Q. Lu, P.D. Persans, and R.J. Gutmann, accepted to 2005 Electronic Materials Conference (EMC), University of California, Santa Barbara, CA, June 22-24, 2005.
- Posters presented at Interconnect Focus Center Workshops, Albany, NY, June 23, 2005:
  - “Processes and Evaluation of Wafer Alignment and Bonding for Wafer-Level 3D ICs”, **F. Niklaus**, S.H. Lee, R.J. Kumar, J.J. McMahon, J. Yu, J.-Q. Lu, T.S. Cale, and R.J. Gutmann, Rensselaer.
  - “Via-First 3D Interconnect Approach with Wafer Bonding of Damascene-Patterned Metal/Adhesive Redistribution Layers”, **J. J. McMahon**, F. Niklaus, R.J. Kumar, J. Yu, J.-Q. Lu, and R. J. Gutmann, Rensselaer.
  - “Low-Temperature Ti/Si-Based Wafer Bonding for 3D Integration”, **J. Yu**, R.J. Kumar, J.J. McMahon, J.-Q. Lu, and R.J. Gutmann, Rensselaer.
  - “Interlayer Optical Coupling using Multilayers Resulting from Wafer-Level 3D Bonding”, **P.D. Persans**, R.J. Kumar, J.-Q. Lu, A. Filin, and R.J. Gutmann, Rensselaer.

“Exploratory 3D Integration Technologies”, **J.-Q. Lu**, T.-M. Lu, P. Ajayan, V.P. LaBella\*, A.T. Tran, O. Nalamasu, and R.J. Gutmann, Rensselaer, \* University at Albany.

“Modeling Thermomechanical Stresses in 3D IC Inter-Wafer Interconnects”, **J. Zhang**, M.O. Bloomfield, J.-Q. Lu, A.T. Tran, R.J. Gutmann, and T.S. Cale, Rensselaer.

“3D Integration of Next-Generation Transceivers for Wireless Communications”, **S. Devarajan**, M.M. Hella, J.-Q. Lu, K. Rose, and R.J. Gutmann, Rensselaer.

“Memory Performance Prediction for High-Performance Microprocessors at Deep Submicron Technologies in 2D and 3D Implementations”, **A.Y. Zeng**, K. Rose, J.-Q. Lu, and R.J. Gutmann, Rensselaer.

“Monolithic DC-DC Converters for 3D Integration of a Point-of-Load Converter and a Microprocessor”, **D. Giuliano**, J. Sun, T.P. Chow, J.-Q. Lu, and R.J. Gutmann, Rensselaer.

## H. NEWBERG

- “The Halo of the Milky Way”, **H. J. Newberg**, SDSS Collaboration Meeting, U of Portsmouth, Portsmouth, UK, June 19, 2005.
- “The S and I Parameters”, **H. J. Newberg**, SDSS Collaboration Meeting, U of Portsmouth, Portsmouth, UK, June 19, 2005.
- “The SEGUE Footprint”, **H. J. Newberg**, SDSS Collaboration Meeting, U of Portsmouth, Portsmouth, UK, June 19, 2005.

## E.F. SCHUBERT

- “Omni-Directional Reflector Using a Low Refractive Index Material”, J.-Q. Xi, M. Ojha, W. Chow, C. Wetzel, T. Gessmann, E.F. Schubert, J.L. Plawsky, and W.N. Gill, Conference on Lasers and Electrooptics (CLEO), Baltimore, MD, May 22-27, 2005.
- “Light-Emitting Diodes and Solid-State Lighting” Conference on Lasers and Electrooptics (CLEO), Baltimore, MD, May 22-27, 2005.
- “Light-Emitting Diodes and Solid-State Lighting”, E.F. Schubert, Chautauqua Short Course at RPI, Troy, NY, June 13, 2005.
- “Innovations in Light-Emitting Devices”, E.F. Schubert and J.K. Kim, Samsung Advanced Institute of Technology, Suwan City, Korea, June 27, 2005.
- “Short Course on Light-Emitting Diodes”, E.F. Schubert, Samsung Mechatronics Corporation, Suwan City, Korea, June 28, 2005.
- “Innovations in Light-Emitting Devices”, E.F. Schubert and J.K. Kim, Seoul National University, Seoul Korea, June 29, 2005.

## G.-C. WANG

- Wang did an overview of department for staff from Enrollment Management Office, June 8, 2005.

## I. WILKE

- “THz-Emission by Narrow Band Gap Semiconductors”, I. Wilke, IBM- Center for Broadband Data Communications – Center for Terahertz Research Meeting, Rensselaer, March 31, 2005.
- “Laser-Assisted Controlled Micro-Injection into Living Cells”, I. Wilke, **C. Peng**, and R. Palazzo, CLEO/QELS 2005 (Conference on Electro-Optics / Quantum Electronics and Laser Science Conference), Baltimore, MD, May 22-27, 2005.

## M. YAMAGUCHI

- “Noncontact Measurement of Thermal Conductivity in Nanoscale Devices”, Energy meeting, Rensselaer, May 26, 2005.

## X.-C. ZHANG

- “THz Detection of Explosives and Related Compounds”, H. Liu, Y. Chen, H. Zhong, N. Karpowicz, and X. -C. Zhang, Conference on Working Together: R & D Partnerships in Homeland Security, Boston, MA, April 27, 2005.
- “Center for THz Research”, RPI-IBM THz Workshop, Rensselaer, May 31, 2005.
- “THz Technology and Applications”, Toyota Motor Corp., delegation at Rensselaer, June 8, 2005.
- “Next Rays? T-Ray!”, NSF Research Experience for Undergraduate program, June 14, 2005.

## PAPERS PUBLISHED

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

- “Dielectric Barriers, Pore Sealing, and Metallization”, J.S. Juneja, P.-I. Wang, T. Karabacak, and T.-M. Lu, Thin Solid Films. Submitted.
- “Enhanced Step Coverage by Oblique Angle Physical Vapor Deposition”, T. Karabacak and T.-M. Lu, J. Appl. Phys., 97, 124504, 2005.

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

- “AFM, SEM and In Situ RHEED Study of Cu Texture Evolution on Amorphous Carbon by Oblique Angle Vapor Deposition”, F. Tang, C. Gaire, D.-X. Ye, T. Karabacak, T.-M. Lu, and G.-C. Wang, Phys. Rev. B, accepted.
- “Low Temperature Melting of Copper Nanorod Arrays Grown by Oblique Angle Deposition”, T. Karabacak, J.S. DeLuca, D.-X. Ye, P.-I. Wang, G.-C. Wang, and T.-M. Lu, Nanotechnology. 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. Vac. Sci. Technol. A, 23, 986, 2005.

## J.-Q. LU

- “Wafer Bonding of Damascene-Patterned Metal/Adhesive Redistribution Layers for Via-First Three-Dimensional (3D) Interconnect”, J.J. McMahon, J.-Q. Lu, and R.J. Gutmann, IEEE 55th Electronic Components and Technology Conference (ECTC 2005), Florida, May 31-June 3, 2005.
- “Die-on-Wafer and Wafer-Level 3D Integration for MM-Wave Smart Antenna Transceivers”, M.M. Hella, J.-Q. Lu, S. Devarajan, K. Rose, and R.J. Gutmann, 7th annual IEEE Wireless and Microwave Technology Conference (WAMICON 2005), Clearwater, FL, April 7-8, 2005.
- “Low-Temperature Silicon Wafer Bonding with Titanium”, J. Yu, Y. Wang, J.-Q. Lu, and R.J. Gutmann, 8th International Symposium on Semiconductor Wafer Bonding: Science, Technology, and Applications, 207th Meeting of The Electrochemical Society, Quebec City, Canada, May 15-20, 2005.
- “Copper Metallization Needs for Wafer-Level Three-Dimensional Integration”, R.J. Gutmann, J.-Q. Lu, J. Yu, K.-N. Chen, and R. Reif, Symposium F1: Electrochemical Processing in ULSI Fabrication and Electrodeposition of and on Semiconductors VI, 207th Meeting of The Electrochemical Society, Quebec City, Canada, May 15-20, 2005.
- “Wafer Bonding with Partially-Cured Benzocyclobutene (BCB) for 3D Integration Applications”, R.J. Kumar, F. Niklaus, J. Yu, J.J. McMahon, J.-Q. Lu, P.D. Persans, and R.J. Gutmann, accepted to 2005 Electronic Materials Conference (EMC), University of California, Santa Barbara, CA, June 22-24, 2005.
- “Wafer-Level Hyper-Integration Technology for 3D ICs and Packaging”, J.-Q. Lu, Proceedings of 3D Architectures for Semiconductor Integration and Packaging, Tempe, AZ, June 13-15, 2005.
- “Wafer-Level 3D Hyper-Integration: Technology Platforms and Design”, R.J. Gutmann and J.-Q. Lu, Proceedings of Interconnect Focus Center Workshops, University at Albany, NY, June 23, 2005.

## T.-M. LU

- “Polycarbosilane-Based Films for Interlayer Dielectric Applications”, Z. Wu; P.-I. Wang, T.-M. Lu, and L.V. Interrante, *Polymeric Materials: Science and Engineering* 92, 106-107, 2005.
- “A Novel Polycarbosilane Based Low K Dielectric Material”, P.-I. Wang, Z. Wu, T.-M. Lu, and L.V. Interrante, *J. Electrochemical Society*. Submitted.
- “Bias-Temperature Stability of Ti-Si-N-O Films”, Y.C. Ee, J.S. Juneja, P.-I. Wang, T.-M. Lu, H. Bakhru, L. Chan, S.B. Law, C. Yong, Z. Chen, and S. Xu, *J. Electrochemical Society*. Submitted.

## T.-M. LU and E.F. SCHUBERT

- “Optical Thin Films with Very Low Refractive Index Consisting of Array of SiO<sub>2</sub> Nano-Rods”, J.-Q. Xi, J.K. Kim, D.-X. Ye, J. Juneja, T.-M. Lu, S.-Y. Lin, and E.F. Schubert, *Nano Letters*. Submitted.

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

- “Mechanical Testing of Isolated Amorphous Silicon Slanted Nanorods”, C. Gaire<sup>a\*</sup>, D.-X. Ye<sup>a</sup>, F. Tang<sup>a</sup>, R.C. Picu<sup>b</sup>, G.-C. Wang<sup>a</sup>, and T.-M. Lu<sup>a</sup>, accepted for publication in *Journal of Nanoscience and Nanotechnology*, <sup>a</sup>Department of Physics, Applied Physics and Astronomy, <sup>b</sup>Department of Mechanical, Aerospace and Nuclear Engineering, Rensselaer, Troy, NY.
- “Low Temperature Chemical Vapor Deposition of Co Thin Films from Co<sub>2</sub>(CO)<sub>8</sub>”, D.-X. Ye, S. Pimanpang, C. Jezewski, F. Tang, J. J. Senkevich, G.-C. Wang, and T.-M. Lu, *Thin Solid Films*, Vol. 485(1-2), pp 95-100, 2005.
- “Evaluation of a Novel Cu(I) Precursor for Chemical Vapor Deposition”, D.-X. Ye, B. Carrow, S. Pimanpang, H. Bakhru, G.A. Ten Eyck, G.-C. Wang, and T.-M. Lu, *Electrochem. Solid-State Lett.* 8, C85, 2005.

## H. NEWBERG

- “A Comprehensive Model for the Monoceros Tidal Stream”, J. Peñarrubia, D. Martínez-Delgado, H.W. Rix, M.A. Gómez-Flechoso, J. Munn, H. Newberg, E.F. Bell, B. Yanny, D. Zucker, and E.K. Grebel, *The Astrophysical Journal*, 626, 128, 2005.
- “A Dark Matter Stream Through the Solar Neighborhood”, P. Gondolo, K. Freese, H.J. Newberg, and M. Lewis, *New Astronomy Reviews*, 49, 193-197, 2005.

## E.F. SCHUBERT

- “Solid-State Light Sources Becoming Smart”, E.F. Schubert and J.K. Kim, *Science* 308, 1274, May, 2005.
- RPI press release featuring research of E.F. Schubert and J.K. Kim entitled: “Solid-State Lighting Sources Getting More Energy Efficient and Smart – Rensselaer Researchers Detail Potential for Smart Lighting in *Science [Magazine]*”, May 26, 2005.
- “Analysis of High Power Packages for Phosphor-Based White-Light-Emitting Diodes”, H. Luo, J.K. Kim, E.F. Schubert, J. Cho, C. Sone, and Y. Park, *Appl. Phys. Lett.* 86, 243505, June, 2005.
- “Strongly Enhanced Phosphor Efficiency in GaInN White Light-Emitting Diodes Using Remote Phosphor Configuration and Diffuse Reflector Cup”, J.K. Kim, H. Luo, E.F. Schubert, J. Cho, C. Sone, and Y. Park, *Jpn. J. Appl. Phys. Express Letter* 44, L 649, May, 2005.

## I. WILKE

- “Enhanced Terahertz Emission From Impurity Compensated GaSb”, R. Ascazubi, C. Shneider, I. Wilke, R. Pino, and P. Dutta, *Phys. Rev. B* 72 (4), June 15, 2005.

## X.-C. ZHANG

- “Comparison Between Pulsed Terahertz Time-Domain Imaging and Continuous Wave Terahertz Imaging”, N. Karpowicz, H. Zhong, J. Xu, K.-I. Lin, J.-S. Hwang, and X-C Zhang, *Semicond. Sci. Technol.* 20 S293-S299, 2005.
- “Terahertz Science and Technology”, X. Xie and X.-C. Zhang, *Science (China)*, 57-3, 10, 2005.
- “Terahertz Wave Imaging Technology”, H. Zhong, N. Karpowicz, A. Redo, X. Li, S.H. Wang, B. Ferguson, and X.-C. Zhang, 4<sup>th</sup> World Congress on Industrial Process Tomography, 2005. Submitted.
- “Plasma Wave Resonant Detection of Femtosecond Pulsed Terahertz Radiation by a Nanometer Field-Effect Transistor”, F. Teppe, D. Veksler, V. Yu. Kachorovski, A.P. Dmitriev, X. Xu, X.-C. Zhang, S. Romyantsev, W. Knap, and M.S. Shur, *Appl. Phys. Lett.*, 86, XXX 2005.

## PROPOSALS (SUBMITTED or GRANTED)

### J.-Q. LU

- Proposal title: “Scalable Millimeter-Wave Architectures for Reconfigurable Transceivers (SMART)”, RPI PI, J.-Q. Lu; BOEING Company is the prime for the full proposal, submitted to DARPA for BAA number: BAA 05-27, June 28, 2005.

## T.-M. LU

- "New Processing Techniques for Sputter Deposited Tantalum Coatings with Improved Bore Coating Adhesion", \$80K, Benet Lab, June 2005 to May 2007. Granted.

## H. NEWBERG

- "Collaborative Research: Improved Undergraduate Astronomy Laboratories and Public Outreach with a Modernized Hirsch Observatory Control System", \$72,911.00, NSF CCLI, 7/2005-7/2007. Granted.
- "NASA/NY Space Grant Graduate Fellowship", \$10,000, NASA/NY Space Grant, 2/2005-1/2006. Granted.
- "DDDAS-TMRP: A Dynamic Grid for Astroinformatics: Data-Driven Discovery of the Milky Way Origin and Evolution from the Sloan Digital Sky Survey", \$985,786.00, NSF DDDAS. Submitted.

## M. YAMAGUCHI

- "Dynamic Hierarchy of Thermal Fluctuations in Glass Forming Liquids", ACS-Petroleum grant-AC, \$120K for 3 years, May 20, 2005. Submitted.

## X.-C. ZHANG

- NATO Advanced Research Workshop on "Terahertz Frequency Detection and Identification of Materials and Objects", Spiez, Switzerland, 35,000 Euro, one year, 2005. Granted.
- IMRA Fellow Award, IMRA America, \$50,000, one-year, 2005. Received.
- Gift from DuPont for THz wave microscope project, \$10,000, 9 months, 2005. Received.
- The Petroleum Research Fund, Symposium, "Analytical Applications of Terahertz Spectroscopy", 230<sup>th</sup> American Chemical Society National Meeting and Exposition. \$1200, August 2005. Granted.
- Lockheed Martin, THz CW imaging system, \$210,000, 9 months, 2005. Granted.
- Thomas-Keating detector, CUNY CAT Matching fund for Corning sponsored research at Rensselaer, \$10,000, one month, 2005. Granted.
- Gerber Scientific International, Terahertz wave detection of flaws in leather materials, \$50,000, six months, 2005. Received.
- HSARPA SBIR Phase II: "Polychromic Imaging for Standoff Detection of Explosives and Weapons", with Intelligent Optical Systems, \$750k for two years. Submitted.
- Proposal with Mark Embrechts (Department of Decision Science), ARO \$1.25M for four years. Submitted.

- HSAPAR, “Portable High Sensitivity THz Scanning Device for Low Vapor Pressure Chemicals” RPI, SC&A, and Princeton Nanotechnology System (PNTS), Phase I - \$1.23M, Phase II - \$2.73M, and Phase III - \$3.18M. Submitted. An official letter from HSAPAR informed us that our proposal has been selected to enter into negotiations for a potential award.
- “Terahertz Wave Technology for Standoff Detection of Explosives”, ARO Short-Term Analysis Services Program, \$40,000, one year. Submitted.

## **VISITORS TO RENSSELAER**

### **J.-Q. LU**

- Dr. David J. Eaglesham, director of the New Business and New Products Group for Applied Materials, for collaboration opportunities, April 21, 2005.
- Scott Pozder from Freescale Semiconductor. This on-campus visit is as a part of the SRC program activities, to discuss and enhance our current collaboration with our SRC funded research program of Stress Analysis of Three-dimensional Integrated ICs, as well as to explore new collaboration/funding opportunities, May 6, 2005.
- Dr. Hui-Feng Li, Optotek Ltd., Ottawa, Canada, staff candidate interview, May 23, 2005.

### **I. WILKE**

- Hudson Duan, Loraine Levine, Shaker High School, May 10, 2005 and May 24, 2005.

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

- Rich Sikbo (PNTS) and Steve Ostrow (SC&A) visited the Center for THz Research, April 26, 2005.
- Carlo Williams and Victor Schneider from Corning performed collaborated research in Keck Lab for THz Science, April 28, 2005.
- Professor Hiromasa Ito, Director of Research Institute of Electrical Communication, Tohoku University and Prof. J. Shikata, Dr. Y. Sasaki, Mr. T. Ikari, Tohoku University, May 27, 2005.
- Professor Ryo Shimano, Physics Department, Tokyo University, May 30, 2005.
- Dr. S. Nishizawa, President of Aspiec, Japan, June 6, 2005.

- Mr. Yasuhiko Miwata, Project General Manager, Instrumentation Engineering Division, Toyota; Mr. Seiji Yamada, Assistant Manager, Instrumentation Engineering Division, Toyota; Mr. Masahiro Yamakage, Instrumentation Engineering Division, Toyota; Mr. Tomoya Hirosumi, Sales Manager; Aisin Seiki; and Mr. Yuzuru Uehara, VP, Research, IMRA America, visited on June 8, 2005.
- Dr. Dong Ho Wu, Naval Research Laboratory, June 8-10, 2005.
- Professor Hyun-Shik Kang, Department of Physics, College of Education, Chonbuk National University, Chonju, Korea, and Professor Yong Seog Jeon, School of Engineering, Jeonju University, Jeonju, 560-759, Korea, June 13-23, 2005.
- Matthew Price-Gallagher, President & CEO of HydroElectron Ventures Inc. Canada, and Ms. Clark Fletcher, HydroElectron Ventures Inc. Canada, June 16, 2005.
- Dr. Warren Ussery, Lockheed Martin, June 20-21, 2005.

## **IMPORTANT ACTIVITIES OF STUDENTS**

### **D. LIU**

- Won 2005 Hill Huntington Award and 2005 Lester Gerhardt Award. (G.-C. Wang)

### **J. PURNELL**

- Jonathan received a Master Degree in Computer Science, May, 2005. (H. Newberg)

### **F. TANG**

- Won 2005 American Vacuum Society graduate student award and AVS Thin Film Division Award. He can only accept one award. The award consists of \$1000 and up to \$750 travel to attend the National AVS Symposium in Boston. (G.-C. Wang)

### **X. TANG**

- "Electrodeposited Co/Cu Multilayered Nanowires", X. Tang, M. Shima, and G.-C. Wang, Monday, May 16, 2005, in the Poster Session "General Student Poster Session ", of the 207th Meeting of The Electrochemical Society, Quebec City Convention Center, Quebec City, Canada, May 15 -20, 2005. Poster presented by Xueti Tang. (G.-C. Wang)

## OTHER

### J.-Q. LU

- Business Week reports Lu's 3D research in its annual report of "The Future of Technology and the IT 100" under article "More Life for Moore's Law", Business Week, Issue June 20, 2005.  
([http://www.businessweek.com/magazine/content/05\\_25/b3938629.htm](http://www.businessweek.com/magazine/content/05_25/b3938629.htm))
- Rensselaer Research Quarterly reports Lu's 3D research, "Designing for New Dimensions - Rensselaer researchers reach for new heights with 3-D chip technology", Rensselaer Research Quarterly, Spring 2005.  
(<http://www.rpi.edu/research/magazine/spring05/chips.html>)

### E.F. SCHUBERT

- "Solid-State Light Sources Getting Smart", Radio interview with BBC Worldwide Service, May 26, 2005.
- "Solid-State Light Sources Getting Smart", Radio interview with German SWR Service, May 26, 2005.
- "Solid-State Light Sources Getting Smart", E.F. Schubert and J.K. Kim, Television interview with Jim Kambrich, Albany NBC Affiliate, Channel 13, June 15, 2005.

### G.-C. WANG

- Attended Accepted Graduate Students Day, April 1, 2005.
- Department External Review, April 8, 2005.
- SOS Council Meeting, April 12, 2005.
- REU program in Physics started on June 1, 2005.

### X.-C. ZHANG

- THz imaging group demonstrated a THz wave emission microscope with 1-nm resolution for the first time. The impact covers from the material science to biomedical cellular level imaging. When a pulsed laser (femtosecond laser) and a sharp tip (several tens of nanometer) interact with a semiconductor, a THz wave emitted from the tip-semiconductor junction provides the transient electronic information of photo carrier near the junction with nanometer or even atomic resolution. With the decrease of device dimension and increase of the device speed, this unprecedented resolution paves the way toward the THz wave spectroscopic imaging of the semiconductor quantum dot and hetero-structure at nanometer, sub-nanometer, and even atomic scales, which was considered as impossible before. The project is supported by two NSF grants, recently DuPont supports the project with a seed grant.
- Patent filed, "High Repetition Rate, Linear, True Time Optical Delay Line", J. Xu and X.-C. Zhang.
- Patent filed, "THz Wave Emission Microscope", T. Yuan, J. Xu, and X.-C. Zhang.