Rensselaer Physics Department Activities

OCT 2008 – DEC 2008

(Rensselaer Students are underlined*)*

HONORS AND AWARDS

Wang

- G.-C. Wang chaired the first session of workshop "Computational Materials Science Network" sponsored by Department of Energy.

Wetzel

- Conference Chair, International Workshop of Nitride Semiconductors, 2010.
- Continue acting as Treasurer of the Electronic Materials Conference, 2007-2010.
- Program Committee Member, 2008 IEEE International Reliability Physics Symposium.
- Program Committee Member, Second International Symposium on Growth of III-Nitrides, 2008.
- Session Chair Session W: Solar Cells: Organic, Hybrid, Inorganic, Electronic Materials Conference, St. Barbara, CA, June 26, 2008.
- Session Chair, Second International Symposium on Growth of III-Nitrides, Izu, Japan, July 8, 2008.
- Discussion Leader: Defects in Nitride Semiconductors, Gordon Conference Defects in Semiconductors, New London, NH, Aug. 5, 2008.
- Discussion Leader, Workshop on the „Physics of Nitride-Based, Nanostructured, Light-Emitting Devices", DFG Research Group, Riezlern, Austria, Sept. 26, 2008.
- Session Chair WS 5 - Optical characterization-III, International Workshop on Nitride Semiconductors, Montreux, Switzerland, Oct. 9, 2008.

SB Zhang

- Vice Chair, Gordon Research Conference: Defects in Semiconductors, August 3-8, 2008, Colby-Sawyer College, New London, NH
- Session Chair, The 5th International Workshop on ZnO and Related Materials, Sept. 23, 2008, Ann Arbor Marriott Ypsilanti at Eagle Crest, Michigan.

INVITED TALKS

Detchprohm

- T. Detchprohm and C. Wetzel, "Development of Non-Polar GaInN based Green Light Emitting Diodes for Solid State Lighting Application",Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland, Oct 3, 2008.

Kar

- Title: Hybrid Nanotube Architectures
  Place: 2008 ASME International Mechanical Engineering Congress & Exposition
  Date: 4th November, 2008

Wang

- Magnesium nanoblades for hydrogen storage, G.-C. Wang, DO Energy Basic Energy Science, Computational Materials Science Network, Gatlinburg, TN, Oct. 31 – Nov. 1, 2008.

Wetzel

- "Grünes Licht aus Piezoelektrischen Halbleitern: Leucht- und Laserdioden aus GaInN/GaN", Institut für Halbleiterphysik, Technical University Dresden, Dresden, Germany, Oct 2, 2008.
- "Grünes Licht aus Piezoelektrischen Halbleitern: Leucht- und Laserdioden aus GaInN/GaN", Physik Kolloquium, University Regensburg, Regensburg, Germany, October 13, 2008.
- "Development of Non-Polar GaInN based Green Light Emitting Diodes for Solid State Lighting Application", Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland, October 3, 2008.
- "Grüne Emitter in polaren und nicht-polaren GaInN/GaN Schichten," Walter Schottky Institute, Technical University Munich, Germany, September 30, 2008.
- "Solid-State Lighting with Polar and Nonpolar Nitride Structures," Forschergruppe der Deutschen Forschungsgemeinschaft, Riezlern, Austria September 25, 2008.
- "Solid-State Lighting with Wide Bandgap Semiconductors," Department of Physics & Astronomy, Union College, Schenectady, NY, May 8, 2008.
- "Solving the "Green Gap" in LED Technology", Philips Lumileds, San Jose, CA, March 3, 2008. C. Wetzel.
- "Development of Green LEDs inGaInN and Perspectives for Solar Cells," Applied Materials, Santa Clara, March 4, 2008.
- "Deep Green Light Emission LEDs in Polar and Non-Polar Growth," The Workshop on Compound Semiconductor Materials and Devices, Palm Springs, CA, February 18, 2008.
- "Solving the "Green Gap" in LED Technology," Transformations in Lighting, 2008 DOE, Solid-State Lighting R&D Workshop," Atlanta, GA, January 30, 2008.

SB Zhang

- "Physics of defect complexes and their nano analogy", **Shengbai Zhang**, Shanghai Institute of Technical Physics, Chinese Academy of Sciences, Shanghai, China, July 8, 2008
- "Hydrogen Interactions and Storage in Graphitic Carbon", **Shengbai Zhang**, The 5th International Workshop on Frontier Topics in Condensed Matter Physics, Zhengzhou, China, July 12, 2008
- "Electronic Structure Calculation for Renewable Energy", **Shengbai Zhang**, Inaugural Workshop of International Center for Quantum Design of Fundamental Materials, University of Science and Technology of China, Hefei, China, July 22, 2008
- "Simulating real materials for our energy future", **Shengbai Zhang**, CPM Seminar McGill University, Montreal, Canada, September 17, 2008
- "Simulating our energy future", **Shengbai Zhang**, Department of Physics Colloquium, SUNY at Buffalo, Buffalo, NY, Oct 16, 2008
- "Simulating real materials for our energy future", **Shengbai Zhang**, High Performance Computing Conference, Troy, NY, October 22, 2008
- "Simulating our energy future", **Shengbai Zhang**, Department of Physics Colloquium, RPI, Troy, NY, October 22, 2008

MEETING ATTENDANCE

Detchprohm

- International Workshop on Nitride Semiconductors 2008, Montreux, Switzerland, Oct 5 - 10, 2008.

Giedt

- Neutrino Frontiers, Minneapolis, Oct. 23-26.

OTHER PROFESSIONAL TRAVEL

Giedt

- Visit with collaborator Simon Catterall at Syracuse U., Nov. 17.

Kar

- Northeastern University, Boston, 4th November 2008 to discuss collaborative work with Prof. Yung Joon Jung and joint student Mr. Younglae Kim, pertaining to an SRC project on carbon nanotubes for electrical interconnects.

PRESENTATIONS (presenter in bold)

Detchprohm

- **T. Detchprohm**, M. Zhu, W. Zhao, Y. Wang, Y. Li, Y. Xia and C. Wetzel: "Enhanced Device Performance of GaInN-Based Deep Green Light Emitting Diodes with V-Defect-Free Active Region", International Workshop on Nitride Semiconductors 2008, Montreux, Switzerland, Oct 8, 2008.

Eah

- "Monolayer Film of Gold Nanoparticles on a 3 inch or Larger Silicon Wafer", (underline)Matthew N. Martin(underline), Sang-Kee Eah, 2008 Materials Research Society Fall Meeting, Dec. 1-5, Boston.

Wang

- Low hydrogen desorption temperature of hydrided Pd coated novel Mg nanoblades, F. Tang, T. Parker, H.-F. Li, G.-C. Wang, and T.-M. Lu, AVS, Oct. 23, 2008, Boston, MA.
- RHEED Surface Pole Figure -- A New In-situ Technique to Study Surface Texture Evolution of Polycrystallines and Nanostructures, Gwo-Ching Wang, Fu Tang, and Toh-Ming Lu, MRS fall 2008, Dec. 4, 2008, Boston, MA.

Wetzel

- Talk: "Enhanced Device Performance of GaInN-Based Deep Green Light Emitting Diodes with V-Defect-Free Active Region", **T. Detchprohm**, M. Zhu, W. Zhao, Y. Wang, Y. Li, Y. Xia and C. Wetzel. International Workshop on Nitride Semiconductors, Montreux, Switzerland, October 5 – 10, 2008.
- Talk: "Unraveling the Efficiency Gap of Green Light Emitting Diodes", **C. Wetzel**, Y. Li, M. Zhu, W. Zhao, and T. Detchprohm. International Workshop on Nitride Semiconductors, Montreux, Switzerland, October 5 – 10, 2008.
- Talk: "Inclined Dislocation Pairs in Green GaInN/GaN Light Emitting Diodes Grown on Bulk GaN Substrate", **M. Zhu**, T. Detchprohm, S. You, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, L. Liu, D. Tsvetkov, D. Hanser, and C. Wetzel; March Meeting of the American Physical Society, New Orleans, LA, Mar 10-14, 2008.
- Talk: "Large Optical Absorption Variation in Green GaInN/GaN Multiply Quantum Well under High Charge Carrier Density", **W. Zhao**, M. Zhu, Y. Li, Y. Xia, J. Senawiratne, T. Detchprohm, and C. Wetzel; March Meeting of the American Physical Society, New Orleans, LA, Mar 10-14, 2008.
- Talk: "Enhanced Performance of GaInN Based Green Light Emitting Diodes on Non-Polar GaN," **T. Detchprohm**, M. Zhu, Y. Li, Y. Xia, W. Zhao, J. Senawiratne, L. Liu, D. Hanser and C. Wetzel; 7th International Symposium on Semiconductor Light Emitting Devices, Phoenix, AZ, Apr 27 – May 2, 2008.
- Talk: "Electroluminescence of Green and Blue GaInN/GaN Multiple Quantum Well Light Emitting Diodes under Photon Bias," **Y. Li**, J. Senawiratne, Y. Xia, W. Zhao, M. Zhu, T.

Detchprohm, and C. Wetzel, 7th International Symposium on Semiconductor Light Emitting Devices, Phoenix, AZ, Apr 27 – May 2, 2008.

- Talk: "Junction Temperature Analysis and Temperature Dependent Quantum Efficiency in GaInN based Green Light Emitting Diodes", **J. Senawiratne**, T. Detchprohm, W. Zhao, M. Zhu, Y. Li, Y. Xia, and C. Wetzel; 7th International Symposium on Semiconductor Light Emitting Devices, Phoenix, AZ, Apr 27 – May 2, 2008.
- Talk: "Optical Properties of Polar and Non-polar GaInN/GaN Quantum Well Structures under Pulsed Laser Excitation," **J. Senawiratne**, Z. Zhang, S. Tomasulo, S. You, Y. Li, M. Zhu, W. Zhao, Y. Xia, T. Detchprohm, P. D. Persans, and C. Wetzel, Electronic Materials Conference, Santa Barbara, CA, June 25 – 27, 2008.
- Talk: "Inclined Dislocation Pairs in Homoepitaxial Green GaInN/GaN Light Emitting Diodes," **Mingwei Zhu**, T. Detchprohm, S. You, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, and C. Wetzel, L. Liu, E. A. Preble, D. Hanser, Electronic Materials Conference, Santa Barbara, CA, June 25 – 27, 2008.
- Talk: "High Density Photon Injection Induced Large Optical Absorption Variation in Green GaInN/GaN Structures," **Wei Zhao**, Yufeng Li, Mingwei Zhu, Yong Xia, Jayantha Senawiratne, Theeradetch Detchprohm, and Christian Wetzel, Electronic Materials Conference, Santa Barbara, CA, June 25 – 27, 2008.
- Talk: "Suppression of Non-Radiative Recombination by V-defects in Single GaInN/GaN Quantum Well Structure with a GaInN Underlayer," **Y. Xia**, T. Detchprohm, M. Zhu, Y. Li, W. Zhao, J. Senawiratne, C. Wetzel, D. D. Koleske, M. H. Crawford, S. R. Lee, and K. H. A. Bogart, Electronic Materials Conference, Santa Barbara, CA, June 25 – 27, 2008.
- Talk: "Wavelength dependent photon modulated electroluminescence of green LEDs," **Yufeng Li**, W. Zhao, M. Zhu, J. Senawiratne, Y. Xia, T. Detchprohm, and C. Wetzel, Electronic Materials Conference, Santa Barbara, CA, June 25 – 27, 2008. Given by Yufeng Li.
- Poster: "Piezoelectric Polarization Control forDeep Green GaInN/GaN Light Emitters," **Christian Wetzel**, Yufeng Li, Mingwei Zhu, Wei Zhao, Yong Xia, and Theeradetch Detchprohm; Gordon Research Conference on Defects in Semiconductors, New London, NH August 4 – 8, 2008.
- Poster: "Efficiency Limitations of Green GaInN/GaN Light Emitting Diodes under High Excitation'" **W. Zhao**, Y. Xia, Y. Li, M. Zhu, T. Detchprohm, and C. Wetzel; Gordon Research Conference on Defects in Semiconductors, New London, NH August 4 – 8, 2008.
- Poster: "Electron Beam and Photon Assisted Defects Analysis of Blue Light Emitting Diodes'" **Y. Li**, Y. Xia, W. Zhao, M. Zhu, Zihui Zhang, Shi You, T. Detchprohm, and C. Wetzel; Gordon Research Conference on Defects in Semiconductors, New London, NH August 4 – 8, 2008.
- Poster: "Green and Deep Green Light Emitting Diodes in Polarization Controlled GaN Homoepitaxy", C. Wetzel, M. Zhu, W. Zhao, Y. Li, Y. Xia, S. You, Y. Wang, Z. Zhang, L. Zhao, W. Hou, J. Senawiratne, and T. Detchprohm; Symposium on Magnetic Excitations in Semiconductors, University at Buffalo, Buffalo, NY, Mar 6 -8, 2008.
- Poster: "Electroluminescence of Green and Blue GaInN/GaN Multiple Quantum Well Light Emitting Diodes under Photon Modulation", **Y. Li**, J. Senawiratne, Y. Xia, W. Zhao, M. Zhu, T. Detchprohm, and C. Wetzel; Symposium on Magnetic Excitations in Semiconductors, University at Buffalo, Buffalo, NY, Mar 6 -8, 2008.
- Poster: "Defects in Green and Deep Green GaInN/GaN Light Emitting Diodes", **M. Zhu**, T. Detchprohm, S. You, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, Y. Wang, Z. Zhang, and C. Wetzel; Symposium on Magnetic Excitations in Semiconductors, University at Buffalo, Buffalo, NY, Mar 6 -8, 2008.

- Poster: “Spectroscopy of V-Defects in Single GaInN/GaN Quantum Well Structures with and without a GaInN Underlayer”, **Y. Xia**, T. Detchprohm, Y. Li, W. Zhao, M. Zhu, J. Senawiratne, and C. Wetzel; Symposium on Magnetic Excitations in Semiconductors, University at Buffalo, Buffalo, NY, Mar 6 -8, 2008.
- Poster: “Optical Properties of Green Emission GaInN/GaN Quantum Well Structures under Pulsed Laser Excitation”, **S. Tomasulo**, J. Senawiratne, T. Detchprohm, P. D. Persans, and C. Wetzel; NSF ERC “Smart Lighting” Site Visit, RPI, Mar 18, 2008.
- Poster: “Electroluminescence of Green GaInN/GaN Multiple Quantum Well Light Emitting Diodes under Photon Modulation”, **Y. Li**, J. Senawiratne, M. Zhu, Y. Xia, W. Zhao, T. Detchprohm, and C. Wetzel; NSF ERC “Smart Lighting” Site Visit, RPI, Mar 18, 2008.
- Poster: “Structural Characterization of Homoepitaxial Green and Deep Green GaInN/GaN Light Emitting Diodes”, **M. Zhu**, T. Detchprohm, S. You, L. Liu, E. A. Preble, D. Hanser, and C. Wetzel; NSF ERC “Smart Lighting” Site Visit, RPI, Mar 18, 2008.
- Poster: “Large Optical Absorption Variation in Green GaInN/GaN Multiple Quantum Well under High Charge Carrier Density”, **Wei Zhao**, Mingwei Zhu, Yufeng Li, Yong Xia, Jayantha Senawiratne, Theeradetch Detchprohm, and Christian Wetzel; NSF ERC “Smart Lighting” Site Visit, RPI, Mar 18, 2008.
- Poster: “Electroluminescence of Green GaInN/GaN Multiple Quantum Well Light Emitting Diodes under Photon Modulation”, **Y. Li**, J. Senawiratne, M. Zhu, Y. Xia, W. Zhao, T. Detchprohm, and C. Wetzel; NSF ERC “Smart Lighting” Site Visit, RPI, Mar 18, 2008.
- Poster: “Spectroscopy of V-Defects in Single GaInN/GaN Quantum Well Structures with and without a GaInN Underlayer”, **Y. Xia**, T. Detchprohm, Y. Li, W. Zhao, M. Zhu, J. Senawiratne, and C. Wetzel; NSF ERC “Smart Lighting” Site Visit, RPI, Mar 18, 2008.

Yamaguchi

- “Acoustic/mechanical properties of vertically grown nanorod arrays”, **Masashi Yamaguchi**, Jianxun Liu, Dexian Ye, and Toh-Ming Lu, Material Research Society fall meeting, Nov.4 Boston.

SB Zhang

- “Hydrogen in ZnO: The unexpected Coulomb binding with isovalent impurities”, Shengbai Zhang, The 5th International Workshop on ZnO and Related Materials, Sept. 22, 2008, Ann Arbor Marriott Ypsilanti at Eagle Crest, Michigan.

PAPERS PUBLISHED

Ciolek

- "Nonlinear Evolution of Gravitational Fragmentation Regulated by Magnetic Fields and Ambipolar Diffusion", by S. Basu, G. E. 163 Ciolek, and J. Wurster, 2009, New Astronomy, 14, 221
- "Magnetically-Regulated Fragmentation Induced by Nonlinear Flows and Ambipolar Diffusion", by S. Basu, G. E. Ciolek, W. Dapp, and J. Wurster, 2009, New Astronomy, submitted

Detchprohm

- T. Detchprohm, M. Zhu, W. Zhao, Y. Wang, Y. Li, Y. Xia and C. Wetzel: “Enhanced Device Performance of GaInN-Based Deep Green Light Emitting Diodes with V-Defect-Free Active Region”, Submitted to Phys. Stat. Sol. (2008).

Giedt

- Phase diagram of SU(2) with 2 flavors of dynamical adjoint quarks.
  Simon Catterall (Syracuse U.), Joel Giedt (Rensselaer Poly.), Francesco Sannino (Odense U.) , Joe Schneible (Syracuse U.).

Published in JHEP 0811:009,2008.
e-Print: arXiv:0807.0792

- Against Tachyophobia.
  John R. Ellis (CERN), Joel Giedt (Rensselaer Poly.), Oleg Lebedev (CERN), Keith Olive (Minnesota U., Theor. Phys. Inst.), Mark Srednicki (UC, Santa Barbara).
  Published in Phys.Rev.D78:075006,2008.
  e-Print: arXiv:0806.3648
- Lattice four-dimensional N=4 SYM is practical.
  Joshua W. Elliott (McGill U.), Joel Giedt (Rensselaer Poly.), Guy D. Moore (McGill U.).
  Published in Phys.Rev.D78:081701,2008.
  e-Print: arXiv:0806.0013

Submitted:

- "Lattice super-Yang-Mills using domain wall fermions in the chiral limit,"
  to Physical Review D, (preprint http://arxiv.org/abs/0810.5746).

Kar

- **Title**: Lüttinger Liquid to Al'tshuler-Aronov Transition in Disordered, Many-Channel Carbon Nanotubes
  Authors: S. Kar, C. Soldano, L. Chen, S. Talapatra, R. Vajtai, S.K. Nayak and P.M. Ajayan
  Journal: ACS Nano, in press, 2008
- **Title**: Detection of Nanoscale Ferromagnetic Activity using a Single Carbon Nanotube
  Authors: C. Soldano, S. Kar, S. Talapatra, S.K. Nayak and P.M. Ajayan
  Journal: Nano Letters, Volume: 8, Page: 4498, Year: 2008
- **Title**: Fabrication and Electrical Characterization of Densified Carbon Nanotube Micro-Pillars for IC Interconnection
  Authors: Zhengchun Liu, Lijie Ci, Swastik Kar, Pulickel M. Ajayan, and Jian-Qiang Lu
  Journal: IEEE Transactions on Nanotechnology, in press
- **Title**: Thermal and electrical transport along MWCNT arrays grown on Inconel substrates
  Authors: S.K. Pal, Y. Son, T. Borca-Tasciuc, D-A. Borca-Tasciuc, S. Kar, R. Vajtai, P.M. Ajayan
  Journal: Journal of Materials Research, Volume: 23, Page: 2099, Year: 2008
- **Title**: Ionically Self Assembled Polyelectrolyte Based Carbon Nanotube Fibers
  Authors: Sandeep Razdan, Prabir K. Patra, Swastik Kar, Lijie Ci, Robert Vajtai, Kos Kukovecz, Zoltán Kónya, Imre Kiricsi and Pulickel. M. Ajayan
  Journal: Chemistry of Materials, submitted
- **Title:** Enhancement of Electrical performance of Ultra-long multi-wall carbon nanotube arrays by Au/Pd coating and High-Bias Treatment
  Authors: S. Talapatra, S. Kar, R. Shah, C. Schenk, X.F. Zhang
  Journal: Science of Advanced Materials (Invited paper, submitted)
- **Title:** A generic synthetic approach to interconnected nanowire/nanotube and nanotube/nanowire/nanotube heterojunctions with branched topology
  Authors: Guowen Meng, Fangming Han, Xianglong Zhao, Bensong Chen, Dachi Yang, Jianxiong Liu, Mingguang Kong, Xiaoguang Zhu, Qiaoling Xu, Yung Joon Jung, Yajun Yang, Zhaoqin Chu, Min Ye, Swastik Kar, Robert Vajtai, and Pulickel M. Ajayan
  Journal: Proceedings of National Academy of Sciences (submitted)

Lu

- "Deformation of amorphous Si nanostructures subjected to monotonic and cyclic loading", C. Gaire, D.-X. Ye, T.-M. Lu, G.-C. Wang, and R. C. Picu, J. of Mater. Res. 23 (2), 328 (2008).
- Toh-Ming Lu, Fu Tang, and Gwo-Ching Wang, "Shadowing growth of biaxially textured nanostructured films", Proc. of SPIE vol.7041, 704107-1 (2008).

- "Morphology and texture of Cu nanorod films grown by controlling directional flux in physical vapor deposition", H.-F. Li, A. K. Kar, T. Parker, G.-C. Wang and T.-M. Lu, Nanotechnology 19, 335708 (2008).
- "*In situ* RHEED study of dehydrogenation process of Pd coated Mg nanoblades", F. Tang, W. Yuan, T.-M. Lu, and G.-C. Wang, J. of Appl. Phys. 104, 033534 (2008).
- "Non-contact atomic force microscopy characterization of vibrators with frequencies up to the tens of MHz", T. C. Parker, F. Tang, G.-C. Wang, and T.-M. Lu, Sensors & Actuators A: Physical 148, 306 (2008).
- "Pd catalyst effect on low temperature hydrogen desorption from hydrided ultrathin Mg nanoblades", F. Tang*, T. Parker*, H.-F. Li, G.-C. Wang, and T.-M. Lu, Nanotechnology, 19, 465706 (2008).
- "Growth of biaxial CdTe/CaF_2 films on amorphous surface", W. Yuan, F. Tang, H. Li, T. Parker, N. LiCausi, G.-C. Wang, T.-M. Lu, and I. Bhat, , Thin Solid Films, submitted.
- "Platinum nanorods as PEM fuel cell electrodes", M. Gasda, R. Teki, T.-M. Lu, N. Koratkar, G. Eisman,[1] D. Gall, Nanotechnology, submitted.
- "Enhanced Pyroelectric Crystal D-D Fusion Using Tungsten Nanorods", Donald J. Gillich, Ranganath Teki, Travis Z. Fullem, Andrew Kovanen, Ezekiel Blain, Douglas B. Chrisey, Toh-Ming Lu, and Yaron Danon, Nature Materials, submitted.
- "Low temperature wafer bonding by copper nanorod array", Pei-I Wang, Sang Hwui Lee, Thomas C. Parker, Michael D. Frey, Tansel Karabacak, J.-Q. Lu, and T.-M. Lu. Nanotechnology.
- "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, submitted to Journal of porous materials.
- "Dielectric breakdown characteristics of porous low-κ with chemical vapor deposited Parylene-N as pore sealant", Jasbir S. Juneja, Ya Ou∗, Pei-I Wang and T.-M. Lu, submitted to Thin Solid Films.

Wang

- "Morphology and texture of Cu nanorod films grown by controlling directional flux in physical vapor deposition", H.-F. Li, A. K. Kar, T. Parker, G.-C. Wang and T.-M. Lu, Nanotechnology 19, 335708 (2008).
- "In situ RHEED study of dehydrogenation process of Pd coated Mg nanoblades", F. Tang, W. Yuan, T.-M. Lu, and G.-C. Wang, J. of Appl. Phys. 104, 033534 (2008).
- "Non-contact atomic force microscopy characterization of vibrators with frequencies up to the tens of MHz", T. C. Parker, F. Tang, G.-C. Wang, and T.-M. Lu, Sensors & Actuators A: Physical 148, 306 (2008).
- "Pd catalyst effect on low temperature hydrogen desorption from hydrided ultrathin Mg nanoblades", F. Tang*, T. Parker*, H.-F. Li, G.-C. Wang, and T.-M. Lu, Nanotechnology, 19, 465706 (2008).

Wetzel

- "Superluminescence in Green Emission GaInN/GaN Quantum Well Structures under Pulsed Laser Excitation," Jayantha Senawiratne, Stephanie Tomasulo, Theeradetch Detchprohm, Mingwei Zhu, Yufeng Li, Wei Zhao, Yong Xia, Zihui Zhang, Peter Persans, Christian Wetzel; in Nitrides and Related Bulk Materials, edited by R. Kniep, F.J. DiSalvo, R. Riedel, Z. Fisk, and Y. Sugahara (Mater. Res. Soc. Symp. Proc. Volume 1040E, Warrendale, PA, 2008), 1040-Q05-05.

- "Structural Analysis in Low-V-defect Blue and Green GaInN/GaN Light Emitting Diodes," Mingwei Zhu, Theeradetch Detchprohm, Yong Xia, Wei Zhao, Yufeng Li, Jayantha Senawiratne, Shi You, Lianghong Liu, Edward A. Preble, Drew Hanser, Christian Wetzel; in Nitrides and Related Bulk Materials, edited by R. Kniep, F.J. DiSalvo, R. Riedel, Z. Fisk, and Y. Sugahara (Mater. Res. Soc. Symp. Proc. Volume 1040E, Warrendale, PA, 2008), 1040-Q03-02.
- "Light Emitting Diode Development on Polar and Non-Polar GaN Substrates," C. Wetzel, M. Zhu, J. Senawiratne, T. Detchprohm, P.D. Persans, L. Liu, E. A. Preble, and D. Hanser, J. Cryst. Growth **310**, 3987-91 (2008) doi:10.1016/j.jcrysgro.2008.06.028 .
- "Green Light Emitting Diodes on a-Plane GaN Bulk Substrates," Theeradetch Detchprohm, Mingwei Zhu, Yufeng Li, Yong Xia, Christian Wetzel, Edward A. Preble, Lianghong Liu, Tanya Paskova, and Drew Hanser, Appl. Phys. Lett. **92**, 24119 (2008) http://dx.doi.org/doi: 10.1063/1.2945664.
- "Green Light Emitting Diodes under Photon Modulation" Yufeng Li, Jayantha Senawiratne, Yong Xia, Mingwei Zhu, Wei Zhao, Theeradetch Detchprohm, Christian M Wetzel; in Nitrides and Related Bulk Materials, edited by R. Kniep, F.J. DiSalvo, R. Riedel, Z. Fisk, and Y. Sugahara (Mater. Res. Soc. Symp. Proc. Volume 1040E, Warrendale, PA, 2008), 1040-Q03-08.
- "Photon Modulated Electroluminescence of GaInN/GaN Multiple Quantum Well Light Emitting Diodes," Y. Li, J. Senawiratne, Y. Xia, W. Zhao, M. Zhu, T. Detchprohm, and C. Wetzel; Phys. Stat. Sol. **5**(6), 2293 – 2295 (2008).
- "V-defect Analysis in Green and Deep Green Light Emitting Diode Structures," M. Zhu, T. Detchprohm, S. You, Y. Wang, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, Z. Zhang, and C. Wetzel; Phys. Stat. Sol., **5**(6), 1777 – 1779, (2008).
- "Junction Temperature Analysis in Green Light Emitting Diodes on GaN and Sapphire Substrates," J. Senawiratne, W. Zhao, T. Detchprohm, A. Chatterjee, Y. Li, M. Zhu, J. L. Plawsky and C. Wetzel; Phys. Stat. Sol. C **5**(6), 2247 – 2249, (2008).
- "Junction Temperature Measurements and Thermal Modeling of GaInN/GaN Quantum Well Light Emitting Diodes", J. Senawiratne, Y. Li, M. Zhu, Y. Xia, W. Zhao, T. Detchprohm, and C. Wetzel, J. Elect. Mater. **37**(5), 607-610 (2008).
- "Improved Performance of GaInN Based Deep Green Light Emitting Diodes through V-Defect Reduction," T. Detchprohm, M. Zhu, Y. Xia, Y. Li, W. Zhao, J. Senawiratne, and C. Wetzel; Phys. Stat. Sol. (c) **5**(6), 2207 – 2209, (2008).
- "Very Strong Nonlinear Optical Absorption in Green GaInN/GaN Multiple Quantum Well Structures," W. Zhao, M. Zhu, Y. Xia, Y. Li, J. Senawiratne, S. You, T. Detchprohm, and C. Wetzel; Phys. Stat. Sol. (b) **245**(5), 916-919 (2008).
- "Junction Temperature Measurements and Thermal Modeling of GaInN/GaN Quantum Well Light-Emitting Diodes," J. Senawiratne, Y. Li, M. Zhu, Y. Xia, W. Zhao, T. Detchprohm, A. Chatterjee, J.L. Plawsky, and C. Wetzel; J. Electron. Mater. **37**(5), 607-610 (2008).
- "Structural Characterization of Homoepitaxial Blue GaInN/GaN Light-Emitting Diodes by Transmission Electron Microscopy," M. Zhu, Y. Xia, W. Zhao, Y. Li, J. Senawiratne, T. Detchprohm, and C. Wetzel; J. Electron. Mater. **37**(5), 641-645 (2008).

SB Zhang

- X.-B. Li, S. Limpijumnong, W. Q. Tian, H.-B. Sun, and S. B. Zhang, "Hydrogen in ZnO revisited: Bond center versus antibonding site", Phys. Rev. B 78, 113203 (2008).
- M.-H. Du, S. B. Zhang, J. E. Northrup, and S. C. Erwin, "Stabilization mechanisms of polar surfaces: ZnO surfaces", Phys. Rev. B 78, 155424 (2008).
- F. Zheng, G. Zhou, Z. Liu, J. Wu, W. Duan, B.-L. Gu, and S. B. Zhang, "Half metallicity along the edge of zigzag boron nitride nanoribbons", Phys. Rev. B 78, 205415 (2008).

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PROPOSALS (SUBMITTED or GRANTED)

Ciolek

- "Setting the stage for life: From interstellar clouds to early Earth and Mars" NASA proposal number 05-NAI5-0024 Collaborator Accepted for funding by NASA 2 Oct. 2008

Eah

- Proposals submitted or granted (title, date, amount, agency).
  "Ultrasensitive Raman spectroscopy of single molecule per square micrometer", PI=Sang-Kee Eah, NSF, $328,484, submitted on Dec. 1, 2008 (pending).

Giedt

- OJI: Lattice Field Theory Beyond the Standard Model, Nov. 5, $484,866, DOE.

Preproposal:

- CDI-Type II: Pilot study for parallel peer-to-peer lattice gauge simulations, Dec. 8, $1,761,496, NSF w/ 2 co-PIs Carlos Varela (RPI) and Simon Catterall (Syracuse U.).

Kar

Granted:

- **Title:** "Fabrication of "all metallic" aligned single-wall carbon nanotube architectures for nanoscale interconnects", Y.J. Jung (PI) & S. Kar (Co-PI)
  Date: 2008-2009
  Amount: $40,000
  Agency: Semiconductor Research Corporation – Cross-disciplinary Semiconductor Research

Submitted:

- **Title**: "Investigation of Nanoscale Magnetism using a single carbon nanotube conductometric sensor", S. Kar (PI)
  Date: 2009-2012

Amount: $300,000
Agency: NSF DMR Condensed Matter Physics 2008

- **Title**: "Investigating quantum transport in "all-metallic", scalable, aligned SWNT arrays", S. Kar & M. Washington
  Date: 2009-2012
  Amount: $200,000
  Agency: Semiconductor Research Corporation/DARPA, Interconnect Focus Center
- **Title**: "Investigation of transport and Confocal Raman microscopy of graphene interconnects", M. Washington & S. Kar
  Date: 2009-2012
  Amount: $200,000
  Agency: Semiconductor Research Corporation/DARPA, Interconnect Focus Center

Lu

- "Reliability of Cu/ultra-low-k material systems", Toh-Ming Lu, SRC, 3 years, $225K, SRC, granted.
- "Center for Computational Energy Materials: Design and Validation", Director S. Lin, Associate Director T.-M. Lu, submitted to DOE, $15M for five years. 13 faculty.

Wang

- "Center for Computational Energy Materials: Design and Validation", PI: Shawn-Yu Lin, Co-PIs: T.M. Lu, S.B. Zhang, K.M. Ho, M.S. Shephard, M. Bloomfield, S. Nayak, M. Yamaguchi, I. Bhat, C.Z. Wang, C. Picu, G.-C. Wang, P. Dutta, Y.S. Kim, Five years (Sept. 1, 2009 to August 31, 2014), $20M. Submitted to Dept. of Energy on Oct. 1st, 2008.
- "Nanorod Arrays for the Generation of Intense Terahertz Wave", PI: G.-C. Wang, Co-PIs: Masashi Yamaguchi, Saroj Nayak, Three years (Jan. 1, 2009 to Dec. 31, 2011), $1,089K, Submitted to DTRA1-08-10-BRCWMD-BAA on Oct. 10, 2008.
- "Terahertz Emerging Science and Technology (TEST) Center", PI: Michael Shur, Co-PIs: G.-C. Wang, X.-C. Zhang, G. Simin (USC), Prober (Yale), Schmuttenmaer (Yale), Jimmy Xu (Brown), Participants: T.-M. Lu, S.Y. Lin, S. Nayak, I. Wilke, M. Yamaguchi, Kim Lewis, P. Dutta, I. Bhat, M. Shephard, A. Oberai, K. Jansen, D. Millard, five years (June 2010 to May, 2015), $20,345,004, submitted to NSF on Oct. 14, 2008.
- "Enhancement of THz wave generation in gaseous media by using nanorod arrays", Yamaguchi, Nayak, and Wang, Three years (June 1, 2009 to May 31, 2012), $460K, NSF, submitted Nov. 7, 2008.

Wetzel

- High Efficacy Green LEDs by Polarization Controlled MOVPE, 7/2009 – 6/2012, $2,071,817, Department of Energy, submitted.
- Smart Lighting Engineering Research Center, 7/2008 – 6/2013, ca $10M, National Science Foundation, granted.
- Building Bridges from High School to Grad School: Inspiring Students Through Discovery-based Activities in Energy and the Environment, 1/2008 – 12/2012, $2,738,000, National Science Foundation, granted.
- Research In Light-Emitting Diodes (LEDs), 7/2008 – 6/2009, $370,299, Samsung Electro-Mechanics Company, Ltd., Suwon, South Korea, submitted.

Yamaguchi

- "Nanorod Arrays for the Generation of Intense Terahertz Wave", PI Masashi Yamaguchi, co-PIs Gwo-Saroj, Nayak, and Ching Wang, Oct.2008, DTRA, $1M for 3 year, submitted.
- "Enhancement of THz Wave Generation", PI Masashi Yamaguchi, co-PIs Gwo-Saroj, Nayak, and Ching Wang, Nov.2008, NSF-DMR, $486k for 3 year, submitted.

SB Zhang

Submitted:

- PI, “Theory of Defect Tolerant Semiconductors for Photovoltaic Applications”, preproposal submitted to DOE, Sept. 1, 2008
- PI, “Defect Mediated Hydrogen Release in Complex Hydrides for Storage”, preproposal submitted to DOE, Sept. 1, 2008
- PI, “Second Generation Hydrogen Sorbents: Design and Validation”, preproposal submitted to DOE, Sept. 1, 2008
- PI, “Developing First-Principles Theory for Defects under Extreme Conditions”, preproposal submitted to DOE, Sept. 1, 2008
- Co-PI, “Center for Computational Energy Materials: Design and Validation”, full proposal submitted to DOE, Oct. 1, 2008
- Co-PI, “Center for Interfacial Photoconversion Processes”, full proposal submitted to DOE, Oct. 1, 2008
- Co-PI, “Photonic Frontiers in Energy Research Systems (PFRONTIERS): An EFRC Proposed by the Ames Laboratory”, full proposal submitted to DOE, Oct. 1, 2008
- Co-PI, “Basic Energy Research Center for the Development of Hybrid Energy Conversion and Energy Storage Technologies”, full proposal submitted to DOE, Oct. 1, 2008
- PI, “Second Generation Hydrogen Sorbents: Design and Validation”, preproposal submitted to NSF, Nov. 4, 2008
- PI, “An orbital-Based Hybrid Approach for Localized Defect states in Widegap Semiconductors”, full proposal submitted to NSF, Nov. 7, 2008, $400,000
- PI, “CDI Type I: A Cognitive Theoretic Approach to Designing Visualization Tools for Advanced Research in Physics”, preproposal submitted to NSF, Dec. 9, 2008, $911,662
- PI, “Solar: Next-Generation Low-Cost High-Efficiency Photoelectrochemical Solar Cells by Nano Design and Validation”, preproposal submitted to NSF, Dec. 17, 2008
- PI, “Defect Modeling beyond the Density Functional Theory”, preproposal submitted to DOE, Oct. 30, 2008
- Co-PI, “Theoretical studies of the self assembly of protein-decorated nanotube systems”, preproposal submitted to DOE, Nov. 19, 2008, $120,000/yr for three years
- PI, “Phase-Change Materials for Nonvolatile Memory - Simulation and Validation”, white paper submitted to Semiconductor Research Consortium, Dec. 10, 2008, $200,000/yr for two years

SIGNIFICANT RESULTS OBTAINED OR NEW RESEARCH AFFILIATES

Ciolek

- RPI team member of the New York Center for Astrobiology (A Member of the NASA Astrobiology Institute)

Giedt

- Together with collaborators, submitted "Lattice super-Yang-Mills using domain wall fermions in the chiral limit," to Physical Review D, (preprint http://arxiv.org/abs/0810.5746). This article is the culmination of research into the gaugino condensate in super-Yang-Mills, utilizing the CCNI. It was found that the condensate is nonzero, a necessary ingredient for most phenomenological models of spontaneous supersymmetry breaking. In total the project required 30 million BlueGene/L core hours, and is the most extensive simulation to date of a supersymmetric lattice gauge theory.

Kar

- Developing a new method of fabrication of few-layered graphene.
  Currently developing novel method of large scale deposition of graphene on $Si/SI0_2$

substrates for electronic transport measurements

Wetzel

- Development of green light emitting diodes with a current-stable emission wavelength.

SB Zhang

- On July 30, 2008, Nature China highlighted our SiC nanoarchitecture work [Nano Lett. 8, 2258 (2008)] in an article entitled “Nanostructures: Growing vines” by Ai Lin Chun. The same work was also highlighted on Oct. 16, 2008 by NPG Asia Materials as a research highlight entitled “Nanowires: Let’s twist again”.
- Our work on comparative study of carbon and BN nanographenes [J. Phys. Chem. C, 2008; 112: 12677] was selected as the Cover Page article for JPCC, Vol. 113, Iss. 33.

VISITORS TO RENSSELAER

Kar

- **Name:** Mr. Younglae Kim
  Affiliation: Northeastern University
  Date: 8th-10th October, 2008, and 22th-24th October, 2008
  Reason: Shared Graduate student visiting to perform experiments on carbon nanotubes

IMPORTANT ACTIVITIES OF STUDENTS

Giedt

- Eric Dzienkowski has made excellent progress in an on-going research project that studies the nonperturbative running coupling in minimal walking technicolor.
- Daniel Carrero completed his Masters Project studing one-loop corrections in the bulk for warped extra dimension models.
- David Hunt has succeeded in constructing analysis code to identify magnetic monopole charge and topological charge in SU(2) lattice gauge theory. He has created to Java applets to visualize these extended field configurations.
- Eric Dzienkowski Recipient Richard Madey ’43 Physics Prize, RPI 2008

Wetzel

- Ryan C. Badeau Recipient Robert Resnick Scholarship, RPI 2008
- Timothy O. Kelley Recipient Richard Madey '43 Physics Prize, RPI 2008
- Kristen N. Clark Recipient SMART Scholar ship, Naval Postgraduate School 2008
- Weixiao Huang Lemelson-Rensselaer Student Prize Finalist (2008).

OTHER

Giedt

- October 15, 2008, Organized and hosted The 13th Robert Resnick Lecture, speaker Dr. Sajeev John from the University of Toronta, CA.