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CMDITR Receives Funding for International Research Experiences Program

by Glen Shen

In September 2005, NSF announced the availability of approximately \$850K for use by STCs in formulating an International Experiences Program for Center students. Cornell University's NanoBiotechnology Center (NBTC) took the lead and, in collaboration with a newly formed advisory panel, issued an RFP on October 20.

As a Center with particularly strong international links, the CMDITR pursued this opportunity aggressively. As a result, our proposal was highly rated and funded at a level of \$138K. This amount is sufficient to sponsor

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Annual Retreat and IAP Expo in Tucson, AZ

Mark your calendars: the CMDITR's 2006 Industrial Affiliate Expo and Annual Retreat have been scheduled for **February 22nd and the 23rd through the 25th** respectively. This is an important annual event for the Center, both for community building and furthering our research. The Annual Retreat is our opportunity to get together as a whole, evaluate our progress and define strategic goals for the future. This will be our most elaborate and inclusive retreat to date. There will be panel discussions and breakout sessions for both thrusts, as well as education and diversity program overviews. On the afternoon of the 25th there will be an optional outing to the Arizona Sonora



2005 Annual Retreat attendees on a lab tour at GT

Desert Museum, a 21-acre world-renowned zoo, natural history museum, and botanical garden.

All STC members are invited to attend. Our goal is to have widespread participation. For funding details, draft agendas and to register please login into the CMDITR's web site and click on the "2006 Scientific Retreat" link.

ALL attendees should register as soon as possible but no later than January 20th. ■

Expanded Capacity for Structural Investigations at NMHU

by Tatiana Timofeeva

Thanks to a DMR/NSF MRI grant to Drs. Tatiana Timofeeva, Mikhail Antipin and Jennifer Lindline, a new X-Ray single crystal diffractometer (SMART APEX II by Bruker) was recently installed at New Mexico Highlands University (NMHU). This has dramatically increased the capacity for structural investigations at NMHU. Prior to this, all of the data collection for structure

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Jose Gallegos & Tiffany Kinnibrugh mount a crystal on the new diffractometer.



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elucidation of luminescent, electro-optical, nonlinear optical materials and materials for OLED applications (obtained from Dr. Marder's group at Georgia Institute of Technology and synthesized at NMHU) was done at the Russian Academy of Sciences in Moscow. With the new equipment it is now possible for our group to not only describe molecular packing and geometry but also the fine details of charge density distribution inside and between donor/acceptor molecules. This data along with quantum computation is extremely

important for a deep understanding of particular materials properties.



Andrey Yakovenko of NMHU is ready to receive interesting samples for X-ray analysis on the new Smart Apex II.

The Timofeeva Research Group would like to invite collaboration from CMDITR associated synthetic groups. Visiting students and researchers who are interested in solving their structures, and are willing to discuss the results with crystallography students and experts, are welcome. Interesting samples may also be sent directly to the group. For more information, please contact Dr. Timofeeva directly at vtimofeeva@nmhu.edu. ■

International Research Program . . . continued from page 1

about one dozen Center students, primarily advanced graduate students, for 10-week research exchanges overseas. We have identified the Université de Mons-Hainaut (Brussels), Chinese Academy of Sciences (Beijing), University of Osaka, and the Russian Academy of Sciences (Moscow) as host institutions with which we hope to engage in reciprocal exchanges.

PhD students Denise Bale (UW), Thomas Beechem (GT), Colleen Craig (UW), Eric Heatwole (UW), Peter Hotchkiss (GT), Joshua Griffin (GT), Kelly Lancaster (GT), PaDreyia Lawson (GT), Susan Odom (GT), Joel Prothro (GT), Jocelyn Takeyesu (UW) and Masters candidates Taina Cleveland (NSU) and Tiffany Kinnibrugh (NMHU) have expressed interest in being the CMDITR's first international ambassadors.

Exchanges may take place January 2006-September 2007 and students will be encouraged to travel in groups. Center participants will be expected to enroll in introductory language courses to enhance their experience. You will hear about their adventures in future issues of Light Works as well as at future Annual Retreats. The Center will sustain this program in future years using internal funds and by building on the experience and goodwill fostered during this initial phase. We will look to all members to help us make visiting students from our international partner institutions feel welcome and productive. Faculty and students interested in learning more about this program may wish to consult the 2005 RFP and Proposal available in our online Document Archive.

Thanks go to Jean-Luc Bredas for his participation on the first Advisory Panel, to Elisa Riedo for volunteering as Project PI, to Tatiana Timofeeva, Oleg Prezhdo, Seth Marder, Greg Durgin, Sam Sun, Alex Jen, Bernard Kippelen, and Larry Dalton for their help in identifying prospective host labs, and to Elisa, Seth, Deborah Illman, and Glen Shen for writing the proposal.

CMDITR Applies for Phase 2 Renewal

by Glen Shen

The CMDITR submitted its proposal for renewal in years 2007-2012 on October 31, 2005. The amount requested is \$18M spread over five years, with phased down funding in the final two years and a university cost share requirement of 30%. Thus, a successful renewal would be worth over \$23M total.

The proposal recounts significant research, education, and knowledge transfer achievements from the past three years and takes a hard look at what can be accomplished over the next phase. While two overarching thrusts remain, our vision to develop new organic and hybrid materials is refocused into four Science and Technology Development Areas (STAs). Under each STA fall two specific projects. This organizational paradigm is reproduced below.

Research and Technology Development Framework

Thrust 1. Organic Electro-Optic and All-Optical Materials and Devices		Thrust 2. Organic Electronics and Integration of Nonlinear Organics with Si Nanophotonics	
STA 1. Materials, devices, and subsystems based on organic EO materials with large r_{33}	STA 2. Materials with large all-optical nonlinearities; Devices and subsystems	STA 3. New laser frequency generation and devices	STA 4. Organic electronics and energy harvesting devices
Project 1.1 E-O and spatial light modulators; hybrid integration with silicon		Project 3.1 Photonic crystal and holey fiber in-filled with nonlinear organics	
Project 1.2 Materials and devices for terahertz generation		Project 3.2 Integration of Si nano-photonics with nonlinear organics	
Project 2.1 Materials for all-optical switching in integrated devices		Project 4.1 Organic electronics for smart integrated platforms	
Project 2.2 Free space signal processing and optically addressable SLM		Project 4.2 Organic portable power generation	

In the proposal, Management Team authors also describe expanded participation by industry and government, pathways to product commercialization, a new management structure, plans for producing ground-breaking course materials, expanding the GEM-STC partnership, community-building within our STC, and much more. The Center will not wait until 2007 but will begin moving in these new directions immediately. Members are encouraged to read the proposal (available online or in hard copy - basic text approx. 25 pp).

The renewal process continues in full force on May 23-24 when an NSF Site Visit Team arrives in Seattle to evaluate our Center up close. **Stay tuned to learn how you can help us put our best face forward.** ■

Travel Report

by Amalia Leclercq

At the 2005 CMDITR Retreat in Atlanta, I had the opportunity to describe to Dr. Alex Jen and Dr. Sei-Hum Jang (University of Washington) the progress of the Bredas Research Group's theoretical investigations on the electro-optic chromophores synthesized in Jen's Research Group. This led to my recent visit to Dr. Jen's laboratory at the University of Washington in Seattle to discuss the latest theoretical and experimental results in greater detail and finalize the outline of some publications.

During my stay, Sei-Hum and I were able to discuss problems encountered in the design of new second-order nonlinear optical (NLO) chromophores, and to establish an experimental/theoretical study plan to solve such problems. I also presented a seminar to Jen's research group briefly explaining the computational methods used to calculate the molecular NLO polarizabilities and their relationship with the chemical structure of the chromophores investigated. Finally, I met with Prof. Bruce Eichinger and graduate student Christine Isborn to share our experiences with these different computational methods.

Overall, my stay in Seattle has greatly increased the level of collaboration between the two research groups. Combination of advances in design and synthesis will lead to improved second-order NLO materials for electro-optic and photonic applications.



UW Ethics Seminar on RFID Technologies Available on CMDITR Web Site

by Deborah Illman

RFID refers to a set of technologies that use radio frequency (RF) to communicate data. In its simplest form, an RFID system consists of a tag attached to an object to be queried, and a device (reader) that can query the tag to obtain information about the object. RFID has been used for a wide range of applications, from locating runners in a marathon to tracking livestock and assisting in inventory management for retail businesses.

But as the uses of RFID expand, so do concerns about their social

and ethical implications, making this an excellent case study for exploration in a CMDITR seminar on Responsible Conduct of Research, held at the UW on December 2nd. Some 50 students, faculty, and staff gathered at the Husky Union Building to take part.

On hand to lead the discussion was Dr. Gaetano Borriello, UW Professor of Computer Science and Engineering (pictured at right), who has chaired the National



Dr. Gaetano Borriello

Research Council Committee on Radio Frequency Identification Technologies. The report of that committee was provided to UW Center participants prior to the seminar and can be viewed at http://www7.nationalacademies.org/cstb/pub_rfid.html.

Borriello's research interests include location-based systems, sensor-based inferencing, and tagging objects with passive and active tags. At the seminar, Borriello provided a brief overview

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The GPAC is Off and Running

by Megan Leahy-Hoppa

The newly formed Graduate Post-doctorate Advisory Council (GPAC) is on its way to becoming the voice of graduate students and post-doctorates in the CMDITR. We have had an exciting fall, getting to know each other and discussing our involvement in the Center.

The GPAC has introduced several initiatives to increase graduate student and post doctoral involvement in and awareness of the Center. First, we are circulating a survey to gather information on graduate student and postdoctoral perceptions of the Center in order to assess our needs. We are asking all graduate students and post-doctorates to fill out the survey and return it to a local GPAC representative. If you have not yet completed your survey, please take a couple of minutes to do so. This survey is a tool for us to find out what students and post-doctorates would like to get from their involvement in the Center. It can be downloaded from the GPAC portion of the CMDITR's web site (see link on next page). Also available on the web site are GPAC research profiles and photographs. Plans are underway to share all graduate student and post-doctorate research profiles and photographs. This will help us learn more about the research that is being done and who is



Megan Leahy-Hoppa is a graduate student in the Hayden Research Group at the University of Maryland, Baltimore County. Her research focuses on molecular modeling and terahertz spectroscopy of nonlinear optical polymers.

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doing it. Photos will help us recognize each other and facilitate communication at Center events such as the upcoming annual retreat. We are also planning some specific graduate student/post-doctorate activities at the annual retreat in February. Anyone wishing to contribute input can send suggestions to local GPAC representatives.

We always welcome new members. If you are interested in participating, please let your local GPAC representative know and we will be happy to help get you involved.

For contact information, GPAC representative bios, and to download the survey, please visit:

www.stc-mditr.org/students/gpac.

Seminar on RFID . . . continued from page 4

of the technical basis for radio frequency identification approaches and discussed some of the implications for personal privacy and other societal concerns.

He covered a wide array of applications, selecting four examples for discussion in more detail by participants in smaller groups. One of the most well-known RFID applications is perhaps supply-chain tracking. According to the NRC report, some retailers, manufacturers, and federal agencies are already requiring suppliers to provide RFID tags on pallets for tracking goods through distribution networks. In another example, livestock tagging may be used to track mad cow disease and to follow the movement of animal products on their way to market. In the breakout session, seminar participants focused on applications in homeland security, tracking of children, electronic payment systems, and health care.

A videotape of the event has been linked with Borriello's slides and is available on an experimental basis at <http://convex.stc.arizona.edu/RCR>. ■

Congratulations to

★ **Michal Lipson & Samuel Graham** for receipt of the **Faculty Early Career Development (CAREER) Award!** This is NSF's most prestigious award in support of the early career-development activities of teacher-scholars who most effectively integrate research and education within the context of the mission of their organization.

★ **Larry Dalton and Alex Jen** for their election in 2005 as **Fellows of the American Association for the Advancement of Science!**

Responsible Conduct of Research training is an NSF funding requirement for participants of this Center. If you have not yet completed the training and certification process, please login to the CMDITR's web site - www.stc-mditr.org - and do so at your earliest convenience.

Dr. Peter Günter to Visit UW in the Spring

The UW will welcome **Dr. Peter Günter** of the Swiss Federal Institute of Technology (ETH) as a Visiting Scientist January 19-March 17. Dr. Günter is an international leader in the development of new non-linear optical, organic and inorganic materials for optical data processing. He heads the Non-Linear Optics Laboratory at the Institute of Quantum Electronics.

Dr. Günter is a former member of CMDITR's Strategic Advisory Board, thus he is very familiar with our Center's mission. Please be on the lookout for announcements of his guest lectures at UW and stop by to visit with him in the Chemistry Department. ■

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RESEARCH HIGHLIGHT



Dr. Elisa Riedo and Robert Szoszkiewicz demonstrate how they used an atomic force microscope (AFM) to study how water bridges form at the nanoscale.

Dr. Elisa Riedo's research on the kinetics of capillary condensation at the nanoscale was recently highlighted in a Georgia Tech news release (www.gatech.edu/news-room/release.php?id=662). The article, "Study Shows Thermal Dependence of Water Bridges," focused on the importance of the relationship between nucleation time and temperature to the designers of very small devices that must operate in the presence of moisture, as well as to the food processing industry. Dr. Riedo's own article on the topic is available in the September 23rd issue of *Physical Review Letters*.

Send Us Your News!

Share your news and successes with fellow CMDITR collaborators. Please send news flashes, information and feedback to hardenm@email.arizona.edu