

LIGHT WORKS



reflect on it...

CLEAN INITIATIVE



UW Postdoc Denise Bale

Clean energy solutions will have a profound impact on nearly every aspect of our lives, including global health, transportation, communication, computing, lighting, national security, and our economy. Meeting the world's energy

needs in a clean and cost-effective manner may be the greatest challenge of our generation. Breakthrough technologies that address this challenge are emerging right here in Washington, including several at UW in nanomaterials and photonics (using light for signal generation, detection and manipulation/processing). To leverage world-class research in these areas, a Steering Committee of local business, civic, and UW representatives was formed under the leadership of CMDITR's Emeritus Executive Director Alvin Kwiram. The main goal of this group is to help position the Pacific Northwest as a leading energy research center and create an industry cluster focused on energy technologies.

Last year the Steering Committee sponsored and developed "Nanophotonics for Breakfast", a series of six lectures at the Rainier Club in downtown Seattle, to inform the wider business community about the significant opportunities for potential commercial developments in nanomaterials and photonics. Each event focused on a different application area: solid-state lighting and displays, biophotonics, sensors, telecommunications, computing, and solar cells. On average, about 90 people attended each event, including a mix of industry, civic, and academic leaders and other professionals. Videos, podcasts, and supplementary reading from the series are available online:
<http://depts.washington.edu/nanophot/>.

Encouraged by the enthusiastic response of the community, the Steering Committee considered how to catapult this effort to a higher level of intensity and impact. The outgrowth of those deliberations was the decision to launch a major regional energy initiative based on the considerable strengths in organic and hybrid

photonics and nanomaterials at the UW. The proposed Clean Low-cost Energy through Advanced Nanomaterials (CLEAN) initiative will focus on organic solar cells, organic solid state lighting, photocatalysis to use solar energy to split water to create hydrogen fuels, improved battery technologies, and novel organic-silicon hybrid electro-optic devices to reduce energy usage in computers and telecommunications. The CLEAN initiative already involves over two dozen faculty from a half dozen departments at the UW and has been endorsed by the Deans of the College of Engineering and the College of Arts and Sciences. The President and the Provost have approved this as a major UW initiative.

The broad outline of the CLEAN initiative was presented in a forum at the annual Greater Seattle Chamber of Commerce Leadership Conference on October 22, 2008. Fifty members of the Chamber attended the CLEAN forum and participated in a lively discussion about the project. Many of the remaining 250 Chamber Members were able to talk with UW CLEAN representatives and see working demonstrations of early-stage solar cell and telecommunications devices.

The next step in the CLEAN initiative is to expand the effort to include

representatives from the Pacific Northwest National Laboratories, local companies, and other institutions. The expanded team will work on building a roadmap for the initiative, rallying endorsements and financial support for the project, continuing to strengthen and coordinate research

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efforts within UW and across institutional boundaries, streamlining the pathway for technology commercialization, and working to develop ways to help early-stage start-up companies identify the capital, financial, and technical resources necessary to succeed.

With a little luck and a lot of hard work, the CLEAN initiative will speed the delivery of compelling renewable energy solutions to the public and spur new economic activity in the Pacific Northwest around the development and commercialization of these technologies.

-Rad Roberts

MLEF

DOE MICKEY LELAND ENERGY FELLOWSHIP PROGRAM

In summer 2008 I participated in the Mickey Leland Energy Fellowship program sponsored by the United States Department of Energy's Office of Fossil Fuel (USDOE-OFF). I was placed at Pacific Northwest National Laboratory (PNNL) in Richland, Washington, which is located near the Hanford Site. During WWII this was the site where uranium was processed into plutonium for nuclear warheads. Consequently, much of the USDOE's current efforts at this lab focus on nuclear waste cleanup. I worked in the Sensor Materials lab located in the Environmental Molecular Sciences Laboratory (EMSL) building. My summer research mentor, Dr. Marvin Warner, is part of the Interfacial Chemistry and Engineering department under the Chemical and Material Sciences Division. Under his advisement, I studied CdSe quantum dots based thin film formations which have implications for the development of quantum dot-based scintillation technology for radiation detectors.



NSU's graduate student Tracee Weaver at PNNL

My contribution to the project was to find a synthetic methodology for nanoparticle thin film formations without a supporting matrix for the purpose of radioluminescence studies. I was required to do an extensive literature search, noting for my mentor what fabrication techniques would provide ease and low cost. I independently addressed challenges of particular fabrication techniques and reported my findings to Dr. Warner along with my experimental approach for tackling these issues. By the end of the 10-week stay, I was able to produce promising quantum dot thin film formations for the radioluminescence studies.

The experience was enriching to my academic and professional development. Although significant time was spent working in the lab, our curriculum included weekly enrichment sessions and research lectures. As a part of this fellowship, I submitted a paper and presented my research at a technical forum in Chicago to USDOE-OFF, Chevron, and Schlumberger representatives. The forum included lab tours of Argonne and Fermi National Laboratories. I also participated in local events, such as the Battelle Staff Association Salmon Bake and the Columbia Cup Boat Races. My research mentor, Dr. Marvin Warner, and project manager Elaine King were very supportive.

- Tracee Weaver

THANKS FOR THE ADVICE!



External Advisory Committee

Each year, CMDITR meets with an External Advisory Committee (EAC) to review our progress and get guidance on how to navigate the pathways ahead of us. The committee is made up of industry researchers, professors from other universities, and national experts on education and human resource development. They are brought together to form a group that can offer our STC advice on diversity, education, research, industry opportunities and "legacy" planning – planning for the continuation of key CMDITR activities and products after NSF funding for CMDITR ends in 2012.

This year, the EAC met at the University of Washington campus in a state-of-the-art videoconference facility so that participants from our Georgia Tech and University of Arizona campuses could be fully engaged in the meeting. Discussions were led by Phil Reid, Alex Jen, Michael Hochberg, Bernard Kippelen, Keith Oden, Leyla Conrad and

Nasser Peyghambarian. Other STC members who joined the discussions were Samuel Graham, Seth Marder, Jeanne Small, Alvin Kwiram and Rad Roberts.

At the end of the day-long event, after participating in presentations on CMDITR's activities in research, education, knowledge transfer and diversity enhancement, the EAC complemented CMDITR on many strengths. The quality of our research, the extent of our industrial partnerships and funding, and the development of our web-based course modules were just a few of the examples that the EAC mentioned. Opportunities that the EAC sees for CMDITR include developing more undergraduate research opportunities, trying more high risk (but potentially high pay-off) research, and continued marketing and branding of the Center and its accomplishments.

CMDITR thanks our EAC for its time and effort to help us move along the best pathways forward.

-Jeanne Small

CMDITR's External Advisory Committee

Theresa Maldonado, (CHAIR), Texas A&M

Interim Vice President for Research
Executive Assoc. Vice President for Research

Zhenan Bao, Stanford

Associate Professor

Miguel Garcia-Garibay, UCLA

Professor

Petra Lahaie, Vault Capital

Managing Director

Shirley McBay, QEM Network

President

Yurii Vlasov, IBM TJ Watson Research Center

Research Staff member

Isiah Warner, LSU

Vice Chancellor, Office of Strategic Initiatives

Carin Weiss, Seattle Community Colleges

Vice Chancellor,
Education, Planning & Distance Learning

CMDITR's External Advisory Committee met on Sep. 30, 2008

2008 GPAC RETREAT

First, I'd like to introduce you to our new GPAC members: Cory Christensen (UA), Dio Placencia (UA), Brent Polishak (UW), Kevin Noone (UW), Taina Matos (NSU), and Tracee Weaver (NSU). You can learn more about them on the GPAC webpage: <http://stc-mditr.org/students/gpac>.

As student representatives, GPAC holds an annual retreat to evaluate the previous year's progress and to begin planning new student initiatives for the upcoming year. The last GPAC Retreat was held in June the day before the CMDITR NSF 2008 Site Visit. This allowed us to help prepare students who were attending and to educate the Site Visit review panel on the success of student programs. We are proud to say that the review panel responded with very positive feedback regarding the Center's student involvement.

Since many of the student programs were successful and warmly received they will be continuing in the upcoming year. In particular, the F.O.O.D. seminar series is beginning again in Fall 2008 and will now be available online for those who can't attend. Past F.O.O.D seminars are available by logging in to the STC's Members Only website, and following the link to "Online Education Programs". To help promote student interaction, GPAC is working to organize a student social activity once a semester or quarter at each institution.

Finally, GPAC is developing a process for students to request STC funding for education and diversity activities. This will allow you as STC members the opportunity to initiate programs, such as guest speakers, workshops, and student outreach.

All in all it's been a great year and we look forward to another one.

-Natalie Doss



Taina Matos



Cory Christensen



Tracee Weaver

PROFILES



Clifford L. Henderson

Associate Professor
Georgia Institute of Technology

B.S. 1994, Georgia Institute of Technology
M.S. 1996, University of Texas at Austin
Ph.D. 1998, University of Texas at Austin

Dr. Henderson's research interests include microelectronics processing, microlithography, photoresists and imaging materials, microstructures, and microfluidics. The general theme of interest in these areas is the concept of patterning, encompassing both the processes and materials used to achieve pattern definition and the use of such processes to build novel materials and devices. Current projects are focused on imaging/resist materials for next-generation lithography (NGL) applications, simulation and modeling of photoresist performance, graft polymerization at solid surfaces, spin-on and photo-definable metal films, and the formation of ultra-thin polymer films.



Elsa Reichmanis

Professor
Georgia Institute of Technology

B.S., 1972, Syracuse University
Ph.D. 1975, Syracuse University

Prior to joining the Georgia Tech faculty in January 2008, Elsa Reichmanis was a Bell Labs Fellow and Director of the Materials Research Department at Bell Labs, Lucent Technologies. She joined Bell Labs in 1978 after working as a Chaim Weizmann Postdoctoral Fellow at Syracuse University for three years. Her research interests include the chemistry, properties, and application of materials technologies for photonic and electronic applications, with particular focus on polymeric and nanostructured materials for advanced technologies.

HOOKED ON PHOTONICS



LaKeisha McClary & Olanda Bryant



HoP Participant



HoP Participants

Take 25 undergraduate students with little or no lab experience, several graduate student mentors, faculty members, project coordinators, three campuses, diverse cultures and mix them all together. What you get is the 5th year of The Hooked on Photonics Summer REU program. Every summer for ten weeks GT, UA and UW play host to a group of students who are looking to get real research experience. Most of these undergrads leave the comfortable familiarity of their homes and travel to one of the campuses where they work with CMDITR faculty and graduate students. The lab time is interspersed with content lectures on photonics, and technical skills seminars. Some of the seminar topics include how to get into graduate school, how to develop technical writing skills, and how to give a great presentation. We had six content lectures in collaboration with the University of Arizona, Georgia Tech and the University of Washington via video conference to further discuss photonic research. These seminars were given by CMDITR faculty from across all three campuses: Dr. Neal Armstrong (UA), Dr. Bob Norwood (UA), Dr. Phil Sullivan (UW), Dr. Jean-Luc Bredas (GT), Dr. Seth Marder (GT), Dr. Christine Luscombe (UW), and Dr. Larry Dalton (UW). We would like to thank each of them for supporting our summer 2008 HoP REU Program.

The HoP students at the University of Arizona (UA) last summer participated in several activities that were organized together with other on-campus summer research programs. The Associate Dean of the Graduate College hosted all 70+ students at her house for a networking activity. Other joint activities included workshops on, “How to Fund Your Graduate Education”, GRE preparation, presentation skills in addition to a joint poster session and closing ceremonies. The students also enjoyed outings to the UA’s Biosphere 2, the nearby Mount Lemmon, and the Arizona-Sonora Desert Museum. Three students from the UA HoP program ended up being recruited to work in their advisors’ lab for the school year.

The GT HoP students visited Oak National Laboratories (ORNL), and collaborated their program with the GT School of Chemistry & Biochemistry’s and with the Center on Photonic and Electronics’

(COPE) REU participants. The first seminar outlined for the HOP REU students was the “Safety Seminar”. This seminar was given by Dr. William Baron the Director of Freshman Chemistry and Senior Academic Professional. Understanding how important it is to be safe in the lab is essential to getting our REU program on its way to a successful summer.

The UW students participated with the other University of Washington REU students in the Undergraduate Research Symposium Poster Session. The UW HoP students were able to present their research to a group with over 120 participants. They also attended a Graduate School Information event and participated in technical writing seminars and a presentation skills workshop.

Team building plays a role in bringing out personalities, building relationships, and developing a sense of comfort among the REU students. Creating this mood early in the program can result in a successful ten weeks. Some of these team building events included a whitewater rafting trip down the Ocoee River in Cleveland, Tennessee, and attending a Seattle Mariners Baseball game.

The REU program would not be possible without the support of our Center members, the graduate student mentors, the faculty advisors, seminar presenters, our Education and Diversity Directors and the program coordinators at each campus. Thank you for making the CMDITR Hooked on Photonics Summer REU program a success.

- Olanda Bryant, Kimberly Sierra-Cajas, Marya Dominik



HoP Participants

HIGHLIGHTING LARRY DALTON

The skepticism was palpable when Larry suggested in 1999 that he would like to seek an NSF Science and Technology Center in photonics for the UW. In 2002 NSF awarded nearly \$20M for a five year project on Materials and Devices for Information Technology Research (MDITR). Larry's talents for selecting acronyms might be questioned, but not his skill and creativity in assembling a stellar team of scientists from a half dozen leading institutions. Launched in August of 2002, the Center (CMDITR) has had some spectacular successes (which will not be listed here) and is generally regarded as one of NSF's most successful Science and Technology Centers. From breakthrough science, to innovative educational initiatives to sound administrative practices, CMDITR has provided leadership across a wide spectrum of activities. What may be more impressive is Larry's longevity as Director; most directors last less than five years. When he steps down in January 2009 as Director he will have guided this organization for seven long and challenging years. The evocative image of "herding cats" hardly does justice to the task of managing a Center as diverse and widespread as CMDITR. He had to choreograph the dance of a group of aggressive and independent players, try to meet the changing and very high expectations of NSF, navigate through constant budget surprises, mediate disagreements among participants, all the while maintaining not only a clear vision of the research goals but also identifying new opportunities and enlisting the players to launch them. I believe the record will show that he has done this superbly well.

But CMDITR is just one facet of his work. An even more improbable goal was to attract the interests of DARPA in molecular photonics, an area that they had invested in many years before and had come away with a bad taste. Larry cajoled DARPA into taking another run at this technology and this time he and his team blew their socks off, so to speak. The advances made in raising the electro-optic coefficient were truly spectacular. These advances combined with the work on hybrid silicon-organic devices, a direction that Larry initiated despite the reservations of some of his advisors, has opened a whole new field of research that is poised to have enormous impact on the signal processing technology arena.

The remarkable accomplishments that emerged from these major initiatives did not go unnoticed in the nation's capital. Larry has been a fixture at NSF and DoD, serving on numerous high level committees of the former and on the Defense Advisory Board of the latter. His staff and colleagues sometimes give the feeling that he spent more time in the other Washington than the one in the Pacific Northwest.

His ten years at the UW have been some of the most productive of his distinguished career. He has been abetted in this work by

excellent UW colleagues who have supported his vision. Chief among these one should name his long-time collaborator Bruce Robinson and his more recent colleague Alex Jen who did a lot of the heavy lifting in pursuing the goals they shared. It has been a highly productive collaboration. Another facet of Larry's leadership is his unstinting support of younger colleagues both by injecting financial resources into their programs but also by encouraging them and advancing their cause with increasing responsibilities. Among these colleagues is Larry's successor as CMDITR Director, Phil Reid, who has made highly important and complementary contributions to the photonics program over the years.



This is just a short synopsis of Larry's contributions. A more extensive description can be found in the biography that can be found in the Festschrift published earlier this year in the vol. 112 of the *Journal of Physical Chemistry* in Larry's honor. More recently Larry was accorded a very special honor at the University of Washington. Last year, the first endowed chair was established at the UW named after one of the Department's most distinguished faculty members, Professor B. Seymour Rabinovitch. On September 12, 2008, a special event was held to install Larry as the first holder of the Rabinovitch chair. This is just one more expression of the high regard Larry's colleagues have for Larry and what he has accomplished. He has had a lasting impact on the Department of Chemistry at the UW (as well as other departments) to say nothing of the remarkable advances that he, his students and his colleagues have made in a number of scientific fields. No doubt he will be recognized with in many other ways in the years ahead, but for now we can be grateful that he has been our leader for the last half dozen years: he has taken the heat, agonized over complex decisions, burned the midnight oil time and again to meet report and proposal deadlines, and has gone well beyond the call of duty to serve his institution, his colleagues in the Center(s) and the nation. We thank you for your leadership, Larry, and we wish you well as you relinquish these daunting duties and turn your attention to other challenging tasks. However, we hope to benefit from your leadership in other more global forms for at least another decade or two!

- Alvin Kwiram

NSF SITE VISIT

Graduate student and postdoctoral presentations declared the *highlight* of the 2008 NSF Site Visit

Once a year, the National Science Foundation (NSF) convenes a team of reviewers to evaluate CMDITR before approving another year of funding for the Center. Last year, the Site Visit was held June 3-4, 2008 at the University of Washington in Seattle. The first day was devoted to presentations, posters, and question/answer sessions that helped the Site Visit Team (SVT) understand the full scale and operations of CMDITR. According to the SVT's report,

"of particular importance and value was the lunch with the graduate students of the center – this was a highlight for the SVT... The graduate students' and post-docs' familiarity with capabilities and goals of the larger project, how to work with them on the next phase of project, and where their efforts fit into that scheme, was impressive. (In fact, their posters made the case better than the Director's and Thrust Leaders' presentations!)"

The annual Site Visit is a serious evaluation of CMDITR's strengths and weaknesses, from management to research to education and diversity. As such, it's very different from our Annual Retreat and IAP Expo—which is supposed to be congenial, fun and educational for all. In contrast, Site Visit participants are carefully selected to represent the full spectrum of CMDITR activities. Presentations are "high stakes"—developed to inform our reviewers so that they can evaluate CMDITR's intellectual merit and broader impacts for further funding.

At the end of the first day, CMDITR leaders are given a homework assignment by the SVT, and are expected to report back on the second day. Usually, the assignment requests clarification of information presented during the day, and additional data that

help the SVT understand CMDITR's operations and future directions. The homework assignment has CMDITR leaders working late into the night to summarize data and thoughtfully respond to SVT questions and critiques.



The second day, enervated from the long night's work, and the previous day's activities, CMDITR leaders wait for hours as the SVT writes and submits its report. Normally calm Management Team members can be seen pacing the corridors, and emails are checked compulsively for the final report. Once the report is received a collective sigh can be heard, then the excitement begins again as the Management Team starts to digest the information that the SVT reported. The Center has 10 days to file a response with NSF. The report – and the response to it – serves as valuable guidance to the Center as it plans its activities for the coming year.

We are pleased to say that with the strengths of CMDITR's Year 6 efforts identified by the SVT, the NSF approved CMDITR's funding for Year 7 (August 1, 2008-July 31, 2009).

We extend special thanks to GPAC, led by Natalie Doss, and the graduate students and postdocs who participated in the Site Visit.

- Jeanne Small

Thank You

We thank our NSF Program Officers Verne Hess, Dragana Brzakovic, Connie Della-Piana, and our Site Visit review team:

Vicki Colvin, Chair, Rice University
 Shekhar Garde, Rensselaer Polytechnic Institute
 David Janes, Purdue University
 Rachel Segalman, University of California Berkeley
 Roger van Zee, National Institute of Standards and Technology
 Pierre Wiltzius, University of Illinois Urbana-Champaign

TECHNOLOGY TEAM UPDATE

New improvements are underway for the STC's website!

New STC Events Calendar

Find out about upcoming STC events at all campuses at:

<http://www.stc-mditr.org/events/>



Log in to add your own STC-related events to the calendar.

Podcasts and RSS Feeds Now Available for STC-Sponsored Events



- F.O.O.D. Seminar Series
- REU Seminar Series
- Nanophotonics for Breakfast Seminar Series
- Chemistry of Organic Electronic Materials

Leadership Lunch Discussion Forum and Seminar Recordings

We have something special for this second season of the Leadership Lunch series: a web discussion board, which gives you the opportunity to pose questions for the speaker prior to the event! Audio recordings of some talks are also available on the website:

<http://www.stc-mditr.org/education/leadershiplunch/>

Forum	Discussion	Replies	Last Post	Read Only
Advanced Questions for the Speaker	edwin	0		No

Online Course Material

Taught by Prof. Jean-Luc Brédas, Georgia Tech, Fall 2008

All available on the STC Members Only website at:

<http://convex.stc.arizona.edu/MembersOnly/Podcast/>

New & Improved Member Directory

The new directory makes it easier for you to find your Center colleagues. You can now upload a photo and a research statement to your profile, and to search others' profiles for keywords.

CMDITR's Technology Team

Suzy Hunter, Team Lead
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CALENDAR

Annual Retreat and IAP Expo

CMDITR Annual Retreat and IAP Expo to be held in Tucson, AZ, February 17-20, 2009

The University of Arizona will be hosting the CMDITR Annual Retreat and Industrial Affiliates Program Expo in February 2009, with over one hundred students, staff and faculty expected to attend. Log in to the STC website for more details.