

LIGHT WORKS

A bi-monthly newsletter for the NSF Science and Technology Center
on Materials and Devices for Information Technology Research

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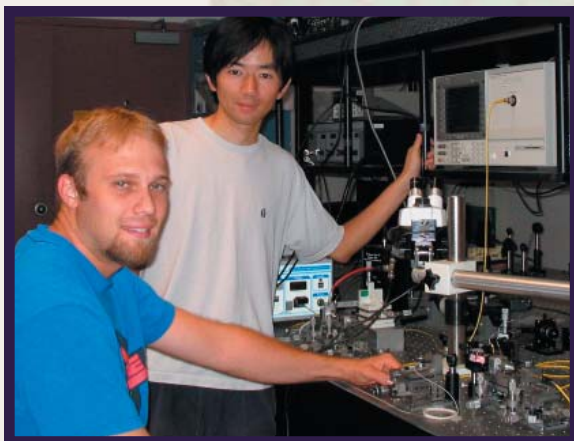


July/August 2005

CMDITR Department of Chemistry Box 351700 University of Washington Seattle, WA 98195

Low Drive Voltage Organic Fabry-Perot Etalons for Optical Modulation and Tunable Optical Filters

by Haiyong Gan, Christopher T. DeRose, Hongxi Zhang (Fallahi and Peyghambarian Research Groups, UA); and Jingdong Luo, (Jen Research Group, UW).



Chris DeRose and Haiyong Gan

The Fallahi and Peyghambarian research groups at University of Arizona and Jen research group at University of Washington have successfully incorporated electro-optic (EO) polymer and hybrid sol-gel material in a Fabry-Perot etalon and achieved highly efficient optical modulation with low drive voltages. Extinction ratios of ~ 10 dB at 5V voltage have been obtained using either AJL8/APC^{1,2} polymer or TCBD³/hybrid sol-gel materials. These Fabry-Perot etalons may be used as electro-optic devices such as optical switches, modulators, and tunable filters.

These results have become possible by combining the excellent performance of EO chromophores (AJL series and TCBD) synthesized by the Jen research group and the state-of-the-art optical design and fabrication techniques of the Fallahi

and Peyghambarian research groups. The Fabry-Perot etalons with EO polymer/hybrid sol-gel materials have been designed using Glass/ITO/DBR/EOP/DBR/ITO/Glass structures (ITO: Indium Tin Oxide; DBR: distributed Bragg reflector and EOP: electro-optic polymer) for transmission testing and Glass/ITO/DBR/EOP/Gold structures for reflection testing. The devices have been simulated and refined using advanced

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2005 Site Visit & Focus on Renewal

On June 28-29, 18 STC faculty, 19 graduate students and postdocs, 9 senior administrators, and 8 staff from six partner universities did their utmost to convey to NSF and this year's 6 external panelists the full extent of our research, education, diversity, and knowledge transfer progress and accomplishments.

Our reviewers showed a clear appreciation of our year-3 accomplishments and changes made as part of our reorganization. They prescribed thoughtful fixes to strengthen our position going into the Class of 2002 renewal process. In particular, we have been encouraged to clarify key technical barriers in our research thrusts as well as the Center's role in device prototyping. As a result of the Site Visit Team's recommendations, technology transfer will figure prominently in our renewal strategy.

All members are encouraged to review the 15-page Site Visit Report which can be found in our members-only document archive. Thanks to all who participated in the review for helping to make this a constructive exercise. Special thanks to Ed Wasserman, our Strategic Advisory Board Chair, Susan Ermer of Lockheed-Martin and Franky So of Osram Opto-Semiconductors for speaking on behalf of the Center.

Visit our website at <http://www.stc-mditr.org>

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Low Drive Voltage Organic Fabry-Perot Etalons . . . *continued from page 1*

optical thin-film design software. High finesse has been achieved by switching the absorptive electrodes (ITO) to outside the Fabry-Perot cavity and improving the surface quality of the Fabry-Perot etalon components. Both corona poling and contact poling have been employed to obtain good electro-optic performance. The two parallel schemes in both transmission mode and reflection mode have been applied in optical testing.

Research is underway to refine the device design in order to achieve even better optical modulation performance, including: (1) improving the electronics (with a smaller RC constant) for high speed optical modulation; (2) further improving Fabry-Perot etalon finesse for even lower voltage drive; (3) employing better performance EO chromophores with higher electro-optic coefficients and (4) improving the electric poling efficiency. Such low voltage and high speed electro-optic devices will have important applications in information technology.

- 1) AJL chromophores: a series of chromophores synthesized in Alex Jen (AJ) group by Jingdong Luo (L);
- 2) APC polymer: Amorphous Poly-Carbonate;
- 3) TCBD chromophore: (3-[5-(2-{4-bis-(2-hydroxy-ethyl)-amino}-phenyl)-vinyl]-thiophen-2-yl]-2,5-dicyano-4-[3-(3-hydroxy-propoxy)-phenyl]-hexa-2,4-dienedinitrile); ref: Optics Letters, 2005, (30) 117-119.

CMDITR Welcomes New Faculty & Research Groups

This month marks the start of CMDITR's fourth year of operations! We extend a warm welcome to the following newly funded faculty along with their graduate students, postdoctorates and staff researchers:

Professor Carl Bonner
Norfolk State University

Professor Peter Delfyett
University of Central Florida

Professor David Ginger
University of Washington

Professor Anthony Johnson
University of Maryland, Baltimore
County

We remind all faculty to update the CMDITR membership database in order to keep our directory as accurate as possible. *Only you know which members of your team are working on Center-related research and whether they should be classified as "participants" or "affiliates".* We also ask all those members leaving the Center to "check-out" so we can properly report our graduation rates and career placements.

The GEM Conference is a Gem

by **PaDreyia V. Lawson, Brédas Research Group, GT**

I recently had the pleasure of attending the 7th Annual Conference of the National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM). The conference took place in Boston, Massachusetts on June 29- July 1, 2005. This year's theme was "Building the Future Together: Leveraging the Power of One." The meeting focused on exploring the "graduate school experience" as a very personal process in becoming an independent thinker that is actually leveraged through the efforts of many different people, circumstances, and influences. Although this conference was geared towards individuals from underrepresented groups

in science and engineering, the workshops and information would be of great value to all students.

Dr. Catherine Millet, author and research scientist with Educational Testing Services (ETS), kicked off the conference with a talk entitled "Composing Your Graduate Student Life: Elements for Consideration". In this session she presented some interesting findings about the doctoral student experience which suggested that while things like establishing effective mentoring relationships, having work-life balance, and managing financial obligations may influence graduate student success, personal feelings, such as one's sense of self, are also key. Dr Millet's work

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GEM Conference . . .

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confirms what I and many others already know to be true: regardless of one's field, gender or ethnic background, graduate school is not easy and you need to surround yourself with a good support system.

One of the underlying themes throughout the conference was the importance of the mentor/mentee relationship. I think it is possible to develop a mentoring relationship with anyone, whether student, faculty, or staff. As Dr. Seth Marder of the Georgia Institute of Technology stated in the "Developing Successful Mentoring Relationships" workshop, students can even serve as mentors to each other. Simply having Dr. Marder and other panelists acknowledge the common fears which make many students and new faculty

. . . the most valuable aspect of the conference was simply the opportunity to network and talk with other students, to exchange ideas and experiences.

hesitant in the pursuit of mentor/mentee relationships left me and my peers feeling freer to seek out these beneficial relationships. This is really important for students and new faculty from underrepresented groups in which there are significantly higher attrition rates compared to their majority counterparts.

Accordingly, the most valuable aspect of the conference was simply the opportunity to network and talk with other students, to exchange ideas and experiences. It may seem trite, but it helps to

know what color the grass really is on the other side! This was significant for me as much of what you learn and need in graduate school does not come from course work, but from connecting with people whether it be at professional conferences, while conducting research, or just by chance. For me, the conference was encouraging and motivating. It was inspiring to hear the "experts," people who've already "made it" and now make it look easy, share feelings about their graduate school experiences that are so similar to my own.

CMDITR Announces First Ever GEM-STC Fellow: Myneeka Cook!

CMDITR is proud to announce the first ever GEM-STC Fellow – Ms. Myneeka R. Cook. Ms. Cook will be an entering Chemistry doctoral student at Georgia Tech this fall and has been selected as the recipient of the first "GEM-STC" Fellowship award. Since June 2001 until last month, she worked for IBM as a full-time Staff Engineer in their Process Limited Yield (PLY) sector while simultaneously completing her B.S. in Chemistry (May 2004) at the Polytechnic University of Brooklyn, New York. In addition,



Myneeka volunteered at several community centers and after school programs where she served as a mentor, tutor, and role model for minority students while helping them develop their technical skills and interests.

Welcome to the CMDITR Myneeka!

Candidates for the GEM-STC Fellowship are selected from the following underrepresented groups: African American, Mexican American, American Indian, Puerto Rican American, and other Hispanic Americans. The applicant must be a U.S. citizen at the time of application.

For further information about the GEM-STC partnership go to: <http://www.gem-stc.org>

After NSF site visit, CMDITR members enjoy a little R and R in Northwest Waters . . .

Orcas Island Sea Kayaking Trip

by Megan Leahy-Hoppa,
Hayden Research
Group, UMBC

At 5:30 AM on June 29th, eleven CMDITR members embarked on a voyage through the environs of the San Juan Islands.

Our journey began as we drove to Anacortes and boarded the ferry to San Juan Island. This was a first time experience for most of us. We arrived in Friday Harbor, and had a little bit of time to explore before our guides picked us up for the short drive across the island to our launch site. After unloading our kayaks and receiving our gear, we were given some brief lessons on safety and technique. Then we were as ready as we could be to launch our kayaks into the brisk



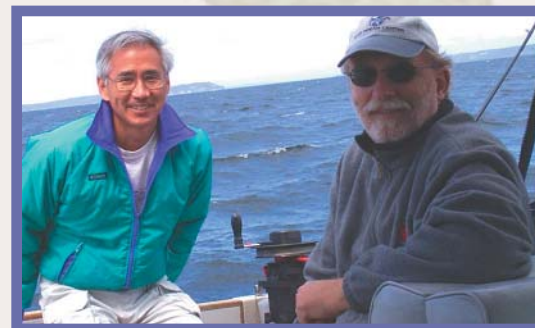
CMDITR GRAs and Staff at Sea Kayak launch site in the San Juan Islands.

48 - 50 °F water. Two at a time, we entered the water and climbed into our sea kayaks.

We paddled through a kelp forest, passed a bald eagle's nest and watched a peregrine falcon on the rock face near its nest. We saw sea otters sunning themselves, skipped rocks and tide-pooled off the shore of Dead Man's Cove where we stopped for a picnic lunch. On our way back to

our launch site we passed an old limekiln and saw some Native American petroglyphs.

Although our return trip did not get us back to Seattle until ~9:45 PM, 16 hours after our start, we shared an unforgettable experience.



Glen Shen and Neal Armstrong enjoy a little Salmon fishing in Puget Sound.

CMDITR Graduate-Postdoctoral Advisory (GPAC) Formed

By process of voting and volunteerism, the graduate students of the Center have assembled an advisory body to represent the interests of students and postdocs. The GPAC is meant to be a tool for these groups to provide input, as well as increase center awareness and communication.

Denise and James are coordinating the first meeting of the GPAC to take place this month. One representative from each of the principal partner universities (UW, UA, GT) will also be invited to sit in on alternating Management Team videoconference meetings in order to stay abreast of Center happenings and to air student/postdoctoral concerns.

Additional representation from Cornell, Norfolk State, and UCF is welcome at any time, as is greater involvement by postdocs. If you are interested in participating, please contact any of the representatives listed here.

Six representatives have been assembled as follows:

Denise Bale, GRA, UW

James Westphal, GRA, UW

Mike Brumbach, GRA, UA

Josh Haddock, GRA, GT

Terrell Neal, GRA, CIT

Megan Leahy-Hoppa, GRA,
UMBC

Stay tuned for action on suggestions from our February Retreat & the recent Site Visit.

CMDITR Spearheads UW Coalition to Hire Director for Diversity Recruitment

As part of the Center's commitment to diversity we are spearheading an effort at UW to develop a more systematic strategy for recruiting underrepresented minority graduate students through the hire of a Director for Diversity Recruitment.

Lead by the CMDITR, a group of Centers and administrative units at UW have pledged funding for an initial two year period to employ a Director for Diversity Recruitment. The short ad for this position is provided below. If you know of a strong candidate, we hope you will bring this opportunity to their attention.

The University of Washington seeks a trained professional to spearhead the development of collegial networks and innovative programs that will enhance diversity throughout the respective graduate STEM programs on campus. This individual will establish long-term relationships with target institutions, engage UW faculty, coordinate activities with various minority affairs programs, and shepherd candidates through and beyond the recruitment process. Candidates must have outstanding communication and interpersonal skills to interact with tact and diplomacy with students, families, and faculty, as well as demonstrated knowledge of cultural, economic, and political impediments and incentives to promoting diversity in higher education. Ability to travel 25-35%. To apply, log on to the UW Employment web site: www.washington.edu/jobs; search by Req #11475. Affirmative Action/Equal Opportunity Employer.

Transitions

The Center wishes to acknowledge the work and friendship of **Dan Doll, Manager of IP and Industrial Relations**. Dan has played an important role in managing our Industrial Affiliates Program and establishing close relationships with Center research teams in order to recognize and protect intellectual property. We wish Dan great success in his new role as a senior Director of the University of Calgary's Brain Institute.

The Center welcomes **Janis Hill, Fiscal Specialist II**, to the administrative team at UW. If you have not interacted with her already, you likely will soon as Janis handles an array of Center functions including travel, meeting preparation, and managing of subcontracts and sub-budgets.

UW CMDITR Barbeque and REU Send-Off

Friday, Aug 19 in CHB 102 and Lawn at the south end of CHB near the herb garden.

10:00 am - REU Poster Session (students, staff, and mentors only)

11:00 am - REU Poster Session open to all STC members

12:00 noon - Barbeque lunch

Come socialize with your STC colleagues and show your support for our summer interns! [If you plan to come for lunch, please rsvp to Glen at glenshen@u.washington.edu by 8/15]

UA REU Presentations and Poster Session

Poster Session - Wednesday, Aug 10, Student Union, Ballroom North & Catalina/Rincon, 1:00-3:00pm (all CMDITR members welcome)

"Congratulations" to the 2005 GT REU students who completed their research on July 28th and "Thank you" to all the staff, faculty, and graduate student mentors who made the program a success!

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MDITR
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Inside:

Highly Efficient Optical Modulation w/ Low Drive voltages achieved through Incorporation of EO polymer & hybrid sol-gel material in Fabry-Pérot etalon

Welcome New Faculty

First Ever GEM-STC Fellow

Site Visit & Focus on Renewal

GPAC Update

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**CMDITR Handbook
now available!**

This is a great tool for any member. Participants who have not received a handbook, by the end of August, please speak with your local coordinator, or email Glen Shen (glenshen@u.washington.edu)



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