

CENTER FOR LASER APPLICATIONS

Executive Summary

This has been an exciting year at the Center for Laser Applications. In this report you will find that our continued research themes are strong and successful, and our new initiatives are gaining traction in the research community. We had over two million dollars in research funds expended this past year and expect the next year to be even better. Thirty-six refereed journal articles were published by CLA faculty. We announced a new Center for Advanced Photonic Processing which is a formal alignment of CLA with laser materials processing at UT Knoxville and the infrared photonic processing efforts at Oak Ridge National Laboratory. We are working towards a serious program in nano manufacturing with several activities. We purchased a new high power femtosecond laser source for materials processing which will be the centerpiece for our nanofabrication efforts. This equipment will enable work in materials modification of photonic materials and diamond microelectronics. The laser, along with an ultra high vacuum system, vacuum compatible nano-positioning stage and reflection time of flight mass spectrometer will be housed in the CLA clean room which is scheduled for completion by the end of the calendar year. One use of nanoscale fabrication is to support Professor Davis' single molecule spectroscopy research. A proposal to the Center for Nanomaterials Science at Oak Ridge National Laboratory to study nanochannel fabrication for single molecule detection was approved. CLA now has access to this national resource. This nanofabrication effort will keep our ultra fast spectroscopy work on biomolecules at the cutting edge and solidify Prof. Davis' national prominence in single molecule spectroscopy.

Professor Moeller continues his work in non-equilibrium fluid (plasma) physics with several grants and a particularly large effort with General Atomics for hypersonic vehicle electric power systems. Professors Lewis and Chen have been successful in securing continued funding for their eye screening program and have launched an effort in laser induced breakdown spectroscopy for two-phase, time-dependant rocket combustion. The materials processing group (Hofmeister) secured funding from Advanced Powder Solutions for net-shape consolidation of nano-encapsolated powders. This effort includes

collaboration with Oak Ridge National Laboratory under the banner of the Center for Advanced Photonic Processing. Professor Dahotre was elected a Fellow of ASM International, Received the UT Chancellor's Research and Creativity Achievement Award, the College of Engineering Research Fellow Award, and continues to work on surface modification using lasers. Industrial interest in our capabilities remains strong. We performed educational and consulting services for Fisher USA, and are negotiating with Baker Oil Tools and Lennox to implement LSI technology in their businesses portfolios.


We submitted several proposals this year to NIH, NSF, DEPSCoR and DARPA programs. The NSF NIRT submission last year was not successful and will be resubmitted this fall with the reviewers concerns addressed. The general theme of these proposals is to combine nanofabrication with single molecule spectroscopy and build on the strengths of Prof. Davis' and Hofmeister's nationally recognized expertise.

The key to success in a research institution is the talent and innovation of its scientists and engineers. In the past year we have added four postdoctoral fellows to our personnel pool: Lino Costa from Instituto Superior Tecnico, Lisbon, Portugal; Xiaoxuan Li from the University of Connecticut; Yelena White from Vanderbilt University, and Zbigniew Sikorski, from Warsaw University of Technology, Warsaw, Poland, by way of CFD Research in Huntsville, Alabama. These individuals are making significant contributions to our research endeavors. The UTSI revitalization plan is driving the addition of faculty to the materials science area at CLA. One tenure track and two research faculty positions in materials science will be available next year.

Our ability to hire new postdoctoral fellows and secure state-of-the-art equipment comes from a realignment of the resources of CLA. We have shifted funds from tenured and research faculty salaries to postdoctoral fellows and equipment. This also enabled hiring seven summer interns (high school and undergraduate) to participate in research in CLA's laboratory.

This year we made major advances in our community outreach. CLA is dedicated to impacting our community in a positive way and meaningful interactions with area students is a great contribution. To supplement our "tour" programs, we coordinated "mini-courses" with UTSI faculty for high school students, conducted three science camps this summer, and employed seven interns.

We did have our share of sadness with the passing of Mr. Fred Schwartz on December 6, 2005. Fred was a technician with CLA since its inception. His enthusiasm and competence will be sorely missed. Fred was a major driver in the laser materials processing area and developed many applications for CLA processes with industrial partners in Tennessee. His work ethic and spirit were an inspiration to all.



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