



Message from the Director

It is with great pleasure that I welcome you to this inaugural issue of the "News of the Infinitesimal." This newsletter and its subsequent issues are dedicated to the coverage of news and information associated with the Institute for Micromanufacturing. Since its inception over a decade ago, the Institute has been carrying out leading-edge research and development efforts, resulting in micro- and nanosystems for biomedical, biological, environmental, chemical, information technology, and other applications. The vision of the Institute is to be a world-class resource for the realization of commercially-viable micro- and nanosystems, contributing to the economic infrastructure of Louisiana and the nation, and benefiting humanity as a whole. The Institute's activities in its main research and development thrust areas of Biotechnology, Nanotechnology, Environmental Technology, and Information Technology are firmly established, and are expected to vigorously progress and further grow, as we look into the future. A wide range of externally spon-

sored research and development efforts are carried out by the Institute faculty and staff. These professionals have formal training and expertise in a wide range of science and engineering disciplines, and are highly skilled in carrying out interdisciplinary projects. The Institute also provides foundry services for the realization of a broad range of micro- and nanosystems. In addition to fabrication and processing, services for testing and measurements, and modeling and simulation are also available. Moreover, educational and technical training programs (e.g. short courses and workshops) are available for on-site and off-site delivery.

I hope you will enjoy reading the present and future issues of this newsletter, as you are kept updated about the Institute for Micromanufacturing, and the accomplishments of its faculty, staff, and students. I also welcome your comments and feedback.

Kody Varahramyan, Director



Dr. Kody Varahramyan, Director
 Institute for Micromanufacturing

Specialization ~ Micro- and Nanofabrication Processes, Materials, and Devices for Integrated Micro and Nanosystems

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Special points of interest:

- Nanotechnology
- Biotechnology
- Environmental Technology
- Information Technology

Professor Paves Way in Nanotechnology Studies

This item originally appeared in the Feb. 19, 2004, issue of The Tech Talk, By Jordan Marshall, Staff Writer

Tech is leading the way in nanotechnology, Dr. Yuri Lvov, an associate professor of chemistry for the Institute for Micromanufacturing, said. Lvov said the IfM is one of the world leaders in layer-by-layer polymeric nanoassembly. "Layer-by-layer assembly is the producing of nanometer thick films with molecularly organized internal structure," Lvov said. "It is based on alternate

absorption of oppositely charged polymers, enzymes and nanoparticles kept together by electrostatic attraction." Lvov established the method of nanofabrication by self-assembly at the university. Lvov, who works closely with Dr. Mike McShane, an assistant professor of biomedical engineering, on the self-assembly research, trained five professors and more than 80 gradu-

ate students to work with him. Jingshi Shi, a doctoral student of engineering, works with Lvov on the layer-by-layer self-assembly. She said she enjoys working on the process and hopes to continue working on it after she graduates. "I like it because it's simple to understand, not expensive and very

(cont. pg 2)

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 Comments are welcomed!



Professor Paves Way in Nanotechnology Studies

(cont. from pg 1)

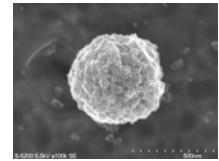


Dr. Yuri Lvov
Associate Professor
Chemistry/IfM
Ph.D. Moscow State University
Specialization ~
Self Assembly Nano-Systems

easy to set up," Shi said. Lvov said one of his research teams is working on a project using the layer-by-layer self-assembly on drug encapsulation. "We make drug micro-particles similar to a tiny submarine which will deliver the drug to a sick cell and treat it," Lvov said. Treating the sick cells is important, because the less drug dosage one takes the better treatment he or she receives, Lvov said. Malcolm Prouty, a doctoral student of engineering, works on the research to develop the submarine-type micro-particles. Prouty said he has been working on the research everyday for about three or four months. "It is a

lot of work, but research and development is what I want to do, so this is good experience," Prouty said. Lvov said he is also using his research in layer-by-layer assembly on biocompatible modification of eye lenses which makes lenses friendlier to eyes. Lvov chaired a conference in New York City this fall about the research the university has been doing on layer-by-layer self-assembly. Lvov said it was very successful and attracted hundreds of famous scientists from other countries including Japan, Germany, France, Russia and the United Kingdom. Lvov said the conference opened the university and its

students to contacts and opportunities for grants. "The students met famous people and made connections, as well as having a first-hand experience," Lvov said. Lvov said the leadership in nanotechnology here attracts industry and in turn brings hundreds of thousands of dollars to the university.

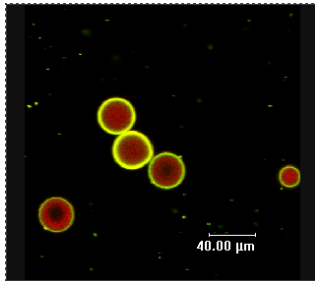


Bionanoreactor - 450-nm diameter.
Engineering devices with virus size!

BioMINDS Lab

The BioMINDS lab under the direction of Dr. Michael McShane is pursuing development of novel analytical systems for chemical and biochemical analysis, largely based on optical spectroscopy. Microfabrication and nanoscale self-assembly methods are being used to produce devices for monitoring chemicals in liquid phase. These systems include fluorescent micro/nanoparticles and capsules for extracellular and intra

cellular use, implantable sensors for diabetes monitoring, optical waveguide-based biosensors for chemical and biological defense applications, MEMS devices for infrared and photoacoustic spectroscopy, and micro/nanostructured cell scaffolds with integrated sensing elements for basic science and tissue engineering applications.



Confocal Image of
Glucose Sensors



Dr. Michael McShane
Assistant Professor, BME/IfM
Ph.D. ~ Texas A&M
Specialization ~ Biomedical Optics
Biosensors, BioMEMS/Nanotechnology

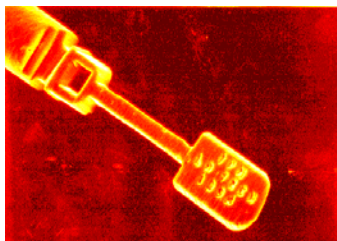
History of IfM

The vision for the Institute for Micromanufacturing (IfM) began in 1985 when university officials began discussing the idea of manufacturing microscopic devices and ten years later, the dedication of the new IfM R&D building was held October 15, 1996. The original name was Manufacturing Systems Engineering Research Center (ManSER) and became IfM in 1991 with the awarding

of the DoE IfM Construction / Equipment Grant. With the assistance of Senator Bennett Johnston, \$10 million in funding was approved for the Institute for Micromanufacturing and its components. Ground breaking for the IfM facility began on December 16, 1994 with a formal ground-breaking ceremony in the Louisiana Tech University Student Center and on site.

Since the beginning of IfM, there have been four Directors: Dr. Robert Warrington, former Department Head for Mechanical Engineering in the College of Engineering and Science, and one of the original planners with the vision for IfM; the second was Dr. Barry Benedict, former Dean of the College of Engineering and Science; the third was Dr.

(cont. pg 3)



Official Groundbreaking Shovel
Measures 10 : m
Reads: IfM, LA Tech, 1994



History of IfM *(cont. from pg 2)*

James Maxwell, professor of Mechanical Engineering; and the fourth and present Director is Dr. Kody Varahramyan, Cordaro/Entergy Distinguished Professor and former Associate Dean of Research and Graduate Studies for the College of Engineering and Science.

Today the Institute for Micro-manufacturing (IfM) consists of three components, totaling 65,000 sq. ft. of user facilities. These are the R & D facility at Louisiana Tech University in Ruston, LA; the X-ray beam lines and lithography processing facility at the Center for

Advanced Microstructures and Devices (CAMD) in Baton Rouge, LA; and the Technology Transfer Center in the Shreve Industrial Park in Shreveport, LA. The R & D facility is housed in a modern 41,000 sq. ft. building on the main campus in Ruston, designed specifically for research and development in micro/nano scale technologies and systems. The R & D complex includes Laboratories occupying 20,000 sq. ft. of environmentally controlled workspace, and contain 5,000 sq. ft. of modular clean rooms. The laboratory facilities provide a full suite of micro- and nanomanufacturing capabilities,

and a comprehensive set of measurement and characterization tools, as well as modeling and simulation software.

Today the IfM is an integrated nanomanufacturing and micro-manufacturing center, dedicated to micro/nano scale technologies and systems research, education, and commercialization with over 30 faculty and postdoctoral scholars associated with the IfM, which also has a support staff of 15, including research engineers and specialized technicians.



The uniqueness of IfM shows even in the design of its front entrance.

Faculty, Staff, and Associates Expertise

The Institute's faculty and staff have training and expertise in a wide range of science and engineering fields, including chemistry, physics, biology, materials science, mathematics and statistics, biomedical engineering, chemical engineering, electrical engineering, mechanical engineering, industrial engineering, and civil engineering. The comprised faculty, staff, and post docs, plus numerous associates from the College of Engineering and Science; College of Applied and Natural

Science School of Biological Sciences; Center for Entrepreneurship and Information Technology; and other universities constitute many of the IfM partners. The technologies that have been developed and/or are currently under development for commercialization by these professionals, include:

- Micro/Nanosensor Technology Platform for Biological, Chemical, and Physical Sensing
- Micro/Nanoshells Tech-

nology Platform for Artificial Cells, Drug Delivery, and Other Applications

- Mirco/Nanoreactor Technology Platform for Chemical and Environmental Applications
- Polymer Microelectronic Technology Platform for IT and Other Applications
- Wireless Micro/Nanosensor Network for Physical, Chemical, and Environmental Monitoring Applications

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★
 ★ **New Patent Issued** ★
 ★ **to Members of IfM** ★
 ★ **Process to Fabricate** ★
 ★ **Silica Like Structures** ★
 ★ **by X-Ray Irradiation** ★
 ★ **or GR 650 Spin-On** ★
 ★ **Glass Films** ★
 ★ **Philip Coane, Vijay-** ★
 ★ **Anandh Shanmugam,** ★
 ★ **and Mike Vasile** ★
 ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

Student Named to Academic Team

Exerts from the 03/07/04 edition of the Ruston Daily Leader News Service

A senior chemical engineering major at Louisiana Tech has been named to the USA Today's 2004 All-USA College Academic Team. Kyle Guice of Ruston, earned an honorable mention in the USA Today competition and was one of only two Louisiana students to make the academic team. The names of the winners who were chosen for the College Academic Team appeared in the Feb. 12 edition of USA

Today. Guice's selection was based on submissions by the nominee that included an essay on his undergraduate research work in nanotechnology and letters of recommendation from Dr. Bill Elmore, program chair of the chemical engineering department; Dr. Michael McShane, a assistant professor of biomedical engineering and Dr. James Nelson, the associate dean for undergraduate studies in the College of Engi-

neering and Science at Tech. "They've always been supportive," Guice said. Guice's research project is funded by NASA and involves oxygen nanosensors for use in micro-gravity. He has been working on the NASA funded project since his sophomore year. McShane served as project director for Guice's research work and called the the 4.0 undergraduate "remarkable."



Kyle Guice
 Chemical Engineering Major
 Louisiana Tech University



Louisiana Tech University

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“Smaller, Lighter, More Functional, Higher Quality,
 and Less Expensive Consumer Products,
 Industrial Machines, Instruments...
 Possibilities Limited Only by One's Imagination”



We're On The Web!

latech.edu/tech/engr/ifm/

Vision and Mission

The vision of the IfM is to be a world-class resource for the realization of commercially-viable micro- and nanosystems, contributing to the economic infrastructure of Louisiana and the nation and benefiting humanity as a whole.

The mission of the IfM is:

- h To research and develop novel micro and nanosystems for biomedical, biological, environmental, chemical, information technology, and other applications
- h To generate and harness commercially viable intellectual property
- h To partner with industry, government, and academia in economic development

- h To transfer new technology and provide technical training to industry and government
- h To develop curricula and educate students in micro/nano scale technologies and systems

The IfM offers a wide range of microtechnology capabilities for the realization of micro electro mechanical systems (MEMS), as well as a complementary array of nanotechnology capabilities for MEMS and other applications.

Nanotechnology, Biotechnology, Environmental Technology, and Information Technology constitute the four major research and development thrust areas and centers of excellence of the IfM.

Examples of projects include:

BioMEMS efforts aimed at the development of select commercially viable micro and nanosystems for biomedical and biological applications; EnviroMEMS efforts aimed at the development of select commercially viable micro and nanosystems for environmental and chemical applications; Nanotechnology efforts directed at the development of select commercially viable nanotechnologies for BioMEMS, EnviroMEMS, and other applications; Information technology efforts are directly supportive of the State of Louisiana IT Initiative and current efforts include projects for the realization of enabling micro/nanotechnologies for information sensing, storage and processing.



*Institute for Micromanufacturing
 Louisiana Tech University
 Ruston, LA*