



Louisiana Tech University Ranks Third in the Nation in Micro/Nanotechnology Education

A recent survey by Small Times Magazine has published its top 10 universities by category. The survey included 26 questions about funding, facilities, patenting, company formation, collaborations with industry, research, publishing, and micro and nano-specific courses and degree programs. It also gave respondents an opportunity to state which of their peer institutions they

thought were leaders in micro and nanotech research and commercialization.

The survey results, ranked Louisiana Tech University third in the nation for micro/nanotechnology education.

This is in recognition of the comprehensive degree programs at the undergraduate and graduate levels, with the supporting courses and laboratory resources, that have been

developed at Louisiana Tech University in the micro/nanotechnology area. As a part of this, the magazine also praised the number of topics at Tech that can lead to degrees; the fact that many students who pursue doctorates in engineering conduct research at Tech's Institute for Micromanufacturing; and the number of faculty and students who conduct micro and nano research.

Start-Up Companies from IfM Research

As reported in Volume 3, Issue 2 of the News of the Infinitesimal, our series featuring start-up companies continue with the Nano Pulp & Paper Company, highlighted below. Future newsletters will highlight other start-up companies based on technology developed at the Institute for Micromanufacturing.

Nano Pulp & Paper Company

The Nano Pulp and Paper Company offers nanotechnology know-how and nanoassembly processes to maintain worldwide competitiveness for the North American pulp and paper industry. It is based on technology developed at the Institute for Micromanufacturing (IfM). Louisiana and some other states in the nation are home for the forestry,

pulp and paper industries. That is why it is so important to develop and improve pulp and paper technology and to establish cooperation with companies in Louisiana and the nation.

The Nano Pulp & Paper Company is ready to implement proven nanotechnologies, developed at IfM in collaboration with the School of Forestry at Louisiana Tech University.

The company's mission is:

- To develop and implement nanotechnology for novel pulp, paper, and nano/capsule products based on Tech's intellectual property.

- To promote Tech's research results in industry to help licensing of the corresponding patents.

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Special points of interest:

- Nanotechnology
- Biotechnology
- Biomedical Nanotechnology
- Environmental Technology
- Information Technology

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 Comments are welcomed!



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•To produce nano-modified pulp and mill-broke recycling.

•To offer technical services via applying nanotechnology concepts to current products.

Layer-by-layer(LbL) assembly technology can be readily introduced into the current paper making process, the

main thrust of the expertise and patented pulp & paper nano-assembly processes and products of the new company. For example, with lignocellulose fiber nano-coating one can double paper strength and essentially increase paper recycling by LbL-processing of mill broke. The company is considering new wood product develop-

ment, such as use of cellulose fibers and microfibrilles as tablet filler, and stabilizing colloidal solutions of different materials.



Dr. Yuri Lvov, T.C. Pipes Endowed Chair, Professor of Micro and Nanosystems. President of NP&P



Ruston-Lincoln Chamber of Commerce Leadership Lincoln Class Visits IfM

Excerpts from RLCC Press Release by Nancy Bergeron, May 19, 2006



Front Row: L-R: Dr. Kody Varahramyan, Director IfM, Shannon Lolley, Andrew Yepson, Lesia Amanuel, Tammy Butler, Kim Benoit; Back Row: L-R: Gregg Phillips, Jim Pesnell, Daniel Taylor, Ben Lee, Scott Terry, President of RLCC, and John Emory, Jr.

Business leaders of Ruston and the surrounding community, and members of the Leadership Lincoln class from the Ruston-Lincoln Chamber of Commerce, accompanied by Mr. Scott Terry, President of the RLCC, visited the Institute for Micromanufacturing on May 18, 2006. During the visit they were given an overview and tour of the IfM by the Director, Dr. Kody Varahramyan.

The leadership program is designed to help participants develop their leadership skills, and be more effective leaders in their workplace, and community affiliations.

After seven months of examining topics, including education, health care, economic development, manufacturing, public services, and tourism, participants of the Leadership Lincoln Class became the 19th class to graduate on May 18, 2006.

Nanotech Research Races; Concerns Over Ethics Follow Close on Its Heels

Story by Jordan Blum, Reprinted from the Monroe News-Star, Sunday, June 26, 2006

From microchip implants in humans to omnipresent nano-sized sensors that could track activities in homes and workplaces, technology research is moving at an ever rapid pace.

But more attention is now being paid to ethical and long-term issues in micro- and nanotechnology research, including Louisiana

"We're encouraging all our researchers to look at the social implications of our research," said Les Guice, Tech Vice President of Research and Develop-

ment. Some are more willing to press forward.

At Harvard University, John Halamka, the medical center's chief information officer, had a computer chip implanted into his right arm that contains his entire medical history, according to *The Chronicle of Higher Education*.

The radio-frequency identification device would allow doctors in an emergency room to access his medical and prescription records by waving an electronic reader over his arm.

Louisiana Tech is using such RFID devices in its re-

search, but not for human implants, said Kody Varahramyan, director of Tech's Institute for Micromanufacturing.

Tech is developing very cheap RFID sensors that could be used to track products on supermarket shelves or in manufacturing plants, he said.

They could be placed in homes of the elderly, for instance, so family members could monitor them, allowing people to live independently longer, Varahramyan said.

Other sensors in development could be used by the government to detect chemi-

cals in case of accidents, spills or terrorist attacks, he said.

"But another issue people are looking at is that a practically unimaginable amount of data will be collected this way — from every person in the whole world," Varahramyan said. "So we'll need much more computer capacity."

No technological advance comes without the potential for abuse, he said. So researchers are constantly looking at security and counter-measures.



Second Annual Poster Symposium on Novel Concepts in Nanotechnology

On May 19, 2006, students from Dr. Chad O'Neal's Nanotechnology Principles course presented posters in the Second Annual Poster Symposium on Novel Concepts in Nanotechnology. This course is one of the core courses for the Micro/Nanosystems graduate programs at Louisiana Tech University. There were also six upper-level undergraduate students participating. The student posters described novel research ideas in the area of nanotechnology for which they had developed and written fifteen page NSF style proposals. This was their final course project, which they had

worked on for a large portion of the spring quarter. The goal of this project was for the students to gain some experience doing a literature search, analyzing published research, and then creating a novel research idea and developing it into a feasible research proposal. The students were free to expand on existing research ideas or develop something completely unique. The proposals followed the NSF guidelines for proposals and emphasized the work plan, preliminary work, feasibility, intellectual merit, and broader impacts. The posters created were graphical presentations of the stu-

dents' plans and were presented by the research teams comprised of three to five students each. Nine groups presented their posters to an audience of students, faculty, and I/M staff. Faculty members evaluated these posters and the research concepts as part of the evaluation process. The symposium was a great success, with many new research ideas generated that will result in innovative projects.



Dr. Chad O'Neal
Assistant Professor MEEN/I/M



Work Runs on Hope of Gasoline Alternative

Story by Anna Holton, Reprinted from the Louisiana Tech Magazine, Spring/Summer 2006 Edition

Anybody tired of paying high gas prices should perk up at the prospective benefits of Dr. Tabbetha Dobbins' recent research. Dobbins, an assistant professor of physics in a joint faculty position between Louisiana Tech and Grambling State universities, is working on the development of a safe hydrogen fuel as an alternative to gasoline.

"President Bush, in his most recent State of the Union address, discussed the need for the development of technology for renewable energy," Dobbins says. "New technologies must meet energy demands at costs low enough to satisfy the energy consumer. One response to the energy problem is the fuel cell which runs on hydrogen fuel."

Once perfected for use,

these fuel cells are slated for automotive application by the U.S. Department of Energy Freedom Car Project. However, in addition to automobile fuel, hydrogen can also be used to power electrical plants and buildings.

Dobbins says the obstacle standing between hydrogen fuel and highway use is the safe on-board storage of the fuel.

"Hydride materials, which contain chemically bound hydrogen atoms, are being researched for their ability to meet on-board hydrogen storage requirements," Dobbins says.



Dr. Tabbetha Dobbins in her laboratory at the Institute for Micromanufacturing.

"Hydrogen can be safely stored in these materials and hydrogen gas can be released on demand."

Dobbins' research specifically targets the role of catalysts in the hydride materials.

"These catalysts reduce the temperature of hydrogen gas release to below 125C and also increase the rate at which hydrogen gas can be released from the hydrides," Dobbins says.

Motivated by the technical challenges faced by the United States and the world, and the need to meet future energy consumption demands, Dobbins has been working on hydrogen research since early

2004.

"At present, the U.S. Department of Energy has set goals, targets, and deadlines for hydrogen storage materials," Dobbins says. "Leading scientists have indicated broad area scientific research directions. Also, individual scientists, and collaborative groups of scientists are working on innovative approaches to solving key technical challenges associated with these materials."

Dobbins says all of these factors, combined with cutting-edge technologies, "make the energy problem an exciting one to work on at this time."

Dobbins' research is funded by the Basic Energy Sciences Division of the Department of Energy, the Division of Materials Research of the National Science Foundation and the Louisiana Board of Regents.



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Vision and Mission

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

The mission of the IfM is:

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

- ✧ To transfer new technology and provide technical training to industry and government
- ✧ 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, Biomedical Nanotechnology, Environmental Technology, and Information Technology constitute the five 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.



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