

# Biological & Agricultural Engineering



Report to Stakeholders

October 2011

## About the LSU AgCenter

The LSU AgCenter is dedicated to providing innovative research, information and education to improve people's lives. Working in a unique statewide network of parish extension offices, research stations and academic departments, the LSU AgCenter helps Louisiana citizens make the best use of natural resources, protect the environment, enhance agricultural enterprises and develop human and community resources.



## Academic/Research/Extension Highlights

Bioengineered coastal reef development can reduce coastal storm surge, enhance coastal wetland ecology and jump-start oyster production in areas where salinity has changed because of diversions. Work on coastal reefs by Steve Hall (BAE) and others shows that using a small framework that encourages native species such as eastern oysters to develop reefs can serve a number of functions, including producing oysters, reducing or reversing erosion and protecting coastal areas.



Controlling RNA function of cells plays a critical role in gene expression and governs many biological processes. No RNA-based drugs are currently on the market, but the total annual RNAi therapy market is expected to reach \$580 million by 2012. Engineers in the BAE department (Todd Monroe and others) are using photosensitive chemicals that inactivate selected genetic material until exposed to light. By controlling small regulatory RNA molecules using light-sensitive "photocaged" chemistries, the desired applications can be targeted and pinpointed through laser activation within particular cells. This reduces effects on surrounding cells and the overall effect on impacted organism (whether a human or an animal).

Research on aerial and ground-based chemical delivery systems for agriculture fields indicates spray quality and uniformity are significant issues. Skyrocketing aviation and high diesel fuel costs require improved efficiencies. BAE engineers (led by Roberto Barbosa) are developing improved measurement techniques, while advancing the effectiveness of application approaches that use less carrier material (primarily water). Less water means less energy to transport and apply the desired materials.

The Louisiana House and the Sustainable Landscape Program are fundamental resources that help Louisiana residents understand and improve their resource use (energy, water, etc.) in the home. Claudette Reichel, Diana Scimeca, Pat Skinner, Kyle Huffstickler and a host of others are involved in creating demonstration resources on innovative building and management practices. Demonstrated building systems to withstand hurricane and flood issues are also a part of the LaHouse program. Sustainable landscape systems (turf and landscape plants) that employ native plants and other efficient landscape systems are also demonstrated within this program.



## Department of Bio & Ag Engineering Office

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### Academic Focus:

B.S. in Biological Engineering; M.S. in Bio & Ag Engineering; Ph.D. program in Engineering Science for students interested in medical, industrial, environmental consulting, government and academic careers.

### Research Focus:

Biomechanics; nano- and micro-scale applications toward human, plant and animal environments; water resources; bioprocessing; coastal systems; biofuel production, processing and management.

### Extension Focus:

Water resources engineering; precision agricultural production, processing and application systems; building safer, stronger, smarter housing; hazard identification and mitigation; land management planning; support of 4-H University, AgMagic and other extension initiatives.

**Significance of Programs**

- Numerous disclosures on techniques that will benefit Louisiana citizens through biobased energy, lab-on-a-chip technologies, processing and managing nanoparticles (microminiature particles), microwave processing of agricultural commodities and sensing approaches.
- Projects aimed toward immediately critical issues such as an improved skimmer for the Gulf Oil spill.
- Conversion and animal waste separation technologies designed to improve the economic potential for processing agricultural byproducts into biobased energy.
- Improved resource utilization (water and energy) for more efficient use of available resources, while maintaining economic viability.

**Department of Bio & Ag Engineering Facts**

- **Outstanding undergraduate program with strong emphasis in training future medical doctors, environmental consultants and those seeking graduate training.**
- **High-achieving undergraduate students, including three Goldwater Scholars and several students attending combined M.D./Ph.D. programs.**
- **High-achieving faculty, including an NSF CAREER Award Recipient, an Alumni Professorship, those receiving national recognitions and Federal competitive funding.**
- **Outstanding teachers who truly care about the students.**
- **Research and extension faculty with a true vision toward the mission of the LSU AgCenter.**

**LSU AgCenter Departments and Schools**

Maximizing the potential for the state's agricultural industries and improving the quality of life for all Louisiana citizens are the major initiatives of the LSU AgCenter.

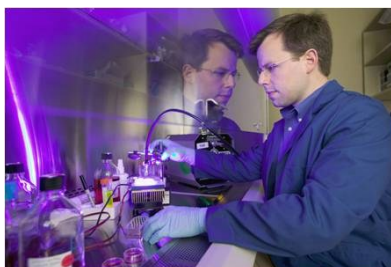
To achieve its mission of serving the people of Louisiana and providing them with the latest research-based information on a vast variety of topics, the LSU AgCenter operates 11 academic departments/schools in Baton Rouge in conjunction with the LSU College of Agriculture. In addition, four other specialized departments also contribute to the mission. These 15 units are an integral part of the LSU AgCenter's research and outreach activities.

Faculty members in the LSU AgCenter's on-campus units are involved in a variety of efforts, including research, classroom teaching and extension education. They cover topics ranging from agricultural economics to human ecology and from entomology to experimental statistics.

The LSU AgCenter has the most successful record of commercialization of intellectual property in the LSU System. Since 2000, nine new companies have been started based on licensed technology from LSU AgCenter. The income is distributed among the LSU System, the inventors and more research.

**Future Plans**

- Explore the influence of nano-material toxicity as it applies to adult, adipose-derived stem cells, and the toxicity, transport and fate of such nanoparticles in aquatic systems and Understanding how these materials interact in target organisms and the environment is essential to their viability as treatment mechanisms.
- Vitamins, antioxidants, and other bioactives can be protected against degradation and delivered efficiently with the food, for improved food quality, food safety and human health.
- Pasteurization and sterilization of liquid products using microwave heating can improve overall energy use and space requirements when compared with conventional heating technologies.
- Calibration and improvements in chemical delivery systems (liquid and solid), including precision techniques for farmers, crop dusters, fertilizer and pesticide cooperatives, and landscape personnel, are essential to improving the efficiency of application, while minimizing potential off-site issues.
- Improve technologies for skimming and separating oil after an oil spill (at right).
- Increase efficiency in energy and water use for agricultural and landscape irrigation systems requires strategic training of personnel and assessment of current equipment. New investigations, while partnering with appropriate collaborators (NRCS), can yield significantly improved resource utilization.



For the latest research-based information on just about anything, visit our website: [LSUAgCenter.com](http://LSUAgCenter.com)