Researchers to Watch

Expanding knowledge in a new millennium

In the past, many scientists at the University of Louisiana at Lafayette have earned national and international recognition for their research findings. As the university enters its second century and a new millennium, other outstanding UL Lafayette investigators are emerging as leaders as they explore new frontiers. • Here are some examples of their work, which will help shape the way we live in the 21st Century.

SAFER PLANES

How can air travel be made safer? Fulbright Scholar **Dr. Fahmida Chowdhury** and three colleagues at LSU and UNO are jointly exploring three techniques that, when combined, may prevent many single airplane crashes.

They are concentrating on improved detection of electrical or mechanical failure; earlier warnings that would enable pilots to take corrective action sooner; and more sophisticated control systems that can operate safely in conditions that cause conventional systems to fail, such as severe thunderstorms.

Chowdhury is an electrical engineering professor.

ALGAE HAVE ANSWERS

Biologist **Dr. Suzanne Fredericq** is studying the relationships of marine red algae from around the world. She examines their structure and DNA sequences to determine how they are related and where they came from.

The seaweed can "tell us a lot about the health and history of the oceans," she said. She refers to some algae as "indicator species" because they are the first to adapt to environmental changes.

Fredericq discovered a new order of red algae in 1989.

FREE TRADE

Free trade—the buying and selling of goods and services unhampered by tariffs and other barriers—will not destroy the nation's economy, says **Dr. Lewis Gale**, a UL Lafayette economist. Instead, it would help, especially in more subtle ways that benefit local economies. For instance, consumers might pay more for imported cars because of import fees. Without these fees, they would pay less. That "savings" is likely to be spent close to home, expanding the local economy, he said.

Gale's research also shows that Louisiana's economy lags behind other states' because of its relative scarcity of highly skilled labor. The solution? More money should be spent on targeted education and infrastructure projects, he said.

MAKING PROGRAMS LAST

While technology is evolving at a dazzling speed, with handheld mobile computing already a reality, the foundation of the Internet is built on "yester-era" mainframe computers, with their decades-old programs.

"Keeping these legacy computer programs up-to-date is a nightmare since they are written in programming languages—the computing equivalent of dinosaurs—that are rarely taught in schools," said **Dr. Arun Lakhotia** of the Center for Advanced Computer Studies.

He has found ways to simplify the logic of these programs so that new programmers can comprehend them. He has also developed tools for translating these computer programs to new languages. He is one of only a handful of researchers around the world who specialize in rejuvenating legacy programs.

BUSINESS TO BUSINESS

If you've ever purchased an item online, you know about "b2c e-commerce" or business-to-customer electronic commerce.

But "b2c" makes up less than 15 percent of the e-commerce marketplace, according to **Dr. Ramesh Kolluru**, A-CIM associate director of

research, and the AAMA/BoRSF Chair Professor. "b2b e-commerce" composes the rest.

For "business-to-business" e-commerce, the Internet is like the Tower of Babel—there is no accepted standard for information exchange.

Kolluru leads a UL Lafayette team (Dr. Paul Meredith, Al Steward and Dr. Stanford Smith) that has been asked by the National Science Foundation to develop a communication architecture that can be used universally by businesses for e-commerce and collaborative management. Researchers from Clemson University collaborate on this project.

MEDIA STUDIES

Dr. Patricia Holmes, an assistant professor of communication, is interested in the promotion and preservation of African culture through its media. She recently concentrated on Sierra Leone, where she found that television broadcasting systems in the civil war-torn country were a product of the British colonial-broadcasting systems. According to Holmes, these systems conflicted with the African people's culture and language. For the past year, she has researched the role of women in radio broadcasting in Ghana.

TAKING IT TO THE STREETS

During the Community Design Workshop conducted by **Dr. Tom Sammons** in the School of Architecture each year, the community becomes students' laboratory.

Upper level students provide expertise in urban planning and landscape design, as well as architecture, housing and preservation. "They help cities, small towns, and neighborhoods visualize their potential as communities," Sammons said.

For instance, the Workshop has produced urban design and planning strategies for Breaux Bridge, La., and for the transformation of Lafayette's Oil Center from a suburban office park into an urban pedestrian landscape. It also proposed the planning and redevelopment of the Simcoe Street Corridor.

PROTECTING NATURE

Dr. Ehab Meselhe, a civil engineer, is developing a computer program that state environmental cleanup experts can use to properly respond to an oil spill in the nearby Calcasieu-Sabine Estuarine System. Once the location of the spill is determined, the program calculates where and how the oil will spread.

He is also working to improve predictions about flooding in low-gradient regions, such as Louisiana. He'll soon begin a complementary project: development of a comprehensive flood management computer model that can evaluate alternative ways to reduce flood damages.

A LINK IN THE CHAIN

Algae are one-cell organisms which form an essential food resource for many marine creatures. Mathematician **Dr. Azmy Ackleh** has developed a mathematical model that describes how predators affect the number of algae present at the surface of the ocean when they are sticking together, or "coagulating."

HOW DO WE THINK?

Scientists at the Institute of Cognitive Science are taking a multidisciplinary approach to studying the human mind. Independent evaluators have predicted the institute has the potential to be a "world leader" in the field.

Dr. Daniel Povinelli has attracted international interest for his challenge of Charles Darwin's contention that there is no fundamental difference between the mental abilities of humans and other animals.

Dr. Julie Boland investigates word recognition and sentence comprehension in normal adults, concentrating on syntactic analysis.

She explains: "The syntactic structure assigned to a sentence determines how it can be interpreted. For example, 'Put the ball in the box on the table' can be assigned two different structures with two different meanings. In one analysis, there is a ball already in the box and in the other analysis, the ball is supposed to be put into the box.' "

Some of Boland's research involves ambiguous words. For example, in "She saw her duck," "duck" can be either a noun or a verb, and "her" can refer to the owner of the duck or the person who is ducking. Boland uses eye tracking procedures and reaction time paradigms to discover what mental representations people construct as they listen to speech and read, and when people have difficulty arriving at the correct interpretation.

Another researcher, **Dr. Claudia Uller**, is exploring what human infants and non-human primates know about mathematical concepts. Humans rely, in part, on language, but how do a preverbal infant and a nonlinguistic monkey represent numbers?

Answers to questions such as that will help researchers develop "hypotheses about the nature of knowledge, its origins, and the parameters for establishing abnormalities, helping specialists in areas such as autism, Down Syndrome, and Williams syndrome, among others," Uller said.