CORNERSTONE

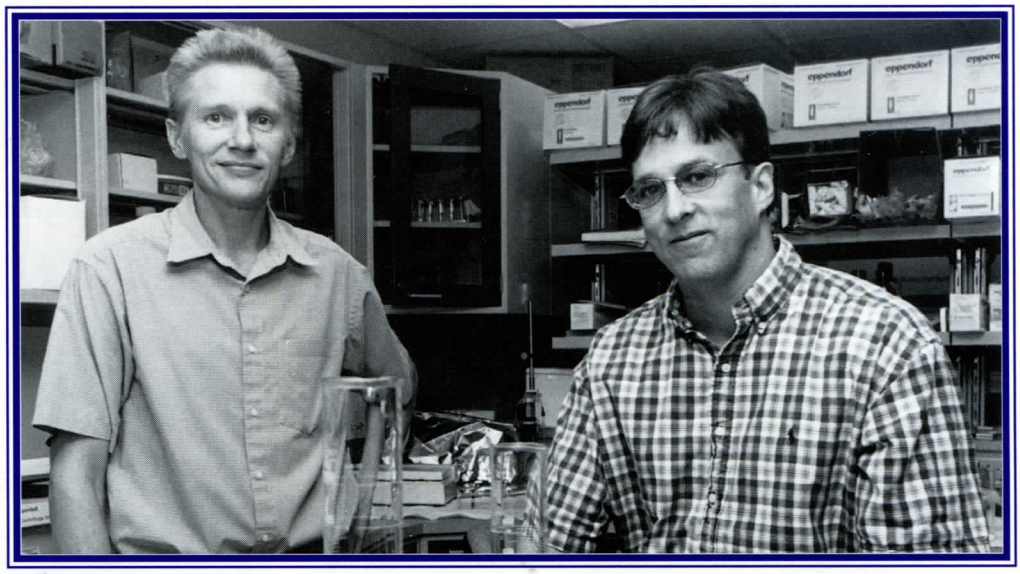
a Publication of the Foundation for the LSU Health Sciences Center

*Fall/Winter 2001*

# LSUHSC YOUNG INVESTIGATORS —

**"A world class research center requires a critical mass of scientists doing outstanding work. The investigators profiled here represent some of the best minds in the country. An investment in these talented scientists will pay big dividends in terms of scientific discovery and in the LSUHSC research reputation."**

**Dr. Nicolas Bazan**



## JEFFREY D. ERICKSON, PH.D.

If Jeff Erickson's parents had not intervened, the LSU Center for Excellence in Neuroscience might today lack the riches of this young man's talent. Jeff had left the University of Colorado at Boulder after two years of study, lured to his ancestral home of Norway. After six months, he became a commercial fisherman in the Arctic Ocean of northern Norway. Two years after his arrival, Jeff had so immersed himself in his work and the dialects of that area that Norwegians refused to believe he was not a native. That ability to absorb information, coupled with a love of logic, a quest for truth and discovery, and a motivation to succeed forecast Jeff's success in his future career.

"The idea of continuing as a commercial fisherman appealed to me – the travel, the adventure," Jeff said. "But I heard my parents' advice, and resumed my education at Boulder, where I joined a work-study program in research.

"My father is with the American Cancer Society in public relations, so I thought I might enjoy biomedical research in that area," Jeff said. "Since nothing was available at that time, I asked to work in a lab in the School of Pharmacy. I had to meet my obligations in the classroom, but my work in the lab drove me. My experiments in Colorado examined the transport of neurotransmitters into synaptic vesicles. That's what I do today.

"When I began research at Colorado, scientists were hampered in their efforts to measure neurotransmitter transport into vesicles purified from the brain," Jeff said. "They did not consider the normal cytoplasm, or the living substance, inside the cells, and were suspending them in buffers not

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## JEFFREY C. MAGEE, PH.D.

Jeff Magee has an edge on a lot of folks in neuroscience research, according to his colleague Jeff Erickson. "He is in a hot area of technical expertise, and because of his technical skill, he can do what most other people can't do." Jeff Magee chooses to do what he does best — at LSU Health Sciences Center.

Born in north Louisiana, Jeff grew up in Dallas. In his last two years in high school, his family moved to Baton Rouge. Since then, he has confined his studies and his life to areas defined by Interstate 10. After a concentration in zoology and philosophy at LSU, Jeff came downriver to Tulane for a doctorate in physiology. He headed west again after Tulane for post-doctoral work at Baylor College of Medicine in Houston.

At Baylor, his work with Daon Johnston in neurophysiology had a major impact on Jeff and shaped what he does today. Jeff participated in a significant breakthrough in the study of dendrites, the tree-like parts of neurons that were until recently something of a mystery. Using new techniques in microscopy and imaging, he worked on discoveries that changed the concept of how neurons work.

The language of neuroscience might confound lay people. Neuro-vocabulary includes neurons, axons, dendrites, synapses, ion channels and the inputs and outputs that give them action. This language provides a short cut that eases the exchange of ideas and information among scientists, especially in studies at the basic cellular level.

Cellular neurophysiology, or information processing and storage in single neurons, has been Jeff's research passion for the past 15 years. A

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consistent with their natural state. After we thought through the make up of the cells, we were able to design a synthetic cytoplasm that allowed us to measure the transport of noradrenaline into the vesicles, an exciting discovery for a young undergraduate."

Jeff's specific field of study at LSU forms the centerpiece of synaptic research. Neurotransmission is mediated through chemical synapses. These chemicals, such as serotonin, adrenalin, and certain amino acids are made in specific neurons and released from them so they can interact with receptors located on other neurons. Before these chemical transmitters are released from neurons at the synapse, they must be packaged in synaptic vesicles.

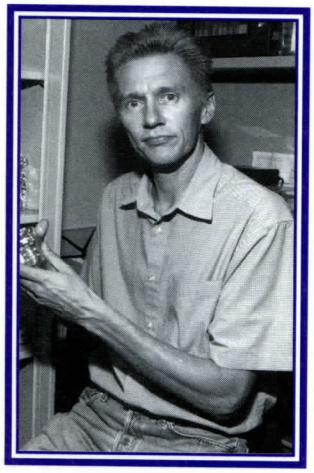
Jeff says his work at LSU is complementary to Jeff Magee's work. Both investigators study the activities that occur at the communication point. Dr. Erickson provides the input Dr. Magee's work uses in studies that show how that transmission is received and processed in neurons or output. Together, they are looking at synapses in toto.

At a conference on Neurochemistry in Montpellier, France, Jeff met Hélène Varoqui who is now his wife and a colleague in research at LSU. "I first saw Hélène standing in front of my poster," Jeff said. "I had discovered the first gene for a vesicular neurotransmitter transporter, and she was interested in cloning one too; together, we succeeded in identifying several additional genes." Hélène and Jeff also teamed up to produce Madeleine Rose and Sissel Marie; both will be three this Halloween. "We carry our teamwork into parenting too," Jeff said. "I need less sleep than Hélène, so I take the night shift when the girls need me."

Hélène, a graduate of the "Grande Ecole" and the Center of National Scientific Research in Paris, France, is also a faculty member in the Neuroscience Center. Last year Hélène discovered a new type of transporter gene that brings glutamine into the neuron. She is looking at the role glutamine plays as a precursor for the major excitatory neurotransmitter in the brain, called glutamate. Jeff and Hélène collaborate and submit joint articles on their work.

Jeff and his team have developed new reagents (genes, antibodies) that can selectively label specific neurons and synapses and will enable a more complete understanding of the synaptic organization of the brain. The results of this work may also clarify how synapses dysfunction in certain conditions such as Alzheimer's, Parkinson's and in stroke. The development of these tools has peaked the interests of the neuroscience community. "When our results become broadly known and accepted, we expect a lot of requests for these reagents, which we will gladly give out," Jeff said.

"This is a very competitive field and our work is difficult," Jeff told me. "We're a small group at LSU, and we have stiff competition from labs throughout the United States and abroad. Those labs are well funded with senior investigators who have a critical mass of young, talented, post-doctoral and graduate students who drive creativity. In order to generate the energy that helps produce new ideas, we need to increase the critical mass of our program with additional talented young scientists."



The Foundation helps by providing direct resources that help scientists compete for National Institutes of Health grants. Success in obtaining grants means bigger labs, more resources, and it will attract new facul-

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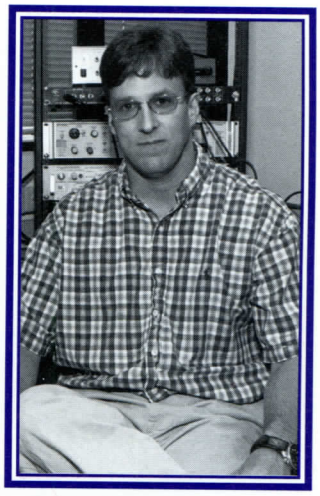

fundamental function of the central nervous system is to process, encode and store vast amounts of incoming information. Through these poorly understood processes, memories are formed, and cognitive activities such as thought and learning are made possible. These tasks are performed by neurons, the basic building blocks of the brain. Neurons are complicated cells with most of their cellular area found within treelike structures known as dendrites, which operate as the main input region of the neuron. Jeff's work concentrates on how these neurons communicate with each other through specialized connections called synapses. Most of these synapses are located within dendrites. The information delivered to a brain cell by a synapse is processed in the dendrites and then sent along to the output area of the cell called an axon. If the connection made by the synapse is strong enough, their activity causes the generation of a nerve impulse within the axon, which then travels to another neuron and the process is repeated. Also, these impulses might use small proteins called ion-channels to generate electrical currents that carry the impulses back into the dendrites and to the synapses themselves. The movement of these electrical impulses throughout the dendritic area plays a critical role in the formation of memories. Memories are formed in an activity-dependent manner by the strength of the various synapses involved in moving information from one cell to another. When a synapse is strong enough to generate an impulse, this impulse travels back to the synapses via the dendrite where it acts to further increase the strength of that synaptic connection, and a pattern of synaptic strength is formed. In this pattern our memories reside.

Folks who claim "senior moments" or students who study all night might wonder why their memory seems to disappear at inopportune times. Jeff might provide one answer in his study that forces rats to stay awake for three days. "When we examine the living brain tissue from these sleep-deprived animals we see profound deficiencies in their ability to change the strength of their synapses. We view this as a cellular level deficit that reduces the capacity of these animals to learn and remember. This is a 'model' study that might also offer clues in understanding and in providing direction for treatment in other areas, such as Alzheimer's and epilepsy.

"Most important, we have to do fundamental work to truly understand how things work before we understand how they don't work," Jeff said. "Then we share this basic research with others, such as Dr. Bazan; they can then take it further in their research into treatments that reverse or alleviate the effects of many neurological conditions."

Jeff's work is driven by his quest to know why, to want to explain the unexplainable. His chemist grandfather first expanded his view of the world of science. Jeff wonders why more young people in Louisiana aren't excited about a career in science with its opportunities for exploration and discovery.

For two months every summer Jeff has an opportunity to explore new issues at a marine biological laboratory on Cape Cod. During the infancy of neuroscience research in the 1930s and '40s, studies of neurological cell properties were examined on the giant axon of a (small) squid, found only in that area. "Assembling in Cape Cod is a tradition in

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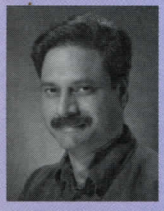
ty, more post doctoral and graduate students, all the kinds of support Dr. Bazan needs in drawing more and better. Success does breed success. The program has developed in the last four years, thanks to Dr. Bazan's reputation and the recruits he has brought to the LSU Center for Excellence in Neuroscience.

"We are all working to broaden our horizons. The more good scientists we have at LSU Health Sciences Center, the more support we have, the more the rest of the country will learn about what we're doing in New Orleans. That's what we need. Good things are happening here."

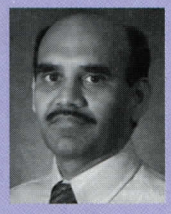
## MORE INVESTIGATORS - The LSUHSC Center of Excellence in Neuroscience

**Hélène Veroqui, Ph.D.** is a research assistant professor studying the role of glutamine transports in glutamatergic neurotransmission. Also, she is interested in how the trafficking of the glutamine transporters to the plasma membrane and vesicular neurotransmitter transporters to secretory organelles might be regulated in neurons providing additional ways for presynaptic modulation of synaptic function.

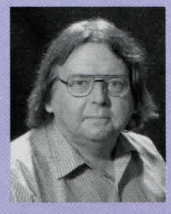


**Rene Anand, Ph.D.**
Assistant Professor of Neuroscience and Neurology. Plasticity and survival mechanisms activated by nicotinic acetylcholine receptors and their relevance for the treatment of addiction and Alzheimer's and Parkinson's disease.

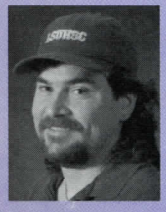
**Gudiseva Chandrasekher Ph.D.**
Assistant Professor of Ophthalmology and Neuroscience. Research interest is on Growth factor mediated signal transduction mechanisms in lens and cornea. The goal of this research is to unravel the mechanisms involved in the differentiation of epithelial cells during lens development and to determine the molecular basis of human cataract formation and corneal wound healing.



**Chu Chen, Ph.D.**
Assistant Professor of Neuroscience, Otorhinolaryngology and Biocommunication Current area of research: Neuromodulation of ion channels and synaptic plasticity in hippocampal neurons.



**Walter J. Lukiw, Ph.D.** is a researcher in human brain molecular biology and genetics and an assistant professor at the LSU Neuroscience Center.The focus of Dr. Lukiw's research is to more closely define molecular genetic mechanisms associated with the onset and progression of Alzheimer's disease for potential pharmacologic intervention.



**Anthony Ricci, Ph.D.**
Anthony Ricci is an assistant professor interested in understanding calcium regulation of auditory hair cells. He uses single cell electrophysiology and imaging techniques to investigate calcium control of sensory input and synaptic transmission. His work aims at understanding such maladies as noise induced hearing loss, age related hearing loss and tinnitus.

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our profession. Up there, we exchange new ideas and explore advanced techniques with people from all over the world," Jeff said. "We then bring these new ideas and techniques back to LSU to use in our everyday research programs."

In September, Jeff presented papers in Australia and Japan. What brought this star of neuroscience research to LSU? "My wife is from Baton Rouge so living near family was one consideration. But I was drawn by Dr. Nicolas Bazan's reputation and the Center of Excellence for Neuroscience. They offered minimal distractions from my doing research and promised adequate funds to create my own laboratory.
"It is awe inspiring to me," Jeff said, "to be in a position to do basic research that answers fundamental questions. We do this work in order that people can better understand themselves — and so that we can help alleviate various diseases of the brain."

## FREE AGENCY SCIENCE?

The recruitment and retention of top-flight research scientists resembles what happens in the arena of free agency football. A young scientist, whose novel discoveries promise the potential for millions of dollars of grant money from the National Institutes of Health and other granting agencies, represents a player with impressive performance statistics with two years experience in the League. In order to keep this rookie star, an academic institution must craft a start-up package of at least $500,000. That package might include a newly renovated laboratory, sophisticated research equipment and a three year salary commitment for a team of research assistants, research technologists and graduate students.

When an institution recruits these talented young scientists it invests in a future that will produce a more fertile scientific environment, attract increased grant money and enhance its research reputation. Yet, keeping these young investigators might prove more of a challenge than recruiting them. As scientists' research reputations grow, they become more desirable in the competitive arenas of academic medicine and the biotechnology industry. Other research institutions entice these well-funded, widely published scientists with promises of endowed chairs, new laboratories and strong institutional support. In order to keep young investigators and protect its initial investment, an institution must do whatever it takes to strengthen and feather the researchers nests.

The creation of the LSU Biomedical Research Fund will fortify the position LSU Health Sciences Center wants to maintain in this free agency atmosphere. The interest produced by a $25 million endowment will provide funds that pay for start-up and retention packages for talented young investigators. We must keep these young research players if we want to strengthen the LSU Health Sciences Center and sustain economic benefits for the city of New Orleans and the state of Louisiana.

*Gifts to the LSU Biomedical Research Fund may be made unrestricted or designated for research in a particular discipline or for a specific disease. For more information on the LSU Biomedical Research Fund, please contact Denise Flock-Williams at 504-568-3712 or email dflock@lsuhsc.edu.*

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