The University of Texas
Health Science Center at Houston

Young Investigators Seek Answers to Wide Range of Questions

Researchers take different paths to travel into new and challenging areas

The following researchers were nominated by their schools and selected by the Research Council as outstanding representatives of the many hard-working young investigators throughout The University of Texas Health Science Center at Houston.

Useful Articles: Elmer Bernstam, M.D., assistant professor, School of Health Information Sciences (SHIS), and internal medicine, Medical School

Search techniques that have been successful on the World Wide Web are helping practicing physicians and biomedical researchers find the answers to their questions.

"As a general internist, my clinical practice is very broad," Bernstam said. "Therefore, I must constantly read about a variety of fields. I face the same difficulties as other people when I try to find information to answer my clinical questions or to help in my research."

Bernstam is working on better ways to access the biomedical literature through MEDLINE, the largest and most complete database of biomedical articles. MEDLINE, which currently contains more than 15 million articles dating back to the 1950s, is growing by more than 500,000 articles per year.

"As more and more articles are published, finding answers to common questions becomes harder because queries return too many articles," he said. "Therefore, we are developing ways to automatically identify important articles. Specifically, we are using techniques that have been successful on the World Wide Web to help searchers find useful articles."

Positive Impact on Patients: Michael Braun, M.D., assistant professor, Brown Foundation Institute of Molecular Medicine for the Prevention of Human Diseases (IMM); Division of Pediatric Nephrology and Hypertension, Department of Pediatrics, Medical School; and Graduate School of Biomedical Sciences (GSBS)

Patients with some kidney diseases may benefit from basic research on a group of blood proteins known as the complement system.

"The desire to have a positive impact on the lives of my patients has been the driving force behind my research work," Braun said.

"Kidney diseases such as lupus nephritis are often due to abnormal immunologic responses, which include activation of the complement system," he said. "Complement proteins can injure the kidney directly, as well as alter the reactivity of the immune system in general."

Using mouse models of human kidney diseases, Braun's research group is investigating how inhibition of the anaphylatoxins – a specific family of complement proteins – alters the development and progression of renal damage. By studying the basic biology of anaphylatoxins in mice, they hope to define critical cellular and molecular pathways that will translate into novel therapeutic approaches for humans with complement dependent kidney diseases.

Braun's interest in complement began during his clinical fellowship in pediatric nephrology, when he trained with two preeminent complement biologists: Clark West, M.D., one of the founding fathers of the specialty of pediatric nephrology, who initially described the association of complement activation and kidney disease, and Alvin Davis, M.D., a leader in the field of C1 inhibitor deficiency.

"During my fellowship I cared for a number of children with very unusual forms of complement dependent kidney diseases and became fascinated by the complexity of the pathophysiology and our limited ability to successfully treat these children," Braun said.

"I have been very fortunate to have had the opportunity to join the faculty at the UT Health Science Center at Houston, where I can care for children with renal disease and work with the world-renowned complement biology group at the Brown Foundation Institute of Molecular Medicine headed by Dr. Irma Gigli and Dr. Rick Wetsel."

Take the Risks: Phillip Carpenter, Ph.D., associate professor of biochemistry and molecular biology, Medical School and GSBS

Research on cell growth and division in response to DNA damage is leading to new knowledge about immunology and some forms of cancer.

"My research into this problem began by accident but has led us on a great journey into areas I thought I would never be involved in (mouse genetics and immunology)," Carpenter said. "I think that this is the essence of research: to travel into new and challenging areas outside of one's traditional expertise and to be willing to take the risks associated with this. To find unexpected connections, rather than to incrementally extend existing knowledge, in a timely fashion is a key."

Carpenter had known since high school biology class that he wanted to study cell division, so he looked for a postdoctoral position in that area. "The decision to go to Caltech as a postdoc was one of the best I have ever made," he said. "Where we choose to study and who we choose to do it with can make all of the difference in the world."

Once in Houston, he was originally interested in following up on some key findings he had made about DNA replication while at Caltech. But he was unable to obtain funding for that research.

Luckily, he also had accidentally found a protein called 53BP1 in a genetic screen at Caltech, and his chairman in Houston, Rod Kellems, Ph.D., suggested that he study 53BP1 in mice, "an idea that we took and have been running with ever since," Carpenter said. An award from the Ellison Medical Foundation supported the transition in his research.

"We learned some very important secrets regarding how cells respond to DNA damage in the context of cell division, an area of research central to the formation of tumors," he said. "We learned that 53BP1 is intimately involved in the development of the immune system and that animals deficient in the function of the protein were immunodeficient because of their

Luncheon Honors Outstanding Young Researchers

(Above) Peter Davies, M.D., Ph.D., executive vice president for research at the UT Health Science Center at Houston, talks with Research Council member Barbara Murray, M.D., director, Division of Infectious Diseases in the Department of Internal Medicine, UT Medical School at Houston.

By Ina Fried, Public Affairs

Two internal medicine residents at Massachusetts General Hospital in 1965 discovered the value of research when results of their clinical research changed the procedures for screening blood for transfusions and patients for open heart surgery.

One of those residents – James T. Willerson, M.D. – praised the critical importance of research at a recent luncheon to honor Outstanding Young Investigators at The University of Texas Health Science Center at Houston. Honorees were nominated by their schools and selected by the health science center's Research Council.

"You just can't separate research and discovery from education or service," said Willerson, president of the health science center. "You can't have excellent education in an environment where there's not excellent discovery. You can't teach the

Continued on page 2

inability to repair broken DNA fragments that are naturally generated during immune development. We also have learned that 53BP1, under certain genetic contexts, prevents the formation of immune cancers (lymphoma)."

Continuous Motion: Valentin Dragoi, Ph.D., assistant professor of neurobiology and anatomy, Medical School and GSBS

Understanding how the brain uses information to form and update visual images may someday help develop prostheses that can be implanted in the brain to assist visually impaired people.

Vision is truly moving pictures. "Indeed," Dragoi said, "the world doesn't sit still – trees move in the wind and birds fly across the sky. Our eyes also move, as we examine the world, to help us fixate on one part of the image and then the next, with a rapid eye movement in between. The brain itself is in continuous motion, even in the absence of sensory input – waves of ongoing neuronal activity sweep across the cortex in random motion. But how, with so much internal and external motion, could the brain build an efficient representation of the world and update the representation as new information is acquired?"

Research in Dragoi's laboratory is aimed at understanding how individual neurons and networks in the visual cortex of animals construct a real-time internal representation of incoming stimuli and how image representations relate to visual behavior.

"We employ electrophysiological techniques that allow us to record simultaneously the activity of multiple neurons in the visual cortex of alert animals during specific behavioral tasks they have been trained to perform," he said. "These experiments are complemented by computational models of network function to understand how neural circuits adapt to changes in input activity."

The research has the potential to advance understanding of the mechanisms underlying visual perception and learning, as well as help develop implantable visual prostheses.

Dragoi started as a computer scientist with strong interests in artificial image processing systems. As he read more about how vision works, he "became amazed by the reliability with which visual perception operates," he said. "What was most striking was that, despite the fact that most artificial devices are only able to function over a limited luminance range, animals and humans are able to rapidly adjust to large changes in luminance (for instance, although we are temporarily blind when walking from bright sunlight to a dark auditorium, we start seeing shapes and images within seconds)."

Lung Protection: Scott Drouin, Ph.D., assistant professor, IMM and GSBS

Day after day of high ozone alerts during the summer may leave Houstonians gasping for air. Drouin's research may help in understanding how the lungs protect themselves and what goes wrong when those defenses fail.

"My laboratory studies asthma and chronic obstructive pulmonary disorder with a primary interest in the innate immune mechanisms that contribute to these inflammatory lung diseases," he said.

"The lung is constantly exposed to an external environment containing a variety of airborne pathogens and pollutants, which could potentially cause damage to this vital organ," Drouin said. "Cells of the lung must be capable of communicating with the immune system in order to defend against external stresses and, at the same time, tightly control and temper these defensive responses in order to prevent damage to the delicate tissues responsible for the transport and exchange of oxygen. This balance is critical.

"When these defense mechanisms don't function properly, a range of disease pathologies can result," he said. "Mild pathologies typically result in the reversible airway obstruction that most people experience with asthma or respiratory infections. Severe pathologies, such as emphysema or chronic obstructive pulmonary disorder, can result in irreversible obstruction and damage to the lung tissue with a gradual loss of a person's ability to breathe."

Drouin and his research team use rodent models of pulmonary disease and techniques for studying lung cells outside the body. The researchers focus primarily on understanding the mechanisms that defend against the external environment in the hope of gaining insight into the defects that lead to inflammatory lung disease.

Always interested in science, Drouin turned to immunology during his doctoral studies in microbiology at the University of Alabama-Birmingham. His postdoctoral training in the Research Center for Immunology and Autoimmmune Diseases at the IMM focused his interest into a research career devoted to understanding the inflammatory mechanisms that lead to pulmonary disease.

Underserved Populations: Maria E. Fernandez, Ph.D., assistant professor of health promotion and behavioral sciences, School of Public Health

Preventing and controlling cancer among low–income and minority populations is a goal of Fernandez's research.

Working in the School of Public Health's Center for Health Promotion and Prevention Research, she has conducted research spanning the field of health promotion – from studies to better understand and measure health behaviors to the development and evaluation of community-based interventions for Hispanic and other underserved populations.

Fernandez is principal investigator (PI) on a large study funded by the U.S. Centers for Disease Control and Prevention (CDC) to develop and evaluate a computer-based multimedia educational intervention to increase utilization of colorectal cancer screening among Hispanic men and women living in the Lower Rio Grande Valley.

She is also the PI on a CDC-funded project called LINCC – Latinos in a Network for Cancer Control, one of eight cancer prevention and control research networks funded across the country. This network focuses on eliminating cancer-related health disparities among Hispanics/Latinos through community-based intervention. The project has resulted in development of strong collaborations with the state health department, community organizations and other research institutions in Texas and surrounding states.

The director of diversity programs for the School of Public Health, Fernandez works with her colleagues in the Office of Student Affairs to enhance recruitment and retention of minority students and faculty. She also is heavily involved in research related to the reduction of health disparities and was recognized with an award from the UT M. D. Anderson Cancer Center's Center for Research on Minority Health for her contributions to health disparities research.

During undergraduate training in human physiology, she was attracted to health promotion and behavioral sciences because the field "incorporates knowledge and skills from many disciplines, including psychology, anthropology, medicine, sociology and public health," she said. "I enjoy working as a member of multidisciplinary teams that bring varied expertise together to address a public health problem.

"As a Hispanic individual," she said, "I was also drawn to the opportunity to work with Hispanic/Latino populations to help reduce health disparities through better understanding of health behaviors and environmental conditions that influence health and the development of effective interventions that ultimately lead to improved health and quality of life.

Genes and Stroke: Myriam Fornage, Ph.D., assistant professor, IMM and GSBS

groundbreaking information or the things that really might make a difference in people's lives.

"It's my conviction," he said, "that I can't be a good doctor or a good educator without being very involved in discovery. It makes many things easier. I can read the literature and be critical. I can use that background when the knowledge isn't available about a specific clinical question. I can sometimes make a pretty good decision about what I should do even when there's no precedent and no established body of information.

"As a doctor I take care of one patient at a time. The impact of that activity, while great on the individual, is small in terms of populations compared to a discovery that changes medicine," Willerson said.

"If you pursue research and are persistent and dedicated, and if you're just a little bit lucky, you'll have a lifelong career that's very important, not only to you, but possibly to thousands of people," he said. "The sense of fulfillment that comes from that is absolutely enormous."

Continued on page 4

(Above) At the luncheon are Michael Braun, M.D., Brown Foundation Institute of Molecular Medicine for the Prevention of Human Diseases (IMM) and Medical School, and Irma Gigli, M.D., deputy director of the IMM.

(Right) James T. Willerson, M.D., president of the UT Health Science Center at Houston, says research and discovery cannot be separated from education and service.

Fornage's research focuses on identifying genes that influence susceptibility to stroke and cerebrovascular disease.

"As the leading cause of severe long-term disability and third leading cause of death, stroke has tremendous human and financial costs," Fornage said. "A better understanding of the disease through discovery of the genes involved in its cause or origin may open new avenues for the development of novel therapies and prevention strategies."

Her laboratory applies novel genomic technologies and modern genetic analysis methods to uncover genes and gene pathways contributing to stroke susceptibility in an animal model: a type of rat that naturally has hypertension, or high blood pressure, and is prone to stroke. These findings are then directly translated to human disease research by investigating whether these same genes influence stroke susceptibility in human populations.

The research is an extension of her graduate and post-graduate work on the genetic basis of hypertension, a major risk factor for stroke.

Determinants of Health: Luisa Franzini, Ph.D., assistant professor of management, policy and community health, School of Public Health

Where you live and your family's income affect your health. Franzini's research uses sophisticated statistical methods to understand the role of social and economic factors in affecting health.

"Health depends not only on genetics and health care, but also in large part on the socioeconomic environment people live in," Franzini said. "So, for example, individuals with more education or with higher income have better health and longer life expectancy.

"Why is that so? Partly because better off individuals have more economic and social resources to draw on. More money allows them to live in better and safer neighborhoods and to afford a healthier diet and better quality housing. More education leads to better knowledge of what is a healthy lifestyle and to the ability to maintain healthy habits," she said.

"On the other hand, disadvantaged people tend to have less material resources, less control over their lives, and more stress," she said. "These conditions negatively affect health through unhealthy lifestyles and chronic stress."

Franzini's interest in socioeconomic determinants of health began early in her public health career. "I was investigating the costs of treating breast cancer patients," she said, "when I noticed that survival varied significantly in the different racial groups. I was intrigued by this result and decided to investigate."

Brain Functioning: Roger Janz, Ph.D., assistant professor of neurobiology and anatomy, Medical School and GSBS

Parkinson's disease, Alzheimer's disease, epilepsy, schizophrenia and depression – these are just a few examples of the many neurological and psychiatric diseases that result from a lack or an imbalance of certain neurotransmitters in the brain. The properly regulated secretion of neurotransmitters – chemicals that transmit nerve impulses – is essential for normal functioning of the brain.

The work in Janz's lab studies the role of a group of proteins called SV2s that are involved in the regulation of neurotransmitter release from nerve cells.

"During my postdoctoral training at UT Southwestern, I generated genetically engineered mice that are lacking these SV2 proteins," he said. "Since moving to Houston, my lab has used these mice as tools to study the biological function of these proteins.

"Our studies have shown that SV2 proteins are involved in epilepsy, as well as certain forms of blindness," Janz said. "By studying the exact mechanism by which SV2 proteins regulate neurotransmitter release, we hope to contribute to better understanding of the mechanism of different diseases. This understanding eventually can lead to better treatment of these illnesses."

Rapid Communication: Vasanthi Jayaraman, Ph.D., assistant professor of integrative biology and pharmacology, Medical School and GSBS

When you click the remote control, your television converts the signal into an electrical signal to turn on the set. But if the battery is weak, the distance is too great or the programming is incompatible, the television does not respond.

In the body, rapid communication between nerve cells is mediated by a group of proteins called neurotransmitter receptors that convert chemical signals liberated at the end of one nerve cell into an electrical signal at the second nerve cell. Research to better understand this process will help scientists design better drugs for diseases, such as stroke or Parkinson's, in which this process is disrupted.

"While day-to-day activities, such as learning and memory, depend on this type of communication, excess neurotransmitters, such as glutamate, can result in nerve death, as observed in stroke and ALS," said Jayaraman. "My research is focused on understanding the mechanism of communication by studying the changes in the protein at an atomic level as it carries out its biological function." The research requires an interdisciplinary approach using tools from physics, chemistry and biology.

"My doctoral work involved the use of various physical chemistry methods, while my postdoctoral training was geared towards studying neurotransmitter receptors using conventional electrophysiological methods," she said. "This type of interdisciplinary training put me in a unique position to be able to use chemistry tools to study a group of proteins that had been primarily investigated by molecular biological and physiological methods, thus allowing us to obtain new insights into the mechanism by which they carry our their biological function."

Framework for Memory: James J. Knierim, Ph.D., assistant professor of neurobiology and anatomy, Medical School and GSBS

The main character in the movie "Memento" lived entirely in the moment, unable to create new, long-term memories. This type of amnesia, sometimes shared by people with stroke or Alzheimer's disease, is caused by damage to a part of the brain called the hippocampus.

By studying the hippocampus, Knierim attempts to understand the brain mechanisms involved in learning and memory and in high-level cognition, or the process of knowing. The research group records the activity of hippocampal neurons while rats perform various spatial tasks – hippocampal damage in rats causes deficits in spatial memory, similar to the spatial memory loss of an early Alzheimer's patient.

"Neurons in the rat hippocampus are selectively active when the rat occupies specific locations in its environment," Knierim said, "and it is thought that these cells form the basis of the rat's mental image, or 'cognitive map,' of its environment. Recent results from another laboratory have shown that the human hippocampus also contains these types of cells. We try to understand how the brain constructs this cognitive map, and

(Above) Enjoying the luncheon are Ronald Peters Jr., Dr.P.H., School of Public Health (SPH), and Sue Day, Ph.D., associate dean for research, SPH.

(Left) Visiting are, from left, Valentin Dragoi, Ph.D., Medical School; Harel Shouval, Ph.D., Medical School; Catherine Flaitz, D.D.S., dean of the UT Dental Branch at Houston; and Chunlin Qin, D.D.S., Ph.D., Dental Branch.

how it is used to underlie spatial memory in the rat and serve as the organizing framework for explicit, conscious memory in humans."

As a graduate student, Knierim already was interested in learning and memory and how the brain creates mental representations of the external world. "Then I heard a talk on the 'place cells' of the hippocampus and was so fascinated by the subject that I decided to do my postdoctoral training in that field," he said. "I then continued this work when I set up my own lab at UT."

Stick Together: Renhao Li, Ph.D., assistant professor of biochemistry and molecular biology, Medical School and GSBS

Sometimes cells need to stick together, or adhere, such as for wound healing, and sometimes they don't, such as in development of cardiovascular disease or cancer growth. Cell adhesion is mediated by several families of proteins, called adhesion receptors, which also carry signals both into and out of cells.

"We are broadly interested in the structure and function of cell adhesion receptors, such as integrins and glycoprotein Ib-IX-V complex," Li said. "The glycoprotein Ib-IX-V complex is primarily expressed in the platelets, and it helps the blood to clot properly. Malfunction of this complex leads to severe bleeding and can contribute to many cardiovascular diseases. We aim to understand the structure of the glycoprotein Ib-IX-V complex and to learn how it functions."

Li's work in this area began during his postdoctoral training at the University of Pennsylvania in a lab that is renowned for protein design. He received a postdoctoral fellowship from the Damon Runyon Cancer Research Foundation with a proposal to design a novel integrin-binding ligand.

"The project did not work out as spectacularly as we had hoped," he said. "Nevertheless, upon further reading on the integrins and other cell adhesion receptors, I became interested in the question as to how these receptors mediate signaling across the plasma membrane of the cell, a question crucial to the function and regulation of these receptors."

He expanded his postdoctoral research into this aspect of integrin and has expanded the research to other adhesion receptors since moving to UT, where he now works in the Center for Membrane Biology at the Medical School.

Orchestra without Conductor: Hualou Liang, Ph.D., assistant professor, SHIS and GSBS

"The brain operates as an orchestra without a conductor," said Liang. "To be able to produce the right cognitive melody, different neural 'players' have to coordinate their activities, each providing the right contribution at exactly the right time. It remains a puzzle for scientists to work out how the brain is able to achieve such a feat."

Liang's research is primarily concerned with the properties of large-scale neuronal networks, responsible for such brain functions as attention, learning and processing of visual information. Understanding these complex functions requires a multidisciplinary approach, using techniques and ideas of biology, physics and computer science.

"We are excited about the prospects for contributing to the growth of knowledge about brain functions through a combination of experimental and computational approaches," he said.

The research in his lab is devoted to the quantitative analysis of information processing by neural populations, or groups of nerve cells. It involves advanced mathematical and statistical methods that are relevant to neuroscience, particularly those appropriate for noninvasive imaging techniques and techniques for recording neural activity from multiple electrodes on the same subject.

"My research subjects are mostly monkeys at the National Institutes of Health and the Massachusetts Institute of Technology, where I have collaborators," Liang said. "They provide me data and I run data analysis. I occasionally run experiments on humans here using EEG (electroencephalogram) to record brain waves."

West Nile Virus: Kristy Lillibridge, D.V.M., assistant professor of epidemiology, School of Public Health

If you have high blood pressure, be sure to use mosquito repellant when you go outdoors. Lillibridge has identified high blood pressure and heart disease as important risk factors for developing encephalitis among people infected with West Nile virus.

Lillibridge's research focuses on zoonotic diseases, which are spread from animals to people. She is particularly interested in diseases spread by mosquitoes, including West Nile virus.

"I am looking at why certain people become very ill with encephalitis from West Nile virus infection, and how their body responds following infection," she said. The work was funded recently by the National Institutes of Health.

"Additionally," Lillibridge said, "I have several studies looking at the prevalence of diseases in special populations, including children and the homeless. The findings from these studies can be used to create

recommendations to protect certain high risk groups from becoming infected."

She became interested in zoonotic diseases during a fellowship at the U.S. Centers for Disease Control and Prevention in Atlanta. Part of her work there involved investigating West Nile virus when it first was introduced to the United States in New York City in 1999.

Exposure to Water: Kristina D. Mena, Ph.D., assistant professor of environmental and occupational health, School of Public Health El Paso Regional Campus

"Don't drink the water" may sometimes be good advice on both sides of the U.S.-Mexico border.

Mena is developing microbial risk assessment tools to estimate the impact on human health from exposure to various types of water, including drinking, surface, recreational, agricultural/irrigation, and reclaimed waters. She collects samples of water and fecal matter in the field and conducts laboratory analyses for microbial pathogens – including bacteria, enteric viruses and protozoan parasites – using both conventional culture and molecular detection methods.

"I use actual (quantitative) occurrence data of an infectious microorganism in water and then estimate the probability of someone becoming infected or ill from exposure," Mena said. She calculates the risk using mathematical dose-response models and various assumptions regarding exposure.

To verify the accuracy of her estimates, she compares them to actual illness data where exposures were known.

"Although I have always been someone who disliked science and laboratory courses, I love microbiology and its application in public health," she said. "I decided to work in this area due to this interest and because as a graduate student, I had the opportunity to work with the top people in this field."

Hypertension Genetics: Alanna Morrison, Ph.D., assistant professor of epidemiology, School of Public Health and GSBS

Heart disease and stroke are the number one killers among both men and women in the United States. Similarly, high blood pressure affects a large number of Americans and is a major risk factor for heart

Joining Willerson to recognize the young investigators were Peter Davies, M.D., Ph.D., executive vice president for research, and Michael McKinney, M.D., senior executive vice president and chief operating officer, along with deans of the health science center's six schools and members of the Research Council.

The Research Council brings together both the leaders and many participants from the research community on a regular basis to explore ways to promote, foster and support research activities within the health science center.

Speaking on behalf of the council, Davies said, "We thought this event should be focused on the research accomplishments of our younger faculty – those of you who are going through the grueling process of establishing and developing a research program. The Research Council views this as an excellent opportunity to bring together some of the faculty who are engaged in this process, both to express our appreciation to them for their achievements and to provide them an opportunity to get

Continued on page 6

(Far Left) Patrick Tarwater, Ph.D., left, SPH El Paso Regional Campus, enjoys talking with Jack Smith, M.D., Ph.D., dean of SHIS.

(Left) Gwin Morris, Ph.D., vice president for public affairs, greets guests at the luncheon.

(Below) Visiting are, from left, L. Maximilian Buja, M.D., executive vice president for academic affairs; Adriana Pérez, Ph.D., SPH Brownsville Regional Campus; and Michael McKinney, M.D., senior executive vice president and chief operating officer.

disease and stroke.

Morrison hopes that identification of the genes and mutations involved in these common chronic diseases will lead to "better understanding of disease pathways, improved treatment protocols and early identification of individuals at risk." She believes that her genetic research into factors contributing to hypertension, or high blood pressure, may help guide physicians as they prescribe anti-hypertensive medications. The research involves two types of studies: samples of families in which multiple people have these diseases and large population-based samples of unrelated individuals that are either cases (they have the disease) or controls (they don't have the disease).

The individuals in these studies have their blood drawn, and then laboratory techniques are used to characterize and identify genetic mutations across their genomes.

"As a statistical analyst, I use computer programs and statistical procedures to help define an association between the diseases that the individuals are afflicted with and the genetic mutations that they carry," Morrison said.

"Genetics is an exciting, fascinating and fast-moving field," she said. "By focusing my research on the identification of genetic variation involved in common chronic diseases, I feel I can make a timely and valuable contribution to the scientific and medical community."

Blindness in Children: Claudia Pedroza, Ph.D., assistant professor of biostatistics, School of Public Health

By developing statistical methods to analyze data in clinical trials, Pedroza may have an impact on millions of children.

As part of the Coordinating Center for Clinical Trials at the School of Public Health, she is involved in a clinical trial dealing with the treatment of retinopathy of prematurity.

"This disease of the retina, which primarily affects premature infants, can potentially lead to blindness. This clinical trial seeks to study how earlier treatment of the disease will affect long-term visual outcome in children," Pedroza said.

"After joining the biostatistics faculty at the School of Public Health, I became interested in clinical trials by talking to fellow faculty," she said. In particular, Robert Hardy, Ph.D., the Allen King Professor in Public Health, talked extensively with her about earlier clinical trials on eye disease.

"I became very interested in the retinopathy of prematurity clinical trial," she said, "not only because it would provide interesting research opportunities in my field, but also because the trial will impact how this disease is treated and potentially reduce the number of children who will develop blindness."

Missing Data: Adriana Pérez, Ph.D., assistant professor of biostatistics, School of Public Health Brownsville Regional Campus

Pérez's expertise is crucial for health and medical research. Her research spans diverse areas such as stomach cancer, intensive care, asthma and depression.

As a biostatistician, Pérez specializes in methods to handle missing data, determining sample size and developing modelling strategies for health-related studies. For instance, respondents often refuse to answer a question on a survey or miss a visit in a clinical trial. Research in medicine, public health, survey or census always has missing data.

"Trying to obtain the true information from any research, while accounting for the uncertainty due to those missing values, is my area of interest," she said. She currently is working collaboratively on several projects funded by the National Science Foundation, the National Institutes of Health and the Department of Defense to study diabetes, cardiovascular disease, cancer and tuberculosis along the Texas-Mexico border.

"I got interested in biostatistics during my college training as a statistician when I heard about the design of experiments for detecting which fertilizers work better in the National Center for Coffee Research in Colombia, South America," she said.

"The design and analysis of any research is equally as important as collecting project information," Pérez said. "Its significance has long-term implications across our country. By focusing on biostatistics, I can help improve the decisions regarding methods, technologies, drugs, prescriptions and the well-being of our people in this world."

Cigarettes and Drugs: Ronald Peters Jr., Dr.P.H., assistant professor of health promotion and behavioral science, School of Public Health

Cigarette smoking and drug abuse are two of the health risks that Peters hopes to reduce, especially among African Americans.

As principal investigator (PI) of a National Cancer Institute Mentored Career Development Award for Underrepresented Minorities, he focuses on cigarette smoking cessation among at-risk African-American alternative school students.

Peters has served as director of the Historically Black College Applied Research Initiative with the School of Public Health's Southwest Prevention Center. "The purpose of the project," he said, "is to assist participating institutions to improve their applied prevention research capacity, with particular emphasis on the health problems of African Americans." Participating along with the School of Public Health are Texas Southern University and Prairie View A&M University School of Nursing.

He also was the PI of the Houston Arrestee Drug Abuse Monitoring Program (ADAM), funded through the National Institute of Justice. ADAM collected data about drug use, drug and alcohol dependency and treatment, and drug market participation among recently booked arrestees (within 48 hours) in 40 communities around the United States.

"The data and research findings that were derived from ADAM, and from the other research supported by this program, help policymakers and practitioners make decisions concerning the problems of drugs and crime," Peters said.

In the last two years, Peters has published 19 peer-reviewed papers in the professional literature. His research has been used for national investigative reports and public health campaigns.

Peters attributes his start in public health to the social and health concerns he dealt with as a teenager growing up in New York coupled with "the brilliant mentorship" he received as a graduate student at the School of Public Health.

"My mentors volunteered endless hours to support not only my academic knowledge," he said, "but also took time to provide me with the self-efficacy to become faculty."

Teeth and Bones: Chunlin Qin, D.D.S., Ph.D., assistant professor of endodontics, Dental Branch

Teeth and bones have a lot in common, and Qin's research is aimed at finding out what goes wrong in such diseases as osteoporosis and dentinogenesis imperfecta, in which teeth become discolored, greatly weakened and easily lost.

Before plans for intervention and treatment for such diseases can be developed, much fundamental information must be discovered about how bone and dentin – the predominant ivory substance forming the mass of a tooth – are formed.

(Bottom left) Vanthi Jayaraman, Ph.D., Medical School, talks with Stanley Schultz, M.D., dean of the Medical School.

(Top left) Valentin Dragoi, Ph.D., Medical School, greets Sandra Hanneman, Ph.D., director of the Center for Nursing Research, UT School of Nursing at Houston. With them are Roger Janz, Ph.D., left, Medical School, and Hualou Liang, Ph.D., School of Health Information Sciences (SHIS).

(Above) Taking advantage of the chance to get acquainted are, from left, Kristy Lillibridge, D.V.M., SPH; Barbara Murray, M.D., Medical School; and Sue Day, Ph.D., SPH. In the background is Scott Merville, senior media relations specialist in the Office of Public Affairs.

The organic components of bone and dentin include collagen and non-collagenous proteins, Qin explained.

"My research work is mainly focused on the non-collagenous proteins that play vital roles in the formation and maintenance of bone and dentin. Based on my recent discoveries, I postulate that some non-collagenous proteins need to be processed into active forms (fragments) before they can function in the formation and maintenance of bone and dentin. Currently, a major part of my research work is to test this hypothesis," he said.

"As a dentist in China who dealt with bone (jaw bones) and dentin on a daily basis, I had a clear understanding about the importance of mineralized tissue research," he said. "With this in mind, I decided to work in this research area 11 years ago when I entered my Ph.D. program in Japan."

Information Encoding: Tom Rich, Ph.D., assistant professor of integrative biology and pharmacology, Medical School and GSBS

Understanding how information is transmitted within cells is the focus of research in Rich's lab.

"To accomplish this," he said, "we need to monitor how concentrations of signaling molecules change and to also measure the outcome of these changes in the same cell, at the same time. With this information we can use systems engineering and systems identification approaches to understand how information is encoded within these signals.

"While I was finishing my graduate work, I began asking the question, 'How are virtually all cellular functions regulated by a relatively few signaling pathways?' Since that time I have concentrated my efforts on developing approaches to measure and understand intracellular signaling pathways."

Rich, who holds a doctorate in biomedical engineering, did postdoctoral training in cardiovascular dynamics at the National Cardiovascular Research Institute in Osaka, Japan, and in physiology and biophysics at the University of Colorado Health Sciences Center.

Since joining the health science center in 2002, Rich has obtained grants as a principal investigator from the American Heart Association, Texas Advanced Technology Program and the National Institutes of Health.

How Humans Learn: Harel Shouval, Ph.D., assistant professor of neurobiology and anatomy, Medical School and GSBS

Learning is sometimes described as making a mental connection. Shouval is studying where the connections are made in the brain – the synapses, where nervous impulses pass from one neuron to another.

"These synapses are the means by which one neuron communicates with another," Shouval said, "and changes in their weights or strengths are called synaptic plasticity. My research focuses on identifying the rules by which changes in synaptic strength – believed to be the basis of learning, memory and development in the cortex – take place.

"I concentrate on theoretical/computational approaches to study synaptic plasticity at many levels, from its molecular basis to its functional implications," he said. "I believe that theoretical studies are essential for forming the link between these different levels."

The aim of Shouval's research is fundamental – to understand how humans learn and how the nervous system develops. "When we understand that," he said, "we will be able to understand why something goes wrong with those processes in such disorders as Alzheimer's Disease."

Shouval, who holds a doctorate in physics, has an appointment in the Center for Biomedical Engineering, a consortium that includes the UT Health Science Center at Houston, UT Austin and the UT M. D. Anderson Cancer Center.

Community-Based Research: William D. Spears, Ph.D., assistant professor of management, policy and community health, School of Public Health San Antonio Regional Campus

What are the major health concerns in the community, and what health resources are available to help meet those concerns?

In the last few years Spears has been involved with community-based participatory research, which involves the community in identifying research questions, assisting in project design and data collection. As a member of the steering committee and an advisor for the Mano a Mano para los Niños (Hand to Hand for the Children) project in San Antonio, he has worked with residents to conduct an assessment of the community, including what the residents think about child abuse and strengthening families and what they think they can do to help that happen.

"Community-based research takes time and patience," Spears said, "but we have had five teams of four residents each of varying skills and education who have conducted 25 'platicas,' or small community meetings with 10 to 15 participants each, to find out what residents think about community concerns."

"In the preliminary analysis," he said. "I have heard that many of the residents are saying, 'We should have more of these meetings; we don't talk about these things anywhere else.' "

Also, in Harris, Bexar and Tarrant counties and in the Lower Rio Grande Valley, Spears has conducted community health assessments, which involve reviewing data from a wide number of sources, including births, deaths, hospital discharges, crime reports and population surveys, as well as information about the supply of physicians, dentists, nurses and other health professionals.

Often for large metropolitan areas it is necessary to have data from units smaller than counties to help with planning for community health needs. So, Spears has worked with data suppliers like the Texas Department of State Health Services to develop sub-county data that previously was not available.

Spears was principal investigator on two projects that made the collected health data available on the Internet: the Saint Luke's Episcopal Health Charities Community Health Information System and the UT School of Public Health Community Health Assessment Resource for Texas.

Analysis of HIV-AIDS: Patrick M. Tarwater, Ph.D., associate professor of biostatistics, School of Public Health El Paso Regional Campus

Tarwater uses his biostatistics expertise both in his own research on HIV-AIDS and in development of a biostatistical consulting group for health sciences research.

At the School of Public Health, he has founded the Data Center for Preclinical and Clinical Research, which manages and analyzes data for eight projects with more than $25 million in funding from the National Institutes of Health. These projects include collaborations with the Department of Comparative Medicine at the Johns Hopkins School of Medicine and the Department of Infectious Diseases and Microbiology at the University of Pittsburgh Graduate School of Public Health.

"My research experience has been the application of biostatistical methods for the analysis of HIV infection, treatment and natural history," Tarwater said.

Recently, he published in *AIDS* as primary author in collaboration with the Multicenter AIDS Cohort Study (MACS) regarding the prognostic

to know one another.

"One of the features of developing a research program is that it's a very concentrated effort," Davies said. "Each scientist works in his or her own particular area, a sort of sub-community within the UT Health Science Center. There is often little opportunity to meet and to interact with colleagues from other schools or other areas of research facing similar challenges. We hope that this event will provide our young investigators with the opportunity to get to know one another and to build bridges to other corners of our diverse research community."

McKinney told the Outstanding Young Investigators, "I really appreciate your work, your efforts and your perseverance."

McKinney and Davies have been hosting a series of lunches with researchers over the past six months in order to keep the university's leadership more up to date on the health science center's research enterprise and the issues of concern to its researchers.

"Research is a top priority of the university," McKinney said, and the administration is making some changes to provide better support. Among the changes are assistance in learning to write grant proposals and provision of bridge funds to support promising research projects between external funding cycles.

The Outstanding Young Investigators luncheon was hosted by the offices of the President, Research and Public Affairs.

Many of those attending the luncheon hold faculty appointments in the UT Graduate School of Biomedical Sciences at Houston. ✪

(Above) James Knierim, Ph.D., left, and Roger Janz, Ph.D., are honorees from the Medical School.

(Top Left) Kristina Mena, Ph.D., left, SPH El Paso Regional Campus, with Sue Day, Ph.D., SPH associate dean for research.

value of HIV RNA levels for development of AIDS in individuals currently on highly active antiretroviral therapy. He and a collaborator at the Retrovirus Laboratory at Johns Hopkins recently published in *JAMA* results from a macaque SIV study that demonstrated the ability of the antibiotic minocycline to suppress viral replication in the brain.

After earning his doctorate in biometry from the UT School of Public Health, he joined the faculty in the Department of Epidemiology at Johns Hopkins.

"Specifically, I worked in the Stat-Epi research group, which acted as the Data Coordinating Center for the MACS, a cohort study designed to characterize the natural history of HIV infection, and for the Women's Interagency HIV Study, a cohort study of HIV positive women," he said. "In this position, I gained extensive experience in the area of HIV infection and progression that I have maintained in my current research pursuits."

Keep Children Healthy: Susan R. Tortolero, Ph.D., assistant professor of health promotion and behavioral science and epidemiology, School of Public Health

Keeping adolescents healthy is a challenge. Tortolero directs the Prevention Research Center, which brings academic researchers, community members, and public health and education agencies together to collaborate on developing effective strategies to prevent health problems among teens.

She is principal investigator (PI) on a long-term study, Healthy Passages, designed to provide an understanding of those factors that help keep children healthy. Information learned in this study can help families, health care providers, schools and communities make the best choices in developing and implementing programs and policies to improve the health and development of children, adolescents and adults.

Tortolero is also PI of several school-based intervention studies to test effective strategies for preventing pregnancy and sexually transmitted infections among teens.

"I have always been interested in adolescent health; however, during my graduate studies, it became clear that many American adolescents are threatened by what has been called 'social morbidities,' which include: unintended pregnancy, sexually transmitted infections, homicide, suicide, injuries related to violence and substance abuse," she said. "These social morbidities and unhealthy behavior patterns not only threaten adolescents' current physical health status, but also are linked through the lifespan to adult chronic diseases and ultimately to adult mortality.

"The task of improving the health status of youth is complex and difficult, yet challenging and rewarding. The task is made more difficult by concurrent problems in educational performance, interrupted family relationships, poor living conditions, and a culture that supports and reinforces many unhealthy behaviors," Tortolero said.

"Parents and educators need solutions to deal with these important health issues," she said. "Being a parent of a 9-year-old and a 16-year-old further motivates me in helping parents, educators and community agencies to address these issues."

Heart and Muscles: Sudha Veeraraghavan, Ph.D., assistant professor of biochemistry and molecular biology, Medical School and GSBS

Understanding the relationships between structure and function on the molecular level may someday lead to new ways to combat muscle degeneration, such as in muscular dystrophy, and to find treatments for certain heart conditions, inflammation or stroke.

Veeraraghavan's research group is studying the structural basis for molecular events that decide which cells of a developing organism must become heart tissue, and which cells will become skeletal or smooth muscles.

One project focuses on finding out how a naturally produced piece of a protein, a peptide, of the Cathelin family reduces the effects of heart attack in mice models. "The peptide triggers angiogenesis or the formation of new blood vessels, which help bring in more oxygen and nutrition to damaged tissues to revive them," she said. With funding from the American Heart Association and a National Institutes of Health subcontract, the team is studying the chemistry and structure of the peptide.

In another project, the researchers are investigating the role of TEA domain (TEAD)-containing proteins in muscle development. TEA domain is the name given to a DNA-binding segment of a family of proteins.

"We know that the TEAD proteins interact with other cellular proteins to determine when, where and how much of muscle proteins will be made," Veeraraghavan said. "The TEAD proteins also bind serum response factor, a protein that is crucial for normal heart development."

The researchers are using NMR spectroscopy to find precisely which molecules must interact and how, at the atomic level, and using various biochemical or biological methods to learn what would happen if the interactions were disrupted.

The team has recently succeeded in obtaining the first three-dimensional structure of the TEAD.

In collaboration with Dr. Xiaolian Gao of the University of Houston, Veeraraghavan said, "We also have found a method to assess, or assay, the ability of a DNA-binding protein to bind to any of thousands of DNA sequences, microscopic amounts of which are arranged on a glass chip, or microarray. Further, rather than one at a time, we can assay the different binding sites all at once to obtain the results in one shot and hence, it is a high-volume or high-throughput method."

Linking Brain and Mind: Hongbin Wang, Ph.D., assistant professor, SHIS

How do people perceive, remember, make decisions and act? Wang is interested in understanding how the neural activities in the brain lead to knowledge and behavior.

His main approach is to use computers to model human cognition, at both the neural networks level and the observable behavioral level, and investigate relationships between the two levels. He also collects empirical data, through neuroimaging (FMRI and EEG) and psychological experiments, in order to evaluate the computer models.

"I have long been fascinated by the idea of using the computer to simulate human cognition," Wang said. At Ohio State University, he earned his doctorate in cognitive psychology and an additional master's degree in computer and information science with a specialty in artificial intellgience. This interdisciplinary background has played a role in his pursuing a unified computational link between the brain and the mind.

Working in the Center for Computational Biomedicine at SHIS, and the Keck Center for Computational Biology, he has been principal investigator on several grants from the Office of Naval Research and NASA.

Smallest Bio-molecules: Willy Wriggers, Ph.D., assistant professor, SHIS and GSBS, and adjunct faculty member, IMM

An answer to human diseases may lie in the smallest known realms of life. That's the promise of nanomedicine, an exciting new field that scientists are pioneering right now at the UT Health Science Center.

(Above) Developing a research program is a very concentrated effort, says Peter Davies, M.D., Ph.D., executive vice president for research.

(Left) Claudia Pedroza, Ph.D., SPH, meets Vanthi Jayaraman, Ph.D., Medical School.

Nanomedicine is medical diagnosis, monitoring and treatment at the level of single molecules or molecular assemblies that provide structure, control, signaling and motility in cells.

"By studying the actions and interactions within life's subcellular machinery, we're finding better drug and treatment options," said Wriggers, who is director of the SHIS Laboratories of Biocomputing and Imaging. "We're also learning how to diagnose diseases earlier. Thereby, our research builds bridges between the smallest size bio-molecules and Texas-size clinical practice.

"Our team is leading the development of technology that brings the prediction of function from the structure of complex molecules within reach of biomedical researchers," he said. "This will lead to a precise understanding of mutations and other biological variations, and the ability to design molecules for medical nanotechnology."

Wriggers holds a Sloan Fellowship and joined the UT Health Science Center after postdoctoral and faculty work in San Diego.

"I was attracted to multi-disciplinary research throughout my scientific development," Wriggers said. "On the one hand, my current research focus on imaging and computer modeling still reflects my background in physics. On the other hand, my earlier postdoctoral training in biochemistry and cell biology at the University of California at San Diego and at The Scripps Research Institute in California inspires me to address biomedical questions related to the functioning of life on the molecular scale.

"Clearly, biomedicine is the major new scientific frontier of the 21st century," he said. "The ongoing advances promise to enrich the lives and well-being of humans, to a similar extent as physics enabled the intellectual mastery of nature in the 20th century."

Cardiac Hypertrophy: Yang Xia, M.D., Ph.D., assistant professor of biochemistry and molecular biology, Medical School and GSBS

Understanding the molecular mechanisms of cardiovascular diseases is the focus of research in Xia's lab. The research has the potential to lead to novel diagnostic and therapeutic opportunities that could greatly reduce morbidity and mortality associated with these diseases.

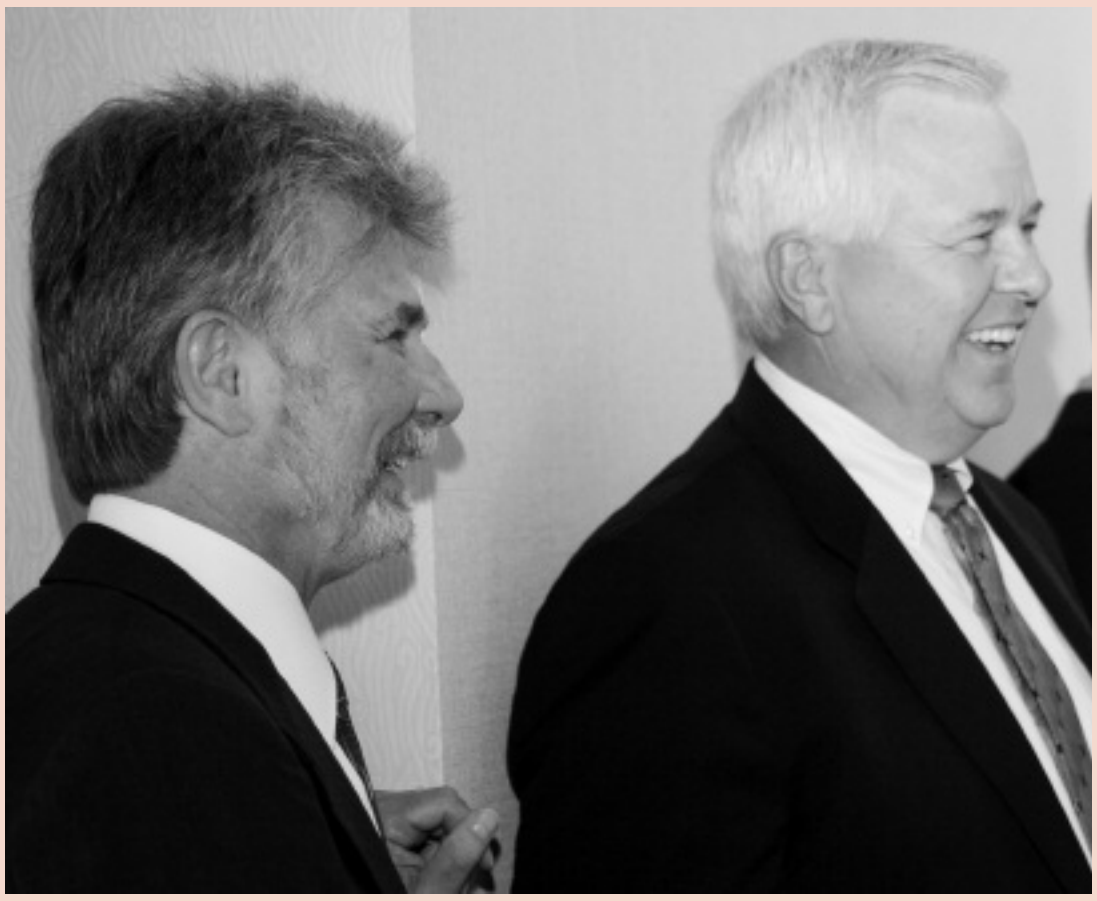
Specifically, Xia is trying to identify the pathways within cells for chemical or electrical signals associated with cardiac hypertrophy.

"Cardiac hypertrophy," she said, "is an early

adaptive process that allows the heart to maintain or increase cardiac output in response to increased workload. I have used both cellular systems and transgenic mice as our experimental methods to investigate the essential role of multiple signaling pathways in cardiac hypertrophy." She is principal investigator on the study, which has funding from American Heart Association-Texas Affiliate.

Her recent studies explore previously unrecognized calcium-independent pathways associated with cardiac hypertrophic gene regulation. These novel findings led to several prestigious awards: Lyndon Baines Johnson Research Award, Young Investigator Award of the International Society of Heart Research and Outstanding Early Career Development Award of American Heart Association.

In addition, she said, "I developed new research in another heart-threatening vascular disease, preeclampsia, a leading cause of death during pregnancy." Her findings raise the possibility that preeclampsia is a gestation-induced autoimmune disease. ✪



(Top left) Sharing a laugh are Guy Parcel, Ph.D., left, dean of SPH, and Michael McKinney, M.D., senior executive vice president and chief operating officer.

(Top right) Enjoying the occasion are Chunlin Qin, D.D.S., Ph.D., left, and John Ludington Jr., D.D.S., chairman of the Department of Endodontics, both from the Dental Branch.

(Bottom right) Hongbin Wang, Ph.D., left, SHIS, with L. Maximilian Buja, M.D., executive vice president for academic affairs.

(Bottom left) Nobel laureate Ferid Murad, M.D., Ph.D., right, director of the IMM, in conversation with Stanley Schultz, M.D., dean of the Medical School.

The University of Texas Health Science Center at Houston

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