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Celebrating And Investing In Research At SMU

James E. Quick, associate vice president for research and dean of graduate studies, who joined SMU in 2007, has long participated in the enterprise of creating new knowledge.

A scientist with the U.S. Geological Survey for 26 years, he brings a global view and experience in creating and leading large and significant research projects: environmental studies to guide Everglades restoration; an earthquake risk assessment of Cyprus; geologic mapping for the Kingdom of Morocco; and monitoring the 169 active volcanoes in the United States. He is experienced in attracting grants and funds from federal and state agencies, the United Nations and various international sources.

Quick, who holds a Ph.D. in geology from California Institute of Technology, has visited five continents to conduct research on the deep magmatic plumbing systems beneath volcanoes. He currently advises the Commonwealth of the Northern Mariana Islands on development of renewable energy.

Quick spent the past year becoming familiar with SMU’s broad range of research activities as well as its funding needs to support those activities. He shares his goals and thoughts with SMU Research.

Q. How does SMU convince alumni and donors that research pertains to them?
A. The evidence is all around us. Research has been fundamental to creating the world we live in now. Absent achievements in science and engineering, we would be living much as we did in medieval Europe. We all benefit from extraordinary advances that have contributed directly to our quality and length of life: automobiles, airplanes, penicillin and modern medicine, electricity, computers, plastics and air conditioning.

As a nation, we have been immeasurably fortunate that the United States has led the world in research since World War II, creating so many of the innovations that constitute the foundation of our prosperity and security. Silicon Valley is a clear example of the contribution research innovation can make to national and local economies.

Now focus on the Dallas-Fort Worth area, and imagine a future in which thriving research at SMU contributes directly to solutions of local problems, such as issues in urban planning, rapid transit and water availability, and to national problems such as energy sustainability and immigration. As a top-flight research university, SMU will be contributing to the local economy through partnerships with the private sector and tech transfer of its research discoveries to stimulate development of new industries. SMU will be competing with the highest ranked universities for the best undergraduate and graduate students, many of whom will settle in North Texas. In short, imagine a community-university partnership that sparks the next Silicon Valley right here in the Metroplex.

Q. What are your goals for Research and Graduate Studies at SMU?
A. My overarching goal is to set SMU squarely on a path that leads to increasing stature as a research university. Looking to the future, I envision SMU as a source of influential scholarship that addresses the major problems facing our society, with a prestigious faculty holding numerous awards from leading professional societies and recognized by increasing memberships in the national academies. I envision a vigorous research enterprise that attracts the best young faculty and offers highly regarded Ph.D. programs that produce graduates whom the nation’s elite universities covet as faculty. I envision an SMU that celebrates and invests in research and graduate education as essential components of the top-tier university it has become.

Q. How does research support teaching?
A. Research informs a faculty member’s teaching, and faculty should constantly seek new knowledge so they can provide the most up-to-date and accurate information to their students. Many fields, such as computer science and biology, are evolving so fast that a faculty member not engaged in research is teaching material that becomes progressively out of date.

Our research must tackle big problems and engage our students in their solution. No leading research university is without a vigorous graduate program, and graduate education is part of the overall educational experience that the modern American university is expected to provide. In addition to performing much of the research, graduate students directly contribute to the education of undergraduates as instructors, mentors and role models. As we grow research at SMU, I hope that we successfully reach out to undergraduates, capture their imaginations and draw them into the excitement of discovery through direct participation in research.
Q. Why is SMU focusing research on issues in health care, immigration and energy sustainability?
A. Provost Paul Ludden launched planning initiatives on these topics to involve the faculty in identifying immediate, high-profile research opportunities, and to develop strategies that SMU can pursue to engage these issues more broadly and effectively in the future. To advance in stature as a research university, SMU must engage problems that are recognized by society as critically important. This is the key to research success. Important problems capture public attention, and research efforts to solve them attract federal funding.

The provost and I are in complete agreement on this direction for SMU. If you listen to the national news on any evening, you are likely to hear coverage on the crisis in health care, climate change, the impact of immigration and the escalating price of gas. The key is to identify aspects of these problems that we can address now with our current resources, and to plan longer-term strategies that foster growth of research at SMU in areas that will contribute increasingly to significant solutions.

Q. How will your office help faculty attract more grants and funding to support their research?
A. The federal government is the largest sponsor of research in the world, but unfortunately, federal funding for research has not kept pace with expectations. The intensely competitive nature of this environment is demonstrated by the fact that success rates for new proposals to many programs are much less than 20 percent and, in some cases, less than 10 percent. Clearly, increasing grants and funding is going to be difficult and slow at first, and growing research at SMU will not be accomplished by simply writing more proposals.

There are immediate actions that my office will do to help. We will improve the proposal preparation process with an online proposal routing and approval process. We will work with the Office of Grants Accounting to provide timely reporting to researchers on the financial balances in their projects so that funds are not left unspent when the project closes. We will provide better information online to faculty on opportunities and regulations. Lastly, we will expand the Office of Research Administration to more effectively process proposals, to assist faculty in matters of compliance on federal regulations and to launch an effective program of tech transfer.

On a more strategic level, I plan to work with the provost and faculty to identify areas into which SMU research can expand. Ideally, these will be areas that build on existing strengths, contribute to the initiatives established by the provost, and avoid competition head-on with established programs at other universities in our region. We need to encourage dialogue between our faculty and federal funding agencies that may lead to new funding initiatives, and dialogue with the private sector that may lead to research partnerships. We need to seek opportunities for collaboration with other Metroplex universities and utilize innovative collaborations within SMU that transcend traditional discipline boundaries. My hope is that this office also will find resources to fund pilot studies, to enable faculty participation in federal programmatic planning exercises, and to provide matching funds to increase the competitiveness of our proposals.

Q. If a key to SMU's future is its investment in research today, how will you rely on the fund-raising initiatives of the upcoming Second Century Campaign to help support that?
A. Research is a business that cannot be grown without investment. A gift given in the interest of building the research enterprise is a gift that will go on giving by enabling the University to attract more federal funding in future years. That said, I have identified several broad targets for support from the campaign.

Investment in Faculty From benchmark universities, it is clear that research activity in terms of grant dollars expended increases exponentially with increasing number of faculty conducting research in fields that have federal dollars available. This is strong evidence that SMU must increase the size of the faculty in the sciences and engineering if we want to reach a target of $50 million per year in research expenditures.

Investment in Graduate Education Graduate students are the muscle that performs much of the research at universities. SMU needs to develop funding for fellowships so that our stipends allow us to compete for top graduate students.

Investment in Infrastructure National Science Foundation statistics show that for every $1 million in research conducted, about 5,000 square feet of laboratory space is required. So, to support $50 million in annual research expenditures, we will have to double the amount of lab space at SMU from 125,000 to 250,000 square feet! That's a challenge, because lab space is expensive. We need to take a hard look at that "traditional" laboratory model and consider alternatives that could increase research at SMU without requiring so much up-front investment on infrastructure.

One alternative that stands out would be to emphasize growth in the computationally intensive subdisciplines of the sciences and engineering. Every field in science and engineering has an aspect that's highly dependent on significant computing muscle, and investment in a high-performance computing center would enable us to significantly expand research in those areas. Although we must not abandon laboratory-
Ford Research Fellowships Recognize Innovation

Five 2008 Ford Research Fellowships were awarded to the following SMU faculty:

Rhonda Blair, professor of theatre, focuses on the application of cognitive neuroscience to acting processes. She is the author of *The Actor, Image and Action: Acting and Cognitive Neuroscience* (Routledge, 2008), which describes how she integrates new strategies derived from the sciences into acting. She has received programmatic grants from the National Endowment for the Arts and the National Endowment for the Humanities, among others.

Marc Christensen, department chair and associate professor of electrical engineering, has built a nationally recognized research group in photonics and computational imaging. His work with imaging sensors and micro-mirror arrays has been funded by the National Science Foundation and the Defense Advanced Research Projects Agency (DARPA), among others. In 2007 he received the DARPA Young Faculty Award. He also leads a project with researchers from the University of Delaware, UT-Dallas and Sandia National Laboratory.

Rajani Sudan, associate professor of English, is a specialist in early modern British literature whose research interests include literature and science, cultural representations of imperial identity and cybertulture. Her first book, *Fair Exotics: Xenophobic Subjects in English Literature, 1720-1850* (University of Pennsylvania Press, 2002), received a 2002-03 Godbey Authors’ Award for outstanding research by an SMU faculty member. Her upcoming book, *Mud, Mortar and Other Technologies of Empire*, focuses on non-European contributions to the Age of Enlightenment.

Kumar Venkataraman, associate professor of finance, specializes in market microstructure dynamics and market efficiency. His research has influenced policy debates on the structure of financial markets and has been cited by the U.S. Securities and Exchange Commission. His work has been featured in industry publications and in several books, including *The Handbook of World Stock, Derivatives and Commodities Exchanges*. In addition, he is an invited member of the National Bureau of Economic Research Working Group on Market Microstructure.

Steven Vik, professor of biological sciences, examines key mechanisms of bioenergetics – the study of how living systems get and use the energy sources required to sustain life. He has made significant contributions to the understanding of the vital enzyme in these processes, the ATP synthase, including its role in the production of adenosine triphosphate (ATP), which is essential for nerve functioning, muscular and molecular movement and other vital cellular processes. He is a member of the editorial board of the *Journal of Biological Chemistry*.

Established in 2002 with a $1 million gift from SMU Trustee Gerald J. Ford, the fellowships help the University retain and reward outstanding scholars. Each recipient receives a financial award for research support.

Huffington Endowment Boosts Earth Sciences

One of SMU’s oldest and most distinguished academic departments has new resources to support its research and teaching, thanks to a gift of more than $10 million from the Honorable Roy M. Huffington of Houston, who died July 11. The gift endows the Department of Earth Sciences in SMU’s Dedman College, now renamed the Roy M. Huffington Department of Earth Sciences.

Earth sciences research at SMU has achieved international recognition in the areas of seismology, experimental petrology, geothermal studies and paleoclimatology, which integrates stable isotope geology, sedimentology and paleontology. Currently, research projects of the Earth Sciences faculty have external funding totaling more than $4 million from agencies including the National Science Foundation, National Geographic Society, Petroleum Research Fund of the American Chemical Society, U.S. Department of Defense and U.S. Department of Energy. Research sites include Asia, Arabia, Africa, Australia, Antarctica, Pacific Islands, the Americas and Europe.

Major Earth Sciences research facilities at SMU include:

- Geothermal Laboratory – the major repository for geothermal resource data in the United States.
- Hydrothermal Laboratory – can simulate subsurface conditions and fluid-rock interactions to a depth of eight miles.
- Seismology and Infrasound Program – specializing in seismo-acoustic arrays and the sources of earthquakes, an
integral part of the U.S. nuclear test detection efforts.
- Shuler Museum of Paleontology – major repository of vertebrate and plant fossils from North America and significant holdings from Africa, Asia and the Middle East.
- Stable Isotope Laboratory – center for studies of hydrogen, carbon and oxygen isotopes of fluids and rocks with applications to Earth's major cycles, including ancient and modern climate.

"An expanding need for earth science professionals has resulted from increased environmental concerns and other growing demands," says Paul W. Ludden, SMU provost and vice president for academic affairs. "As SMU has responded to previous national needs, we are poised to prepare the next generation of earth scientists to address new national problems."

Oil, Gas And Geothermal Energy: The New Dynamic
SMU's nationally recognized geothermal energy team provided an alternative energy "how-to" forum in June, demonstrating how oil and gas producers can breathe new life into low-producing wells and generate low-cost electricity by tapping the "nuisance" hot water generated by drilling operations.

The Geothermal Energy Utilization Associated with Oil and Gas Development Conference, the third SMU geothermal/oil and gas conference, attracted a record 220 participants. Although geothermal scientists, inventors and developers have dominated previous events, the 2008 conference drew larger numbers of participants from the oil and gas industry who are seeking ways to enter the alternative energy market.

"For the first time we also had significant participation by end-users who are pushing the geothermal community to determine ways to make geothermal projects happen," says Maria Richards, SMU Geothermal Lab coordinator and conference organizer. "They want to buy the renewable resource for their projects."

A highlight of the conference was the formal announcement by the U.S. Department of Energy of its "Enhanced Geothermal Systems Research, Development and Demonstration" funding program, which will award $10.5 million in fiscal year 2008, with an additional $79 million in funding anticipated over fiscal years 2009 and 2010. SMU's geothermal team will compete for a share of the funding, partnering with various companies and individuals to submit projects and proposals, Richards says. The conference was a natural fit for the University: Half the nation's active oil and gas land rigs are located in Texas, and SMU's geothermal scientists are the acknowledged experts in this emerging field.

Although geothermal energy often is associated with large, high-temperature hydrothermal power plants, the technology exists to draw clean, affordable power from lower-temperature water. For example, the process of pumping oil and gas frequently brings with it waste fluids that carry substantial heat to the surface from areas of unusually hot rock. The installation of a binary pump at the wellhead can produce enough energy to run the well, mitigating production costs for low-volume wells. In addition, an oil field full of geothermal pumps could be linked to distribute surplus electricity, at a profit, to outside users.

SMU researchers have documented large amounts of hot water that Texas oil and gas producers must reinject into the ground at considerable expense. In West Texas, for every barrel of oil produced, nearly 100 barrels of hot water are co-produced.

The idea of using CO₂ instead of water as a heat and oil extraction mechanism drew much discussion. A power plant using this method would be carbon negative, says David Blackwell, SMU's W.B. Hamilton Professor of Geophysics. But the geothermal and oil and gas industries can succeed with either fluid.

Blackwell and Richards were part of an 18-member panel assembled by MIT in September 2005 to evaluate the potential of geothermal energy becoming a major energy source for the United States by 2050. Blackwell and Richards also developed the Geothermal Map of North America, released by the American Association of Petroleum Geologists in 2004.

The SMU Geothermal Lab is partially funded by a grant from the Texas State Energy Conservation Office (SECO) for geothermal outreach and networking. The goal of this program is to increase geothermal awareness among Texas residents and development of additional geothermal projects in the state.

Historian Honored By Academy, Institute
One of the nation's leading historians of the American Southwest and the U.S.-Mexico borderlands, David J. Weber, has been elected to the American Academy of Arts and Sciences. Weber, the Robert and Nancy Dedman Professor of History, directs the William P. Clements Center for Southwest Studies at SMU.

In addition, Weber received the Lon Tinkle Award for Lifetime Achievement from the Texas Institute of Letters earlier this year.

He is the author or editor of more than 20 books and 60 scholarly articles. His books have won numerous major awards,
including the American Historical Association’s 2006 John Edwin Fagg Prize for Bárbaros: Spaniards and Their Savages in the Age of Enlightenment (Yale University Press, 2005).

Two governments have given Weber the highest honor they bestow on foreigners: In 2002 King Juan Carlos of Spain named him to membership in the Real Orden de Isabel la Católica, and in 2005 Mexico named him to the Orden Mexicana del Águila Azteca.

For more information: faculty.smu.edu/dweber/

**Tech, Immigration Booms Tied Together**

The ways in which immigration is reshaping the United States today and its future impact are examined in Twenty-First Century Gateways (Brookings Institution Press, 2008), a new book co-edited by SMU Anthropology Professor Caroline Brettell.

The book’s case studies center on the fastest-growing immigrant populations in metropolitan areas with previously low levels of immigration, including the Dallas-Fort Worth area. These 21st-century gateways are home to one in five immigrants to the United States. According to Brettell, in 1970, only 2 percent of Dallas’ population was foreign-born; by 2000, nearly one-quarter of the city’s residents were born in another country.

Brettell’s research focused on 600 immigrants in Dallas, Tarrant, Collin and Denton counties. Her findings mirror the trend in other new gateways: “high-capital immigrants,” the more highly educated, highly skilled newcomers, help fuel tech-sector growth, which creates jobs in construction and service industries for lower-skilled immigrants.

For more information: www.brookings.edu/press.aspx

**By The Numbers: Probing The Gender Gap In Science**

According to the National Research Council (2006), women earned 44.7 percent of the doctorates awarded in the biological sciences between 1993 and 2004, yet comprised only 30.2 percent of the assistant professors at the top 50 U.S. universities. In physics, the gap is far wider.

Anne Lincoln, SMU assistant professor of sociology, researches the reasons for the gender disparities. In September Lincoln received a three-year grant from the National Science Foundation’s Research on Gender in Science and Engineering program to examine women’s and men’s reasons for pursuing academic science careers as well as their perceptions about women’s contributions to academic science.

Lincoln and a team of four sociology undergraduate students are nearing the completion of the sampling database—a list of all faculty and graduates students at top-20 biology and physics graduate departments in the United States—and will randomly select 2,500 of them to participate in an Internet-based survey. A subsample of about 150 respondents will later be selected for more in-depth interviews, which will take place in 2009.

“In 2010, we will be wrapping up the study and mostly running analyses on the data,” she says.

Lincoln’s co-investigator is Elaine Howard Ecklund of Rice University.

In addition to expanding recent scholarly findings related to the role perceptions have in the decision to pursue a career in academic science, Lincoln’s research is expected to provide the “necessary research underpinnings to build university policies and practices that encourage women’s interest in science majors and careers.”

**Unemployment: Is It A Black And White Issue?**

Research over the past four decades shows that the unemployment rate of African Americans has been substantially higher than that of whites—the black unemployment rate is about twice that of whites—with the disparity amplified during an economic recession. Recent research by Isaac Mbiti, assistant professor of economics in SMU’s Dedman College of Humanities and Sciences, is attempting to pinpoint why.

In the paper “An Empirical Analysis of Black-White Employment Differences over the Business Cycle,” Mbiti and co-author Yusuf Soner Baskaya of Brown University compare the changes in employment of black and white workers during recessions. After adjusting for differences in worker skill and productivity using a novel method—analyzing data on wages earned in the prior year—“the recessionary black-white employment gap remains large and significant.”

The report has provided important insights about the sources of differences in black-white employment outcomes, including the possibility that “these results may indicate discrimination against blacks.”

For more information: isaacmbiti.googlepages.com/research
Taking The Geologic View Of Climate Change

With headlines proclaiming that climate change is coming — seas may rise and cities may flood, crops may fail and people may be displaced — nothing seems stable about the state of the planet. But geologist Robert Gregory has taken the long planetary view of Earth’s geological and climate cycles. In short, he sees the Earth as extremely stable when compared with other alternatives in our solar system.

“We worry about the state of Earth and how climate is changing,” says Gregory, professor and chair of the Roy M. Huffington Department of Earth Sciences in Dedman College. “But the underlying cycles have been similar for 3.5 billion years, and I assure you that Earth is very stable in the long term. We know, however, that climate fluctuations occur.”

Areas of the planet that were abnormally hot — or cold — change in size from time to time, he says. These fluctuations are not symptoms of major instability; in fact, they are normal.

“The problem is that civilizations are not good at adjusting to climate change, especially now,” he explains. “In the old days, it was easier for civilizations to pick up and move when the climate shifted. Humans could follow the warmth and flee the flooding or the cold. But now, with human population near the carrying capacity of the planet and humans having the ability to affect global climate change, it is not so easy.”

Gregory, who earned his Ph.D. from the California Institute of Technology, has spent his career studying how the Earth works, especially global geochemical cycles and plate tectonics — the interaction between rocks and fluids in the crust and mantle. He was one of the first scientists to understand how deep seawater circulation penetrated into the mantle as a result of crust formation at mid-ocean ridges by using the oxygen isotope ratios in 100-million-year-old ocean crustal rocks. These oxygen isotope ratios contain a “memory” of when they first came into contact with seawater millions of years ago.

With their understanding of plate tectonics expanding, Gregory and other researchers took a second look at what was occurring on and below the ocean floors and how it affects the chemical composition of the oceans and the atmosphere. Carbon dioxide and water and their interaction with rocks driven by plate tectonics provide a “thermostatic control” of Earth’s climate by regulating the carbon dioxide content of the atmosphere. In addition, the chemistry of the oceans is regulated, much as the kidneys help cleanse and regulate the salt content of blood in the human body, providing a stable environment for life to evolve, Gregory says. “It is no accident that the medical profession uses saline solution with seawater salinity.”

As Gregory continues to study stable isotopes to find more clues about the planet’s future by unlocking the past, he and his SMU Earth Sciences colleagues Crayton Yapp and Neil Tabor remain confident about the general stability of the Earth over geologic time. “However, the big concern this century is human activity that is perturbing the carbon cycle at unprecedented rates,” he says. “For the short term, energy and climate are tied together and both will affect the future quality of life.”

For more information: smu.edu/earthsciences/people/faculty/gregory.asp
Walking the narrow corridors of what once housed a federal prison in Mexico City to search the archives for his book published in 2003, Revolution in Texas, SMU historian Benjamin Johnson could only imagine what the halls might have witnessed long ago.

"The documents are stored in the jail cells where the walls are still covered with graffiti from the prisoners," says Johnson, associate professor of history in Dedman College of Humanities and Sciences. "The atmosphere was intense, but these papers were the records of the 1910 land redistribution, near Mexico's Matamoras and opposite Brownsville, Texas, that helped inspire the revolt."

Revolution in Texas (Yale University Press) recounts an early 20th-century uprising of Tejanos (Texans of Mexican origin) that occurred in the lower Rio Grande Valley and was fueled by Anglo settlers' desire for land.

For years, this violent regional history was suppressed. Eventual cooperation between the U.S. and Mexican governments helped end the cross-border attacks, but the events would inspire Tejanos to fight for their rights as Americans, an effort that still continues. Tejanos who weren't part of the violence went on to found organizations like the League of United Latin American Citizens (LULAC) in 1929.

In his latest book, Bordertown: The Odyssey of An American Place (Yale University Press, September 2008), Johnson uses the remote town of Roma, Texas, as an example of the larger history of the U.S.-Mexico border and its changing role in the United States. Similar to the first work, Bordertown, which features photographs by Jeffrey Gusky, is an explanation of how border residents came to identify themselves as Americans in the United States while continuing to feel powerful kinship with their Mexican heritage. Bordertown also includes exploration of material culture and urban layout.

Borderlands research piqued this native Texan's interest while in graduate school at Yale – where he earned M.A. and Ph.D. degrees – as he realized the Mexican border's importance to the United States. "The United States is not self-contained; to understand our history requires an understanding of our connection with other parts of the world, in this case Mexico," says Johnson, who joined SMU in 2002.

Estimating that by 2050, more than a quarter of the United States' population will have some kind of Hispanic ancestry, mostly Mexican, Johnson says the Hispanic role in American history has been largely ignored. "The United States is such a polyglot society, and there are many notions of Americanism. Different people have found a place to fit in, which is one way our country works. Telling these stories about history has made room for them."

Johnson also studies environmental history, a relatively new field that examines interactions between humans and the natural world. He focuses on the experience and social history of conservation.

Another book under contract with Yale University Press, Escaping the Dark, Gray City: How Conservation Re-made City, Suburb and Countryside in the Progressive Era, combines several aspects of the conservation story, including environmental politics, urban history and architectural forms, and traces the rise of the movement and its effects on industrial society.

"Conservation has been a more profound strand within American culture than most realize and is usually presented as a movement followed by a small, undemocratic elite," Johnson says. "But I see mass support for it in spite of complicated circumstances."

For more information: faculty.smu.edu/bjohnson/
Actors often are asked to mine their emotions and conjure up memories to bring substance to their roles for the stage or the big screen. But many become too focused on getting a feeling or a memory exactly right — what Professor of Theatre Rhonda Blair calls a "neurotic preoccupation with authenticity. Sometimes actors don't understand that thinking is feeling."

In philosophical opposition to this approach, Blair says, are the academic performance theorists who, for the past few decades, refused to acknowledge the validity and importance of emotions for actors.

After more than 30 years in the theatre as both a director/actor and academic writer, Blair found herself in the middle: disagreeing, to some degree, with both sides. "On one side were the practice-centered actors who were so focused on feeling that they didn't want to think, and on the other, the performance theorists who disdained feelings," she says. "It was a variation on Descartes' assertion of the mind-body split."

As a way to reconcile the two viewpoints, she turned to cognitive neuroscience — the study of the relationship between biological mechanisms, emotion/feeling and thinking/reasoning. "The cognitive view requires both actors and theorists to understand they can't separate body, feeling and thinking — it's all of a piece."

The application of cognitive neuroscience to the theatre realm has developed only within the past eight years. "Cognitive science shows that memory, imagination, emotion, physicality and reason are all connected, and they are all, in many ways, a process, not pieces to be held onto and practiced individually," Blair says. "The goal is to teach actors to be less focused on themselves in a psychoanalytic sense and more on the role — on being as engaged as possible with the role and the audience. By doing so, actors can focus on what they can take from their experiences and imagination in service of the role."

Her research has made a significant impact not only on her work as a director but also as a teacher. This spring, she published The Actor, Image and Action: Acting and Cognitive Neuroscience, the first book written for actors that applies the insights of cognitive neuroscience to actor training.

"The book is a required text for my graduate acting classes, and I talk to all my students about how the brain works," says Blair, who was named a Ford Research Fellow for 2008. "I'm more attentive to their physical state and energy level in the room. I've become less lecture-oriented and more interactive, providing much more sensory stimulation. As a result, the students are noticeably more engaged with the material."

Blair, who joined SMU's Meadows School of the Arts in 1995, received her Ph.D. (theory and criticism, directing, Russian theatre) and two M.A. degrees (acting and directing; Russian language and literature) from the University of Kansas. She has directed and acted in more than 75 productions and has staged original solo and collaborative performance work since the 1980s. In addition, she has given national and international workshops and presentations on solo performance, gender and performance, and improvisation.

For more information: smu.edu/meadows/theatre/faculty/blair.asp
Medical Tourism: Searching For Cheaper Health Care

More and more Americans are choosing to receive medical treatment — even complicated surgeries — in foreign countries to save big money. The practice is called "medical tourism," but do the risks to consumers outweigh the savings? That's an important question, says Nathan Cortez, SMU Dedman School of Law assistant professor, who is focusing his research in health law on this emerging medical market.

"Patients take a calculated risk by seeking medical care overseas in regulatory systems that may not offer the rights or protections they expect," Cortez says. Interviewed for National Public Radio last November, he warned that although patients are free to travel overseas and reap whatever savings they can find, the international shop-around could affect how U.S. hospitals pay for care for the uninsured.

"We see this all the time with other industries," Cortez told NPR. "Health care has been notoriously a local industry, and now it's ... succumbing to globalization like other industries have."

Cortez has published the first comprehensive look at how domestic policymaking can offer American medical tourists some level of consumer protection. "Patients Without Borders: The Emerging Global Market for Patients and the Evolution of Modern Health Care" is included in the winter 2008 issue of the Indiana Law Journal.

Attempts to restrict patient travel may not be effective, Cortez warns. But he offers some practical approaches to help protect American patients:

- Regulating the activities of brokers and others who arrange for U.S. patients to travel overseas could provide access to information about the quality of care outside the United States.
- Lawmakers could require employers or insurers that encourage patients to have surgery overseas to pay for pre-screening and post-operative care in the United States.
- Lawmakers could require employers to share a minimum portion of the cost savings with patients willing to have surgery overseas, which would partially compensate them for any additional risk they may bear.

"Health care has been notoriously a local industry, and now it's ... succumbing to globalization like other industries have."

Although lowering the cost of medical care is a universal concern, Cortez says there is no evidence of American employers requiring employees to seek cross-border treatment. But neither are cost-conscious companies who are quietly adding foreign hospitals to their provider networks seeking publicity for those additions.

"California is the only state where you can buy insurance plans that require treatment outside the United States," Cortez says. "It's a niche market for the immigrant population there — you agree to go to Mexico."

Cortez was a featured speaker at a March symposium on cross-border health care hosted by the Wisconsin International Law Journal, and is conducting research for that publication on the underlying trends that encourage medical tourism. "I argue that the practices and standards in the medical industry are becoming more similar across borders, which makes medical tourism possible."

Cortez teaches courses in administrative law, health law, FDA law and the legislative process. Before joining SMU in fall 2007, he practiced with the Washington, D.C., firm of Arnold & Porter representing medical technology clients, with a special emphasis on health care fraud and abuse, FDA enforcement and health privacy. He earned a J.D. from Stanford.

For more information: nathan.cortez.googlepages.com
Assessing Neo-monasticism’s Impact On The Church

In search of a simple community life devoted to worship and social activism over program-driven church, some Christians today have chosen a “new monastic” lifestyle, taking a spiritual path that blends aspects of ancient monasticism with 21st-century church practices.

“Traditionally we think of evangelism as a tornado that moves through town and gathers everyone into the vortex of our church,” says the Rev. Elaine Heath, McCreless Assistant Professor of Evangelism in Perkins School of Theology and director of Perkins’ Center for the Advanced Study and Practice of Evangelism. “In the neo-monastic model, evangelism is the ‘reverse tornado’ described in Luke 10: Going out into the community, being invited into our neighbors’ lives and sharing the goodness of God.”

The recipient of a Sam Taylor Fellowship from the United Methodist General Board of Higher Education and Ministry, Heath is writing two books about emerging neo-monastic communities in the United States. A Summer Research Fellowship from the Wabash Center will enable her to spend time at several neo-monastic communities, including Communality in Lexington, Kentucky, and Camden House in Camden, New Jersey.

“I’m very interested in how neo-monasticism relates to the rest of the church and how it will shape the church and the church will shape it,” she says. Although no statistics are available on the number of new monastic communities in the United States, she says the grassroots movement is growing. “The rest of the church can learn much from the new monasticism,” Heath says, including regaining “a sense of parish, of being the church for the neighborhood, and disciplined spiritual practices and a rule of life for ordinary Christians.”

Variations on the monastic theme crop up throughout Christianity’s history, flowering “when people see the church losing its vitality,” Heath says. Men and women embracing neo-monasticism take socially conscious citizenship as seriously as they do their faith. Many opt to move into blighted urban areas and open their homes to those in need of food, shelter and spiritual support while spearheading such efforts as reclaiming abandoned buildings that improve the quality of life for neighborhoods.

Heath’s research explores such issues as “how we can apply that ethos to our regular, middle-class neighborhoods.” She identifies old-fashioned hospitality — “Christians opening their homes to neighbors for dinner and friendship” — and community spirit — “actually getting to know and understand the neighborhood and its needs” — as hallmarks of suburban neo-monasticism.

An ordained United Methodist minister, Heath is the co-author, with Scott Kisker, of the forthcoming Longing for Spring: A New Vision for Wesleyan Community, which casts a vision for how to develop and lead new monastic communities in the United Methodist tradition. Heath arrived at SMU in 2005 from Ashland Theological Seminary in Ohio, where she was director of the Doctor of Ministry program and assistant professor of spiritual theology.

The former pastor of several small United Methodist congregations in Ohio, Heath holds an M. Div. from Ashland Theological Seminary and a Ph.D. in systematic theology from Duquesne University.

For more information: smu.edu/theology/people/heath.html.
Navigating Workplace Change, One Employee At A Time

Miguel Quiñones describes today's business climate with an age-old saying: "The only constant is change."

"With competition coming from the other side of the globe and over the Internet, the rate of change has accelerated. Organizations must constantly adapt to survive," says Quiñones, who joined SMU's Cox School of Business as the Marilyn and Leo Corrigan Endowed Professor of Management and Organization in 2006.

Quiñones focuses much of his research on individuals working in these organizations, including his new study, "Explaining Differences in Reactions to Organizational Change: The Role of an Individual's Stage of Change." He presented the research in April 2008 to the Society for Industrial and Organizational Psychology.

The study began in 2005, while Quiñones was serving as a U.S. Fulbright Scholar and visiting professor at Pontificia Universidad Catolica in Santiago, Chile. There he met David Huepe, a graduate student and consultant to the Chilean investigative police, which was significantly changing how it hired detectives — and creating conflict between managers and subordinates in the process.

Change theories typically focus on subordinates' deep-seated resistance, Quiñones says, but he suspected something else was behind the conflict. "It's always struck me that those at the upper levels, with their wide view of the competitive landscape, have had time to accept the need for a change and work through all the alternatives — and then they just spring this new direction on their organization."

In developing a survey that Quiñones and Huepe gave to 580 officers in Santiago, they drew from a 1994 model that identified five necessary stages for lasting change — precontemplation, contemplation, preparation, action and maintenance — and demonstrated that different techniques are needed to move individuals from one stage to the next.

Their survey found more managers at the action stage, when they felt genuinely committed to the change, and more subordinates at the early stages, where they felt forced to change. "When making a change, organizations clearly must not assume that everyone is at the same place," Quiñones says. "If they don't lead individuals through the process, the change isn't likely to take hold."

He plans to follow up with another study on effective strategies for different stages, such as support groups and reward systems.

Quiñones also leads the SMU Cox CEO Sentiment Survey, which he launched last year with Robert Rasberry, assistant professor of management and organizations. Published in the September 2007 Dallas CEO magazine, the survey tracks the perspective of Dallas-Fort Worth business leaders on the local economic outlook, the quality of the workforce, competitive challenges and other issues. "We want to do this every year to keep our finger on the pulse of the area's business leadership and to follow trends and shifts," Quiñones says. He notes that Cox's strong connections to a vibrant business community drew him to SMU, along with the University's commitment to teaching and research.

After receiving his Ph.D. in industrial/organizational psychology from Michigan State University, Quiñones taught at Rice University and at the University of Arizona. He is a fellow of the American Psychological Association and the Society for Industrial and Organizational Psychology, and serves as associate editor of the Journal of Management.

"I like to link the academic world with the business world to solve problems," Quiñones says. "If we do our work right in organizational psychology, we help create an environment where people feel valued and productive, which makes for a stronger, more innovative organization."

For more information: cox.smu.edu/academic/professor.do/quinones
Creating Polyglots Via The Internet

As an undergraduate German major at the University of Kentucky and a prize-winning writer in English, Paige Daniel Ware was surprised when the written intricacies of a foreign tongue did not come as easily as verbal fluency. Her second language flowed more naturally in conversation than it spilled onto the page, an experience that influences her research involving young English learners who often have “to perform [in school] in a language in which they are not yet proficient.”

Now an assistant professor in SMU’s Annette Caldwell Simmons School of Education and Human Development, Ware received a 2006 Ford Fellowship for her research on the integration of instructional technologies, particularly Web-based tools and applications, into second language learning and teaching. In support of further research in this area, she recently received a prestigious National Academy of Education Spencer Fellowship for a two-year project involving adolescent English language learners in the United States and their peers in Spain who are learning English as a foreign language.

The first year of the two-phase study will focus on a voluntary after-school program; in the second year, students will participate as part of their regular English language arts classes. Ware’s analysis will consider whether one of the settings is more conducive to literacy and writing development than the other.

Because of her ongoing relationships with the Irving ISD and a bilingual school in Granada, Spain, Ware expects to draw about 20 students from each location. Although it’s not yet clear what impact the international component will have, Ware says that at the very least it will provide “an outlet for them, as bilingual students, to communicate with an audience outside of their worlds.”

As “key pals” – the online equivalent of “pen pals” – the students will craft at least 10 exchanges, but they won’t be ordinary e-mails. “The students may write letters, but they’ll have to add multiple hyperlinks to hobby sites, family blogs or other sites,” Ware says. “The second type of exchange will be a multimedia slide show in which they’ll use still images and voice-overs; and the third is a digital story that they’ll create with whatever video editing software is available on their computers.”

The multimedia twist to the research serves a dual purpose: as a carrot – “multimedia tends to engage adolescents, so it could be a motivating factor” for some students to participate – and as a measuring stick, of sorts. “Previously the concern was that there are the technology and Internet ‘haves’ and ‘have nots’ the digital divide. Now we see that despite having computers and access to

the Internet at school, students in lower socioeconomic brackets do not perform at the same technical level: the second-level digital divide,” Ware explains. “As a way to close that divide, the study will document how language growth occurs when students engage in purposeful writing with peers” while developing and demonstrating digital literacy.

Ware expects the results to have practical applications for teachers. “The findings should provide evidence that the type of engagement and language use generated around multimedia literacy also can lead to the growth of students’ more traditional writing skills.”

A polyglot with a passion for writing, Ware’s interests in languages and learning coalesced at UC Berkeley, where she earned a Ph.D. in education, language, literacy and culture. She also was an instructor in the creative writing program at Berkeley. Before completing her doctorate, she spent time in Germany as a Fulbright scholar and lived in Spain for three years to learn Spanish and teach in a bilingual school.

In addition to her research and teaching, Ware, who has been at SMU since 2003, is the principal investigator of a Department of Education Office of English Language Acquisition (OELA) professional development grant that supports secondary school educators in obtaining their ESL supplemental certification.

For more information: smu.edu/education/teachereducation/faculty/warepaige.asp
At 10 p.m. on a Saturday night in April, a handful of SMU scientists continue working at the European Organization for Nuclear Research (CERN) in Geneva, Switzerland. A scattering of lights illuminates the windows in several buildings along the Rue Einstein, where researchers from dozens of countries and hundreds of institutions are combining their expertise on the Large Hadron Collider (LHC) – the biggest physics experiment in history.

Ryszard Stroynowski, chair and professor of physics at SMU, points out each building in succession to a group of visitors. "By October, every light in every one of these windows will be on all night," he says.

By then, the LHC is expected to be fully tested and ready to work. When the largest particle accelerator ever constructed becomes fully operational, it will hurl protons at one another with precision to a fraction of a micron and with velocities approaching the speed of light. These conditions will allow physicists to recreate and record conditions at the origin of the universe – and possibly discover the mechanisms that cause particles in space to acquire their differences in mass.

For Stroynowski, who has worked for almost 20 years to help make the experiment a reality, the anticipation surrounding its imminent activation. "It is somewhat like that of a 6-year-old kid on Christmas Eve, waiting for Santa Claus," he says. "The time stretches almost unbearably long."

The LHC will be the site of several experiments in high-energy physics with high-profile collaborators such as Harvard and Duke and national laboratories including Argonne, Brookhaven, Lawrence Berkeley and Fermilab. None of the experiments is more imposing than ATLAS, one of two general-purpose particle detectors in the LHC array.

At about 42 meters long and weighing 7,000 tons, ATLAS fills a 12-story cavern beneath the CERN facilities in Meyrin, Switzerland, just outside Geneva. It is a tight fit: ATLAS overwhelms even the vast space it occupies. A catwalk, not quite wide enough for two people to stand side by side, encircles the device and allows an occasional dizzying view into its works.

Size Matters

In ATLAS' case, size matters. The detector's scale will help to focus and release the maximum amount of energy from each subatomic collision. A series of bar codes on each of its parts ensure that the detector’s components, whether palm-sized or room-sized, are aligned and locked with the perfect precision required for operability. Scientists from 37 countries and regions and 167 institutions

From left: James Quick and Ryszard Stroynowski examine a model of the Large Hadron Collider at CERN headquarters. Photo by Kathleen Tibbetts
SMU Physicists Participate in an International Experiment to Explore Origins of the Universe

By Kathleen Tibbetts
participated in its design and construction.

As U.S. coordinator for the literal and experimental heart of the ATLAS detector — its Liquid Argon Calorimeter — Stroynowski is helping to finalize the last details of the detector’s operation in anticipation of the extensive testing, scheduled to begin in August. He leads an SMU delegation that includes Robert Kehoe and Jingbo Ye, assistant professors of physics in Dedman College of Humanities and Sciences.

SMU scientists are completing work on the computer software interfaces that will control the device, which measures energy deposited by the flying debris of smashed atoms. A cadre of University graduate students and postdoctoral fellows also is working on data processing for ATLAS’ 220,000 channels of electronic signals — an information stream larger than the Internet traffic of a small country.

An estimated 53,000 visitors crowded the CERN facilities on the organization’s “Day of Open Doors” April 6, eager for a glimpse of the work that CNN International has named one of the “Seven Wonders of the Modern World.” At the beginning of May, the areas were sealed off in preparation for the first round of testing. Computers will remotely control the ATLAS experiment, which will not be touched by human hands because of the radiation released by the atomic collisions.

Safety is the reason for the elaborate lockdown procedure involving more than 80 keys, each coded to a different individual’s biometric data. The system is designed to lock out any use of the device if even one key is unaccounted for. “ATLAS has been built to run for at least 15 years with no direct human intervention,” Stroynowski says. “It will be as if we have shot it into space.” Currently, the initial test run is schedule to begin September 1, 2008.

The Waiting Game
Once data start streaming in, the game of expectations management begins. The ATLAS detector will produce a staggering amount of raw information from each collision, and the most useful bits will be few and far between. Out of 40 million events per second, the researchers hope to pinpoint 10 events a year. The challenge seems a little like looking for a needle in a haystack the size of Mars.

“We may get what we’re looking for on the first try, or it may take us three years to find anything we can use,” Stroynowski says. “A big part of our job is to make sure we’re ready when we do.”

Among those entrusted with that task are SMU graduate students and postdoctoral fellows in physics, including Rozmin Daya, Kamile Dindar, Ana Firan, Daniel Goldin, Haleh Hadavand, Julia Hoffman, Yuriy Ilchenko, Renat Ishmukhametov, David Joffe, Azeddine Kasmi, Zhihua Liang, Peter Renkel, Ryan Rios and Pavel Zarzhitsky.

“I came to SMU for postdoctoral work specifically because of the department’s involvement in the ATLAS project,” says David Joffe, a native of Canada who received his Ph.D. in physics from Northwestern University. “For particle physicists, being part of this is really a once-in-a-lifetime opportunity.”

For Julia Hoffman, who received her doctorate from Soltans Institute for Nuclear Studies in her native Poland, that opportunity has meant expanding her own horizons. “I learn new — and I mean really new — things every day,” she says. “Different programming languages, different views on physics analysis. I’m learning how it all works from the inside. I work with students and gain new responsibilities. This kind of experience means better chances to find a permanent position that will be as exciting as this one.”

The SMU group works with formulae based in Monte Carlo methods — probabilistic models that use repeated random sampling of vast quantities of numbers — to impose a semblance of order on the chaos created when atoms forcibly disintegrate. The results are highly detailed simulations of known physics that will help make visible the tiny deviations researchers hope to detect when ATLAS begins taking data later this year.

A Challenge And An Opportunity
These unprecedented computing challenges also have become an impetus for new SMU research initiatives. James Quick, SMU associate vice president for research and dean of graduate studies, hopes to contain ATLAS’ vast data-processing requirements with a large-capability computing center located on campus. Quick
Scientists are seen working on the inside of the ATLAS cryostat, which will be used to cool liquid argon to 90 K in the electromagnetic calorimeter. Thin lead plates immersed in the cooled liquid will produce electromagnetic showers of particles when an electron, positron or photon enters the detector. This causes the argon to glow, allowing the initial particle energy to be measured.

visited CERN in April to discuss the details with Stroynowski and other key personnel. The proposed center would provide a first-priority data processing infrastructure for SMU physicists and a powerful new resource for researchers in other schools and departments. During the inevitable LHC downtime, as beams are calibrated and software is debugged, the SMU center's computing power would be available for campus researchers in every field across engineering, the sciences and business.

"The ATLAS experiment presents an opportunity for the University to step up in a big way, and one that will benefit the entire campus," Quick says. He envisions a data processing farm of 1,000 central processing units, each connected to an Internet backbone to allow the fastest possible return on SMU's ATLAS input.

Speed and access are the keys, Stroynowski says, paraphrasing a quote from Winston Churchill: "The winner gets the oyster, and the runner-up gets the shell." Those who have made their careers in high-energy physics are well aware of the stakes involved in the LHC, he adds, and being the first to process certain data could separate a potential Nobel Prize winner from those who will make the same discovery a day late.

As a group, high-energy physicists are accustomed to taking the long view — and for SMU researchers, the long view has been especially helpful. The ghost of the Superconducting Super Collider, which would have made its home in North Texas, still shadows the recent triumphs at CERN. The SSC brought Stroynowski to the University, and its 1993 demise through congressional defunding was the impetus for the LHC project.

The questions haven't gone away because the experiment has changed venues, Stroynowski says. Yet even now, as the first test nears, his anticipation is tempered by caution. "I don't think we'll get a beam all the way around [the LHC tunnel] on the first try," he says. Indeed, the subject of whether scientists will achieve a beam collision during the first tests or after additional calibration has been the subject of a few lively wagers.

"I think we'll have to wait at least a few more weeks for that milestone," he adds. "But in this case, I'll be more than happy to be wrong."

For more information: www.atlas.ch and www.cern.ch
Bio Wizar

Cutting-Edge Research At SMU Could Help Advance Medical Treatments  By Cathy Frisinger
In his third-floor laboratory in Dedman Life Sciences Building, biologist Robert Harrod and his team are zeroing in on a new way to inhibit the virus that causes AIDS. They already have shown that their approach, which involves the rare genetic disorder Werner syndrome, works when the disorder's enzyme defect is introduced into cells. Now they are trying to find practical ways to use this pathway to inhibit the AIDS virus.

The beauty of this approach is that the AIDS virus will not be able to mutate in a way that can defeat this treatment, says Harrod, associate professor of biological sciences in Dedman College of Humanities and Sciences.

Down the hall from Harrod's lab, Assistant Professor of Biological Sciences Jim Waddle is preparing to file for a patent on a tiny "worm" that is expected to be highly useful in drug-testing, producing results far more quickly than tests run on larger lab creatures.

Meanwhile, their colleagues, Associate Professor Pia Vogel and her husband, John Wise, a lecturer in the Biological Sciences Department, are conducting work that may have implications for cancer treatment.

**WITH YOUNG FACULTY MEMBERS LIKE HARROD, WADDLE AND VOGEL WORKING ON CUTTING-EDGE CONUNDRUMS, AND A RECENT $3.6 MILLION GIFT TO BIOLOGICAL SCIENCES, THE DEPARTMENT IS POISED TO PLAY A HIGH-PROFILE ROLE IN BIOLOGY ADVANCES IN COMING YEARS.**

In university laboratories throughout the world, enormous strides have been made in biology research in recent years, including the mapping of the human genome. With young faculty members like Harrod, Waddle and Vogel working on cutting-edge conundrums, and a recent $3.6 million gift to Biological Sciences, SMU's department is poised to play a high-profile role in biology advances in coming years, says William Orr, chair and professor of biological sciences.

The gift from philanthropist and SMU Board of Trustees member Caren Prothro and the Perkins-Prothro Foundation includes $2 million for an endowed chair, $1 million for an endowed research fund, $500,000 for a graduate fellowship fund and $100,000 for an undergraduate scholarship fund.

The endowment will enable the University to attract a biologist with a national reputation in research to join a faculty that is strong in cellular and molecular biology and biochemistry and is doing research that could have practical applications in medicine, Orr says.

For example, Vogel and Wise are looking for a way to improve the long-term efficacy of chemotherapy treatments. Wise uses a nautical metaphor to explain their work: "Picture a cancer cell as a ship on a sea and the chemotherapy being dumped into the ship, there's a mechanism like a sump pump that will dump that chemical back overboard," he says.

That cellular "sump pump" is important to normal cell health because it keeps toxins out. "Of course, with cancer cells that are targeted for destruction by chemotherapeutics, you'd like to be able to turn off that mechanism," Wise adds.

Vogel explains that many cancer cells respond to treatment by pumping out more and more of the toxins as time goes on, so that a cancer treatment that works well initially might not work as well in later stages. "Switching chemotherapy drugs doesn't help..."
because the cancer cells just pump out everything, resulting in multi-drug resistance,” she says.

Using Electron Spin Resonance Spectroscopy, a biophysical technique that obtains structural information about the cellular pump, Vogel’s research group is trying to find a way to shut off the ATP energy usage by this cellular sump pump. “If you can knock out the pump, you can sink the cancer ship.”

Vogel’s colleague Robert Harrod, who studies retroviruses that infect humans, focusing on transcriptional gene regulation, is working on a mechanism that might sidestep a more specific type of multi-drug resistance – of the virus that causes AIDS to the conventional HAART (highly active antiretroviral treatment) drug regimen.

His approach is related to a rare genetic disorder called Werner syndrome, which causes premature aging in those who have the disease. Researchers have noted that individuals who are carriers for Werner syndrome do not develop AIDS, and Harrod hypothesized that the enzyme involved in Werner syndrome is necessary for transcription of the retrovirus. Using cells that had the Werner syndrome defect inserted into them, his lab was able to confirm this link, and last year he and co-researchers published the findings in The Journal of Biological Chemistry. Now his group is looking for molecules that might be used to block this transcription-necessary enzyme.

Included among the researchers cited in the journal article were several biological sciences students. Both graduate and undergraduate students assisted Harrod in his lab work on retroviral transcription.

Ask Assistant Professor Jim Waddle about the contributions made by students, and he’ll talk about the weird “worm” discovered by one of his graduate students. Waddle, whose Ph.D. work was in molecular genetics, has been studying the nematode Caenorhabditis elegans as a model for food absorption in the human gut. Fingerlike projections called microvilli, which are necessary for the absorption of nutrients, line the human gut; nematodes have microvilli on every gut cell. As part of their research, Waddle’s lab doused the nematodes in mutation-causing chemicals and examined them via a fluorescent protein. Ph.D. candidate Christina Paulson looked at 20,000 nematodes in this manner and came up with one that had a nematode version of diverticulosis, with outpouchings all along the gut. Disappointingly, the mutated worm turned out to be normal in terms of lifespan, reproduction and absorption of nutrients. But, Waddle says, “we threw our heads together and thought about conditions the nematode might encounter in the wild” versus the laboratory setting. He wondered if the worm might have trouble eliminating toxins. It did.

Normal nematodes eliminate toxins too quickly for the worms to be useful in drug testing, but toxins stay in the weird worms long enough to have an effect on them. And that means the millimeter-long creature likely will be highly useful in drug-testing situations, because a nematode’s life cycle is so much shorter than that of the larger animals, such as mice, that generally are used to test drugs.

The student who identified the worm is one of 18 graduate students – nine working on Master’s degrees, nine on Ph.D.s – in the Department of Biological Sciences. With 126 undergraduates, the department enrolls the largest segment of undergraduate majors in the natural sciences at SMU. Undergraduate students who intend to go into biological research can apply for the BRITE (Biomedical Researchers in Training Experience) program, a collaboration between SMU and the University of Texas Southwestern Medical Center, and leads to acceptance into a UT Southwestern Ph.D. program.

Orr believes the Biological Sciences Department is on the verge of a leap forward in size and stature. Administrative support to boost research has come from Provost Paul Ludden, whose background is in biochemistry. Current research projects in the department are supported by $4.3 million from agencies that include the National Institutes of Health, the National Science Foundation and the American Heart Association.

Orr’s dream for the department is to double the current tenured and tenure-track faculty to 18 members. Of the nine, seven conduct ongoing research projects, five of which are funded by federal agencies. The department will add an assistant professor in spring 2009. Later that year, a national search will be conducted to fill the new Distinguished Chair of Biological Sciences.

Although the department is small, a synergy has developed from building a faculty that is focused on cellular and molecular biochemistry, Orr says. Researchers can work together on projects, brainstorming ideas for new areas of investigation. More grants can be applied for, which means more grants awarded.

“We have a strong group that is focused on certain areas. By adding new faculty we will be able to boost the overall stature of the department,” Orr says. “If we increase the academic stature and the amount of research, we can provide more opportunities for graduate students and for undergraduates. It all works together.”
SMU Professor of Electrical Engineering Gary Evans recently received some good news: Journal reviewers said they thought his proposal for solving one of the most perplexing problems in the emerging field of integrated photonics sounded impossible.
"To me, that’s extremely promising when reviewers don’t think it’s possible. When that’s happened, it’s been fun showing the reviewers that the conventional wisdom is incorrect,” Evans says.

Photonics is the science of processing or transmitting information using light. Fiber-optic systems — perhaps the field’s best-known application — transform telephone conversations into laser-generated signals that travel through thin glass wires to machines that decode the signals at the other end.

A photon is a light quantum, the smallest measurable unit of light. Integrated photonics researchers seek to create circuits that use photons to do what electrons do in electric integrated semiconductor circuits.

Evans and Jerome Butler, University Distinguished Professor of Electrical Engineering, think they have hit on a solution to the problem of integrating an optical isolator with other components in a photonic circuit. In electric semiconductor circuits, diodes act as isolators by letting electrons flow in only one direction. “Isolation is crucial when you put about 1 billion devices on a single chip of silicon,” Evans says.

The two researchers want to integrate an optical isolator with a tiny semiconductor laser that would let light travel in one direction within a photonic semiconductor circuit and keep it from reflecting back into the laser, where it could create instabilities in the laser’s output.

It is understandable that their peers might be skeptical, Evans says. Researchers around the world have been trying to create integrated photonic isolators since the 1970s and no one has overcome the problem of reflection in photonic circuits.

Evans had a similar experience when he worked with lasers at RCA Labs in Princeton, N.J., before joining SMU. In 1984 all semiconductor lasers were edge-emitting, meaning they generated light from the edge of the chip rather than the surface. Evans and his team proposed a surface-emitting laser to the Air Force.

“They reviewers said we could never get light out, much less create a laser,” he recalls, adding that his team wrote a proposal and nevertheless received funding from the Air Force starting in 1985. In only seven years, Evans’ group got light out of the system and demonstrated surface-emitting lasers with performance efficiencies as good as edge-emitting lasers. When he came to SMU in 1992, the Air Force continued to fund Evans’ work, which resulted in a spin-off company, Photodigm in Richardson, Texas.

Photodigm conducts research for the government and manufactures a range of lasers, most of them edge-emitting lasers that have been improved using processes developed for surface-emitting ones, says Evans, who serves as co-founder, vice president and chief technology officer. Another co-founder is Jay Kirk, the Electrical Engineering Department’s lab manager and Evans’ former colleague at RCA. Electrical Engineering Chair and Associate Professor Marc P. Christensen is on the company’s technical advisory board, as is Butler, who worked closely with Evans when he was at RCA and helped lure him to SMU.

Evans has since expanded into medical photonics, working with SMU and Drexel University colleagues on a photodynamic therapy system to treat cancer of the esophagus. Similar laser-based systems are used commercially, but they are large and water-cooled. The team hopes to create a machine that’s portable and cheap enough for use in every doctor’s office.

Their design uses arrays of semiconductor lasers, each no bigger than a grain of sand, inserted into the esophagus via a balloon catheter. The patient is given a photosensitive drug that kills cancer cells during a chemical reaction triggered by the lasers.

Christensen says SMU’s photonics researchers — who include faculty members in electrical engineering, mathematics and physics, plus their graduate students — come together periodically for interdisciplinary meetings because so many fields are involved in creating and understanding photonic devices.

Christensen’s Photonic Architectures Laboratory has received more than $2 million in grants from the Defense Advanced Research Projects Agency (DARPA) for a project to make unmanned aerial vehicles (UAVs) stealthier.

"Today we think of a Predator UAV as flying at 30,000 feet carrying a really nice camera with a long lens that can zoom into an area
on the ground and look at it very carefully," he says. Ideally, the device would be tiny with a flat lens, like a cell phone camera; however, those cameras do not produce images of adequate resolution.

Christensen's interdisciplinary team has devised a multi-step solution that starts with an array of hundreds of tiny, flat, square cameras and equally tiny, square mirrors placed in a grid pattern that can be mounted on the underside of an aircraft as small as a model airplane. Each camera will provide slightly different information about the subject because each takes a photograph from a slightly different angle. Computational imaging is then used to combine the numerous low-resolution images to create a sharper image that is akin to one taken by a high-performance camera too heavy to fit on the small aircraft.

"Wouldn't it be great if the camera could determine from its wide shot which objects in the field are most important and be able to zero in on them?" Christensen asks.

Such a camera is being developed at SMU. Called an adaptive resolution camera, it would analyze the wide view and use mathematical formulas to identify objects of interest — such as aircraft on the ground.

Instead of simple mirrors, the adaptive resolution camera uses an array of micro-electric machines (MEMs). Each MEM looks like a mirror that is hundreds of microns across, or about the width of a few human hairs, attached to three even smaller levers. The levers would reposition the mirrors in the desired direction to improve the information collected by the camera's next photographs to create another, better image — all faster than the blink of an eye. The smarter camera would automatically put more pixels in the areas of interest and less in those considered unimportant, he says, adding that the resulting picture may look strange by conventional standards, but it would provide more useful information.

The team from the Electrical Engineering Department incorporates skills from physics, mathematics and computer science. Assistant Professor Dinesh Rajan, a specialist in information theory, finds the mathematical route to the best final image, a so-called "goodness value." Associate Professor Scott Douglas, an adaptive algorithms expert, crafts the formulas to make the system home in on the important details within the big picture. And Professor Panos Papamichalis works on their robustness, making the system more tolerant of the adversities the camera will encounter in daily use.

Integrated circuits make the thousands of necessary computations, and "given the need for miniaturization, the best way to reduce the size of those circuits would make them fully photonic," Christensen says. That step, however, is some time off.

For semiconductor laser structures, Christensen works with Evans. The two have just started a project, also for DARPA, in collaboration with the University of Texas at Dallas, Photodigm, Raytheon and Northrop Grumman. The goal: To develop signal processing with photons, instead of electrons; in other words, computing with light.

To achieve this they must create the photonic equivalent of a semiconductor chip. Most computer chips are made with silicon, which doesn't emit light very well. A better choice is indium (In) phosphide (P), called a III-V semiconductor, Christensen says. The goal is to emit and control light, one photon at a time. "At the quantum level you are literally controlling individual photons and providing gain (to amplify signals)."

Christensen compares the current state of photonic integrated circuits with the world's first electronic integrated circuit, invented at Texas Instruments 50 years ago this summer by the late Jack Kilby when he linked a handful of transistors on a single silicon chip. Over the next 50 years, semiconductors evolved from a handful of components on that first chip to hundreds of millions of components on a single chip, he says.

"If you look at the state of photonics processing, it's about 6 to 15 components," he says. "It's like we're starting today where Jack Kilby was 50 years ago, and it will be interesting to see where a few decades takes the field of integrated photonics."

For more information: engr.smu.edu/ee/research.html
Faculty Mentor Students In The Lab And The Field

Through their research, SMU professors not only bring new information and insights to their classrooms, but also serve as role models and collaborators to students who conduct research in their laboratories across campus.

Maintaining a strong research program is significant for a number of reasons, says James E. Quick, associate vice president for research and dean of graduate studies. "Research programs serve as a recruiting tool that helps a university attract the best students," he says. "Research also increases the diversity of ideas on campus and creates opportunities for different departments to work together on interdisciplinary projects."

In support of SMU's commitment to research at both faculty and student levels—part of the University's long-term strategic plan—Quick is seeking to more than triple SMU's annual research spending to $50 million. He emphasizes that the top 50 universities in the country, as ranked by U.S. News & World Report, each conduct more than $50 million a year in research. "The great universities of the 21st century will spend significant amounts of funds on research," he says.

From anthropology to engineering to religious studies, SMU undergraduate and graduate students and their faculty mentors are discovering new knowledge and playing an important role in higher education through their contributions to research.

**Lessons From Bolivia**

In summer 2007, SMU seniors Erin Eidenshink and Katie Josephson spent eight weeks in Cochabamba—Bolivia's third-largest city—researching gender roles and how they affect economic development programs in that country.

Eidenshink and Josephson received financial support from the Richter International Fellowship Program, which funds independent research abroad for students in SMU's Honors Program. Jill DeTemple, assistant professor of religious studies in Dedman College of Humanities and Sciences, served as their adviser on the research. DeTemple, whose own research examines the effects of faith-based development programs on religious identity in rural Ecuador, spent a semester helping the two students develop a research proposal. She later remained in contact with them by e-mail while they were in Bolivia.

"I am immensely proud of what they accomplished," DeTemple says. "They applied knowledge that they learned in the classroom and developed research skills. They have made the transition from being consumers of knowledge to being creators of knowledge."

Now a book chapter written by the students and DeTemple, describing the messages that faith-based organizations communicate about gender roles, has been accepted into an anthology under review for publication.

"Their work highlights the ways in which most development organizations and scholars presume that men and women relate to households and family life," DeTemple says. "While we have noted that the evangelical movement in Latin America has brought men in closer relationship to household life, Katie and Erin point out that this has not necessarily freed women to become more active in the public sector, nor has it led to gender parity in the household."

"I learned a lot from their research, and will look at gender roles a little bit differently when I do my research," she adds.

DeTemple says she also has enjoyed interesting conversations with Eidenshink and Josephson. "Because no one else on campus is doing research in my area, I don't have these kinds of conversations unless I go to a professional conference. They're working in the field now. We talk as researcher to researcher."

Eidenshink says that working with DeTemple and conducting the research "empowered me to draw my own conclusions."

In addition, DeTemple "challenged us to look at the research that already had been done and then to analyze it based on what we had seen," says Josephson, a President's Scholar. "We found that the facts were complex, not simple and straightforward."

**Encouragement Among The Test Tubes**

Christian Rissing ('03), a Ph.D. student in SMU’s Chemistry Department, studies the interaction of dendrimers based on a tetravinylsilane core with metals like copper, platinum and silver. Any interesting properties that develop "could prove useful for medical and electronic applications," she explains.

If she has any questions, Rissing can call on Associate Professor of Chemistry David Son, her adviser. She began studying with Son as an undergraduate and stayed at SMU to pursue her Ph.D. because she enjoys working with him.

"In the lab, we're always teasing Dr. Son about his favorite line: 'It looks promising,'" Rissing says. "He always looks for and finds the silver lining. I can work on a stubborn experiment for weeks, and I start questioning my technique. Even when the results look bad, he
will look at all the data and find something that 'looks promising.'

"It makes me want to go that extra step – read that extra paper or search through the literature in case I've missed something."

As a Ph.D. student, Rissing works independently, Son says. "I treat her more like a colleague now. But, in the beginning, with any student, you have to be a cheerleader. When I was a graduate student, more than half of my reactions didn't work. A big part of my role is to be an encourager."

**The Physicist's Apprentice**

Junior **Amy Hand** is writing a computer program to design a solenoid magnet that students will use in the physics lab to study the properties of "muons," electron-like radioactive particles produced in Earth's upper atmosphere. (A solenoid magnet is made by wrapping copper wire in a pattern around a specially shaped mechanical frame to produce a uniform magnetic field within the frame's interior.)

Hand, a President's Scholar, chose to study at SMU because of research opportunities made available to undergraduates, she says. "Working with a professor who has so much more experience and can guide me through a project is a huge benefit."

**Tom Coan**, associate professor of physics and Hand's adviser, helps students to develop a broad set of skills, from learning how to solder to selecting and purchasing mechanical and electrical components. "There are a lot of practical things and a bewildering assortment of things that students have to learn to be efficient in a lab," he says.

Hand researches, tests and refines the various components of her project, working closely with Coan to devise solutions as issues arise.

"The best way to learn the nitty-gritty details is elbow to elbow with a mentor," Coan says. "It's like an apprenticeship. You have to invest a fair amount of your time working with a student before you see any return, but the work can be beneficial to both of us."

**Planting The Seed Of Research**

Sophomore **Jason Stegall** spent last summer in the SMU School of Engineering's Laser Micromachining Laboratory using a laser process called micromachining to cut tiny channels on material that can be used to make artificial bones. "I was testing to see how strong the laser needed to be and how many pulses were required per task," he says.

A National Science Foundation grant awarded to **David Willis** and **Paul Krueger**, associate professors of mechanical engineering, supported Stegall's research. The three-year grant funds summer research opportunities for nine undergraduate students through 2009.

Through such grants the federal government is trying to encourage more students to conduct research and go to graduate school in engineering and the sciences, Willis says. "Part of the reason more students don't go to graduate school is that they don't know what researchers do and don't understand all the opportunities that are available to researchers."

Stegall says he eventually wants to become a college professor and do research and development for the automotive or aerospace industries.

**Collaboration In Print**

**Torrey Rick**'s research involves excavating sites as old as 10,000 years on the Channel Islands off the California coast. "The work I do is extremely collaborative," says Rick, assistant professor of anthropology. "Students are an important part of this work, helping to complete field and laboratory analysis and often providing fresh ideas and perspectives. Conducting research also benefits students by showing them how to navigate the world of scholarly publication. Ultimately, doing research and publishing papers can help them secure an academic position."

**Christopher Wolff** will earn his Ph.D. in anthropology with a focus on archaeology this summer and begin a postdoctoral research fellowship at the Smithsonian Institution in the fall. He studies the houses and social organization of a group of people whose cultural tradition, found in Newfoundland and Labrador, is known as Maritime Archaic. They occupied the region around 8,000 to 3,200 years ago.

He recently collaborated with Rick and **Amanda Aland**, another Ph.D. student, on an article that was published in the *Journal of California and the Great Basin Anthropology*. Wolff, the lead author, says, "Torrey is really good about getting students involved and thinking about publication."

Another Ph.D. student in anthropology, **Lauren Willis**, published a paper with Rick in the *Journal of Archaeological Science*. Willis, who came to SMU because of the research Rick is doing, says that "I can learn from reading, but talking to Torrey helps clarify what I've read."

For more information: www.smu.edu/graduate

-- **Joy Hart**
In academic year 2006-07, sponsors awarded a record $20,534,253 to SMU for direct and indirect costs of research and sponsored projects. Totals in previous years were $15,454,165 in 2005-06; $14,675,605 in 2004-05; and $19,658,689 in 2003-04.

Funding sources were federal agencies, $17,874,721; foundations, $2,103,071; corporations, $408,425; and state and local governments, $148,036.

Dedman College received $9,949,804 in 56 awards; the School of Engineering (SoE) received $5,764,143 in 31 awards; the School of Education and Human Development (SEHD) was awarded $2,775,855 in nine awards; Dedman School of Law received $1,636,380 in two awards; Perkins School of Theology received $383,071 in one award; and Meadows School of the Arts received $20,000 in two awards. Non-academic departments reporting to the Provost Office and others received a total of $5,000.

Of the 77 project directors/investigators, the following faculty members received $100,000 or more in aggregate funding. They are listed in alphabetical order.

Tracy Allred and Tonya Burton, Theology, Perkins Youth School of Theology, Lilly Endowment Inc.
Alfredo Armendariz, Environmental and Civil Engineering, "Control of Workplace Diesel Exhaust Particulate," Department of Health and Human Services
John Attanasio, Law, "Rule of Law Forum III" and "Rule of Law Forums," U.S. Department of State
Marc Christensen, Gary Evans and Jerome Butler, "High Performance Coherent Fiber-Optic Link-Photonic Phase Locked Loop (University of Texas at Dallas, Drexel University and Office of Naval Research)," U.S. Navy
Scott Douglas, Electrical Engineering "Source Separation (Modification 2)," Central Intelligence Agency
Richard Gunst and William Schucany, Statistical Science, "Biostatistical Research Interns," University of Texas Southwestern Medical Center; "Gulf War Illness Research Program," Department of Defense
Eugene Herrin and Paul Golden, Earth Sciences, "Infrasound Propagation in the 'Zone of Silence' (U.S. Army Space and Missile Command)," "Continuing Efforts at Midway Atoll," "Site Selection, Preparation, Construction, Installation and Operation of Infrasound Station in North Mississippi," "Ongoing Operations and Maintenance of the International Monitoring System Primary Seismic Array PS47 located near Mina, NV (University of Mississippi/U.S. Army S&MDC)," "Ongoing Operation and Maintenance of the Infrasound Data Acquisition Stations TXBAR and NVIAR Imbedded in the US IMS Primary Seismic Arrays at Terylina, TX TXAR (PS46) and Mina, NV NVAR (PS47) (University of Mississippi/U.S. Army S&MDC)" and "Ongoing Operations and Maintenance of the Mississippi Infrasound Array"
Bonnie Jacobs and Neil Tabor, Earth Sciences, "A Geosystems Approach to Paleobotany, Isotope Geochemistry and Paleoeology of the Late Oligocene Chilga Deposits, Northwest Ethiopian Plateau," NSF

Ernest Jouilhes and Renee McDonald, Psychology, "Domestic Violence and Child Aggression," National Institutes of Health (NIH)

Robert Kehoe, Physics, "Software Infrastructure for ATLAS Online Monitoring (Brookhaven National Laboratory/Department of Energy)," Department of Energy


Patricia Mathes. Literacy, Language and Learning, "National Council on Economic Education-English Language Acquisition Evaluation Research Program (Project ELLA)," Department of Education

Patricia Mathes and Jill Allor, Literacy, Language and Learning, and Ian Harris, Statistical Science, "Maximizing Literacy Learning Among Children with Mild to Moderate Mental Retardation," Department of Education

Patricia Mathes, Literacy, Language and Learning, and Jing Cao, Statistical Science, "Continuous Progress Monitoring of Early Reading Skills," Collins Foundation


William Orr, Biological Sciences, "Thioredoxin Peroxidases, Oxidative Stress and Aging" and "Glutathione, Oxidative Stress and Aging," NIH


William Pulte, Literacy, Language and Learning, "Masters Program in Bilingual Education with Gifted and Talented Focus" and "Supplemental Certification in Bilingual Education," Department of Education

Ne'Shaun Robinson-Jones, Literacy, Language and Learning, "Upward Bound and Supplement," Department of Education

Lawrence Ruben, Biological Sciences, "TRACK Regulates Cytokinesis in Trypanosoma brucei," NIH

Ryszard Stroynowski, Physics, "High Energy Physics (Experimental, Amendment #A005)," Department of Energy; "ATLAS Commissioning Maintenance and Operations," Brookhaven Science Associates, LLC

Ryszard Stroynowski and Fredrick Olson, Physics, "High Energy Physics (Theory, Amendment #A005)," Department of Energy

Brian Stump, Earth Sciences, "Field Studies to Quantify Natural and Man-Induced Events in Northeast China and Korea Using Seismic and Infrasound Observations" and "Seismo-Acoustic Monitoring," Air Force

Brian Stump and Christopher Hayward, Earth Sciences, "Seismic and Infrasound Energy Generation and Propagation at Local and Regional Distances: Active Experiments in the Western United States Seismo-Acoustic Monitoring," Air Force

Neil Tabor, Earth Sciences, "Collaborative Research: Testing Climate-Controlled Endemism in Equatorial Pangea," NSF

Steven Vik, Biological Sciences, "Structure-Function Studies of E. coli Fo-ATPase," NIH; "Analysis of Supercomplexes of Membrane-Bound Enzymes," The Welch Foundation

Pia Vogel, Biological Sciences, "The Stator Subunits of the ATP Synthase" and "NSF Research Experience for Undergraduates Supplement," NSF
based research, a high-performance computing center would cost only a fraction of the price of 125,000 square feet of new lab space. A high-performance computing facility could open up new fields for SMU such as bioinformatics, climate modeling, modeling of large economic markets, traffic modeling, petroleum basin and aquifer modeling, and creation of improved virtual reality training modules for psychology and education. And faculty across the University could benefit immediately from access to the center. For example, the Physics Department, which lacks the computing power to process large volumes of data, would be able to engage the CERN Large Hadron Collider experiment (see article on page 14) at a high level, increasing the profile of SMU as a research university.

Q. A University goal is to strengthen scholarly research and creative achievement. How does this fit into the strategic plan to increase academic quality at SMU?
A. Expansion of research at SMU is necessary if we are to improve our standing in the ranks of U.S. universities. Although not the only way to track the level of scholarly activity, research expenditures constitute the metric most commonly used to compare university research activity and impact.

Not surprisingly, there is a strong correlation between research expenditures and perceived academic quality. Virtually all of the top 50 universities in the U.S. News & World Reports rankings do more than $50 million of sponsored research a year. These are institutions that also house top programs in the humanities and arts. It is clear that a strong research program is no deterrent to academic excellence in other fields and probably indirectly promotes their success.

Increased funding for research creates a new revenue stream and translates into more publications, greater visibility for the University and more faculty and graduate students with whom undergraduates can interact.

The U.S. News' rankings are not the only metric to which we should pay attention. The Carnegie Institute publishes a classification of universities that contributes to public perception of institutional quality. To be classified among the highest-performing research universities, an institution must have research expenditures exceeding $50 million per year. Rice and Notre Dame, which have no medical schools and are comparable to SMU in size, perform $60 million to $85 million a year in federally funded research. That's a range to which SMU can aspire.

NASA's satellite image of the Earth at night underscores the timeliness of Provost Paul Ludden's initiative on energy sustainability. With Earth's population rapidly approaching 7 billion, the increasing demand for energy will continue to push the cost of fossil fuel ever upward.

The question is: “How do we keep the lights on?”

The answer lies in a combination of solutions that will require input from multiple disciplines. We need to locate new petroleum reserves and improve recovery, develop alternative sources of renewable energy, develop conservation strategies and technologies, and educate the next generation of scientists, engineers, and business men and women who will continue to keep the future of America bright.
SMU already is engaged. The Huffington Department of Earth Sciences in Dedman College, which has a long history of close association with the petroleum industry, is home to the nationally recognized Geothermal Laboratory. Through a memo of understanding with the Commonwealth of the Northern Mariana Islands, SMU scientists are attempting to bring geo-thermal energy to people for whom $4-a-gallon gasoline is a fond memory and the cost of diesel-generated electricity is simply no longer affordable. SMU engineering has created a new generation of flow meters that will provide information crucial to maximizing petroleum recovery. The Maguire Energy Institute in Cox School of Business facilitates the exchange of ideas and provides educational materials for students and teachers on the role of the energy industry in our society.

But we need to do more, and more right away, and the provost’s initiative recognizes that SMU is well positioned to contribute significantly to the solution through expansion of research and educational programs. – James E. Quick
Christiana Rissing, a Ph.D. student in the Chemistry Department, discusses her research with Associate Professor of Chemistry David Son. See article on page 24.