UT System Research Impact

May 2011

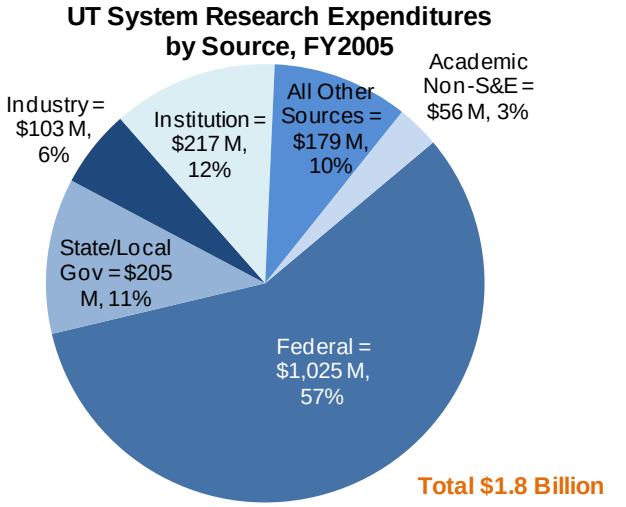
Health Institutions

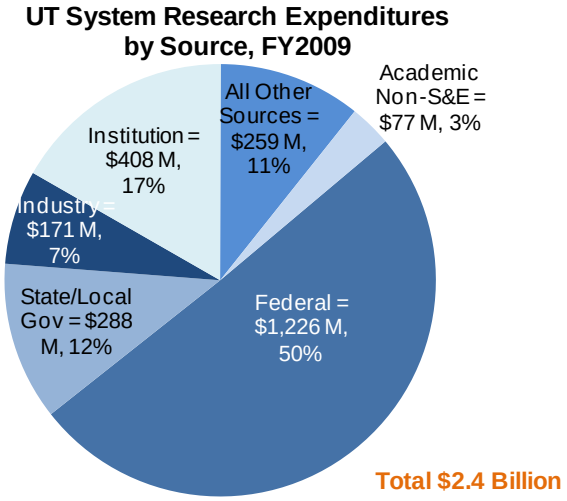
UT Southwestern Medical Center
UT Medical Branch at Galveston
UT Health Science Center at Houston
UT Health Science Center at San Antonio
UT MD Anderson Cancer Center
UT Health Science Center at Tyler

Academic Institutions

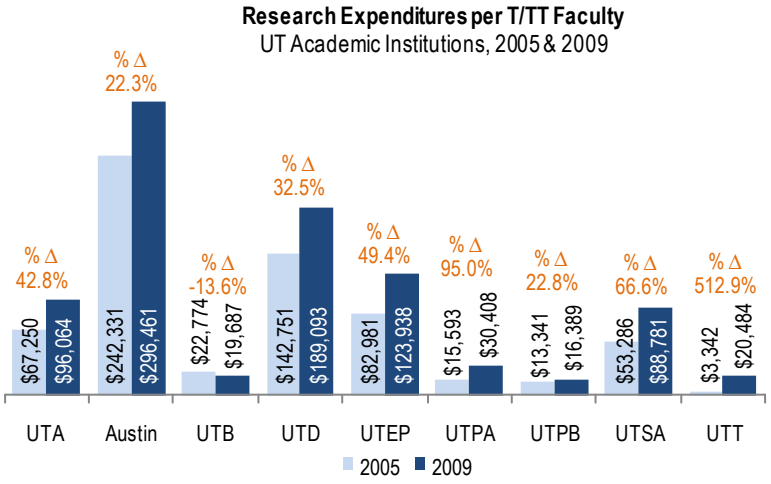
UT Arlington
UT Austin
UT Brownsville
UT Dallas
UT El Paso
UT Pan American
UT Permian Basin
UT San Antonio
UT Tyler

15 University System-wide Trends

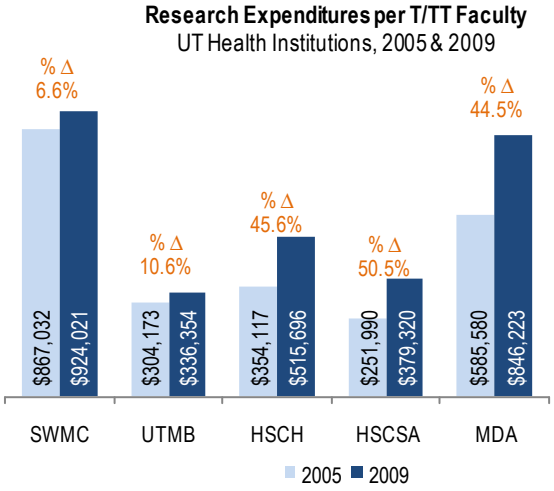




Source: National Science Foundation

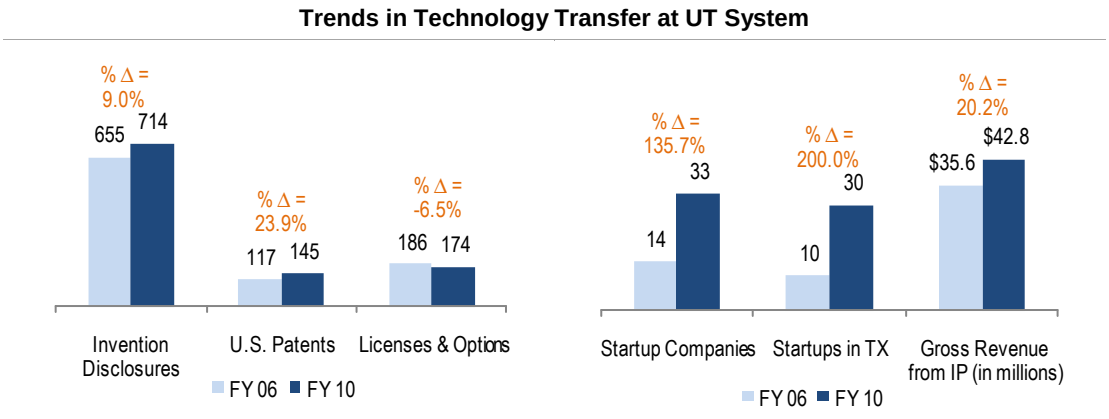


Source: Texas Higher Education Coordinating Board



Source: Texas Higher Education Coordinating Board

"Research Expenditures" – Research expenditures are those dollars spent from research funding (primarily from external sources; reflective of work performed on an annual basis since research funding is often a multi-year contract or grant. T/TT: Tenured/Tenure Track Faculty



Source: Texas Higher Education Coordinating Board

UT System signs a commercialization deal every other day, starts a new company every other week, and receives two U.S. patents nearly every week.

Areas of University Research Impact *{See Appendix for more detail on these and other campus research activities.}*

Research Impacts the Economy

- Attracts businesses interested in 1) partnering with university scientists for discovery and 2) recruiting an educated workforce
- Generates start-ups and spin-offs
- Creates high-paying, skilled jobs in private and public sector
- Produces income for the university through commercialization and technology transfer

On Campus: Strengthening the Economy

Research Brings Jobs to Valley

- UT Pan American
- Nanofiber Research
- 18 patent applications and 3 issued patents. Nanofiber production methods and equipment that enable the creation of nanofibers from a wider variety of materials than has ever before been possible. FibeRio Technology Corporation was launched; licensed Forcespinning™ technology. The company has 14 professional employees.

Reata Pharmaceuticals

- UT Southwestern (w/ UTMDA)
- A startup company that is developing a portfolio of inflammation drugs
- Has 110 employees; is entering a pivotal Phase III trial for a novel therapeutic agent that reverses diabetic kidney disease. In 2010, the company completed business development deals worth over $1 billion.

Bioengineering Innovation

- UT San Antonio
- Biomedical Research
- Research has resulted in more than a dozen patents, with others pending. Helped form three biomedical startup companies in San Antonio. Developed technology and innovations that have been licensed and commercialized.

Research Impacts Education

- Faculty members who conduct research are on the cutting edge of their disciplines, able to incorporate the most current information (as well as their enthusiasm) into the undergraduate and graduate curriculum.
- Assisting faculty members with research projects is an integral part of graduate education; students gain knowledge and research skills required for their own discoveries and innovations.
- Undergraduates who participate in research projects have higher retention rates, are more likely to pursue graduate work, and obtain practical skills that are attractive to employers.
- Research doesn't just impact teaching on college campuses. Research into teaching has led to improvements for training public school teachers in new methods for engaging students in the K-12 classrooms, particularly in STEM subjects.

On Campus: Strengthening the Quality of Education

Imprint Lithography

- UT Austin
- Researchers invented a new process low-cost printing of nanoscale structures.
- Grants support the work of graduate and undergraduate students. Many of the students have gone on to careers at IBM, Intel, AMD, Texas Instruments, Molecular Imprints and other companies and to teaching positions at major universities.

TxAIRE: Energy Efficiency

- UT Tyler (w/ UTHSCT)
- The Texas Allergy, Indoor Environment and Energy (TxAIRE) Institute focuses on energy efficiency and improved indoor environments.
- TxAIRE has funded and mentored 41 undergraduate, graduate, and postdoctoral students. 8 research projects in high performance building design have been performed by students with TxAIRE.

The Future is in the Cloud

- UT Dallas
- Cloud Computing – Improve model for providing on-demand, Internet-based access to a shared pool of computing resources
- New course ("Building and Securing the Cloud") will bring research findings into the curriculum. Graduate students from research team have choice of internships and job offers (e.g., Amazon.com and IBM).

Research Impacts Our Lives

- New drugs, medical interventions, devices, vital new knowledge about diet and lifestyle all improve life expectancy and decrease infant mortality
- Technology derived from research has revolutionized the way we communicate and the way we gather and share information. Examples include the Internet, GPS, lasers, etc.

On Campus: Improving the Quality of Life

Personalizing Cancer Care

- UT MD Anderson
- Research focusing on cancer treatment targeted for the individual.
- Developing new, targeted and more effective therapies and protocols for patients with lung cancer, leukemia, breast cancer, Hodgkin's lymphoma, etc.
- Personalized care is more likely to be effective, saving more lives and possibly reducing treatment costs.

A Blood Test to Detect Early Cancer

- UT Austin (w/ UTSWMC)
- Research to create a device that can detect early stage cancer through a blood test.
- Minimally invasive procedure. Early diagnosis can increase cure rate. Technology that could be used in low-infrastructure environments such as those in rural areas or developing nations, which could help improve mortality rates worldwide.

Prolonging Lifespan

- UTHSC-San Antonio
- Rapamycin extended the expected lifespan of middle-aged mice by 28-38%. In human terms, this would be greater than the predicted increase in extra years of life if cancer and heart disease were both cured and prevented.
- This is the first convincing evidence that the aging process can be slowed and lifespan can be extended by a drug therapy starting at an advanced age.

Appendix I

UT Health Institutions: An Overview of Recent Success & More Detail

UT Southwestern Medical Center
UT Medical Branch at Galveston
UT Health Science Center at Houston
UT Health Science Center at San Antonio
UT MD Anderson Cancer Center
UT Health Science Center at Tyler

APPENDIX 1 Contents at-a-glance

Research at UT Health Institutions: An Overview of Recent Success

Saving Lives, Training Doctors and Scientists, and Creating Jobs

** items are those featured in main document*

Health Campuses

UT Southwestern Medical Center

Reducing the Risk of Heart Disease and Stroke

- Identification of the most important cholesterol lowering target discovered in 20 years. This builds on UTSWMC's history on cholesterol research, which led to the development of statin drugs.
- Statin drugs, the most widely prescribed medication in the U.S., are used by 16 million Americans to lower cholesterol and reduce the risk of heart disease and stroke.
- New research will result in an entirely new class of drugs and is already the subject of drug discovery efforts by some of the leading pharmaceutical companies in the U.S.

*Collaborating to Save Lives

- Professors at UT Southwestern and UT Austin are developing a simple blood test that can detect early stages of some types of cancer, which increases cure rate.
- The technology pairs disposable microchips with a special microscope that can precisely measure tumor markers, or molecules that are over- expressed in cancer cells.
- Handheld microscope technology has been licensed to a medical devices company to develop a minimally invasive surgical endoscope with real-time micro-imaging for breast and skin cancer.

*Reata Pharmaceuticals

- UT Southwestern startup Reata is developing a line of medications known as Antioxidant Inflammation Modulators, which have been shown to protect against a broad range of diseases associated with inflammation and oxidative stress.
- Medications have broad applications in various diseases, including renal/cardiovascular, autoimmune, CNS, pulmonary diseases and cancer; and have simple, once-daily, oral administration.
- With 110 employees, Reata is entering a pivotal Phase III trial for a novel therapeutic agent that reverses diabetic kidney disease; and the majority of its $215 million in private financing has come from Texas investors.

UT Medical Branch at Galveston

Launching a Revolution in Personalized Asthma Care

- UTMB scientists are learning to diagnose particular asthma subtypes, with the goal of tailoring therapies to each and producing much more effective asthma care.
- About 2.2 million Texans afflicted with asthma incur an estimated $447 million in charges for hospital visits, which could be greatly reduced with improved asthma care.

Keeping Seniors Strong, Healthy and Independent

- In an effort to combat weakness and frailty in senior citizens, scientists at UTMB's Sealy Center on Aging are examining the effects of exercise, diet, blood flow restriction in weight training, and hormone and nutritional amino acid supplementation on the elderly.
- Using advanced techniques to track muscle growth, scientists are using combined therapies to increase muscle mass in seniors to fend off frailty.

Aiding Recovery from Traumatic Brain Injury

- UTMB scientists have made important advances in monitoring brain activity of patients with varying degrees of traumatic brain injury (TBI) and in identifying key biochemical pathways that determine whether brain cells will live or die after trauma.

- Several promising treatments are being tested, including implantation of stem cells and the administration of novel drugs, which are aimed at lessening the personal and societal burden of TBI.

The Galveston National Laboratory

- Researchers are actively developing better diagnostics and new vaccines and medications for such killers as Ebola and Marburg viruses, inhalational anthrax and plague.
- GNL research has produced many new licensed and commercialized diagnostics and vaccines, and has been key to the development of external collaborations, such as with Sandia National Laboratory.

Conquering Burns and Inflammation

- Physicians and scientists at UTMB's Blocker Burn Unit have dramatically increased survival rates for children and adults with severe burn injuries, and survival rates there are among the best in the nation for patients with severe burn injury.
- UTMB and the nearby Shriners Hospital are developing a new technique for culturing skin from the patient's own tissue. If the laboratory results can be translated to patient care, it would be the only cultured skin with both surface (epidermis) and underlying (dermis) layers.

Understanding a Leading Cause of Illness in Our Children

- UTMB pediatric investigators have found evidence that suggests many children with mild middle-ear infections can be treated without antibiotics. Researchers are also studying ways to prevent middle-ear infections in the first place.
- Direct and indirect costs associated with treating middle-ear infections top $3.5 billion annually, so proper management could significantly reduce those costs.

UT Health Science Center at Houston

Identifying Obesity and Diabetes Prevalence in South Texas Border Region Hispanics

- A randomized study of 2500 Hispanics in Cameron County documented the extent of health disparities in these individuals and now provides an important springboard for clinical trials and intervention.
- These ongoing studies showed that obesity is massively present, at over 50% of the study population, and diabetes is evident in 30% of adults over 18 years of age. Young adult men are developing diabetes years earlier than do women.

Landmark Neonatal Studies

- Aggressive light therapy prevents bilirubin toxicity in nerve cells and reduces mental impairment in extremely low birth weight infants
- Body cooling known as hypothermia—the first major advance in the care of asphyxiated newborns in the past 50 years—increases survival without disability when assessed in school age survivors

"Firsts" in the study of Acute Stroke Therapy

- Currently, there is only one accepted drug available for treating acute ischemic stroke, the "clot buster" or thrombolytic agent, tissue plasminogen activator (TPA). Thrombolytics like TPA open blocked arteries and allow blood flow to return to the brain after stroke. However, TPA is not always effective.
- New studies show that TPA works better when coupled with transcranial Doppler ultrasonography. This ultrasound technology is applied externally, and resulting energy waves help to expose blood clot surface in blood vessels, allowing clot busting drugs better access for action.
- Administering bone marrow-derived mononuclear cells can improve functional recovery from stroke in animal studies. Ongoing studies are testing the safety of this therapy in acute stroke patients. If shown to be safe, this would be the first study to successfully use stem cells as a treatment for stroke.

UT Health Science Center at San Antonio

Palmaz Stent

- The Palmaz® Stent revolutionized cardiac care, with more than 2 million people a year undergoing coronary artery stenting to repair clogged arteries.
- After earning a U.S. patent in 1988 and receiving FDA approval for use in cardiac arteries in 1994, the balloon-expandable stent was recognized as one of the "Ten Patents that Changed the World."

*Prolonging Lifespan through Drug Therapy

- Testing in mice using rapamycin produced the first convincing evidence that the aging process can be slowed and lifespan can be extended by a drug therapy starting at an advanced age.
- Drug also was found to improve Alzheimer's symptoms.

Titanium Rib

- Invented in 1987, the titanium rib gained FDA approval in 2004 and is the first truly new lung-sparing spinal therapy for children to gain FDA approval in four decades.
- The artificial rib saves lives of children born with thoracic insufficiency syndrome – a disease marked by chest wall deformities, missing ribs or scoliosis that threaten normal lung capacity and growth – and can be expanded in outpatient surgeries as children grow.

The EZ-IO – No More Hunting for the Vein in Trauma Patients

- The EZ-IO provides access through the bone marrow cavity to quickly infuse blood, medications and fluids into critically ill patients who might die waiting for traditional IV lines.
- Unlike conventional IVs, there is no need to feel for a collapsed vein, and there is virtually no risk of infection.

Prostate Cancer Prevention

- Study found that the medication Finasteride, currently used for treatment of prostate enlargement, reduces a man’s risk of prostate cancer.
- Study additionally found that Finasteride also causes PSA to fall by about 50 percent, and that the drug improved detection rate of high-grade prostate cancer.

UT MD Anderson Cancer Center

Targeting Therapies to Help Lung Cancer Patients

- BATTLE trial is the first lung cancer clinical trial to guide targeted therapies to patients based on molecular signatures in tumor biopsies.
- Results are a step toward personalized care and more effective, efficient clinical trials for new drugs.

More Effective Treatment for Chronic Myeloid Leukemia

- Dasatinib, found to be a more effective drug for patients who have just been diagnosed with Chronic Myeloid Leukemia, gets more patients to high-quality remission, and gets them there faster and with fewer side effects than the current standard of care, imatinib.
- Patients taking dasatinib also found to be less likely to experience advanced stages of the disease.

Preventative Mastectomy Effective Only for Some Patients

- MD Anderson study provides the first evidence that only certain breast cancer patients may have improved survival after removing unaffected breast.
- Particular group includes women 50 and younger, who have early-stage disease and are estrogen receptor (ER) negative.

New Hope for Patients with Hodgkin’s Lymphoma

- MD Anderson completed a Phase I trial that showed an antibody loaded with an anti-cancer agent produced complete or partial remissions in 38 percent of patients.
- Drug is the first in three decades developed to combat the deadly disease.

New Pathway to Immune Response Key to Potential Treatments

- Researchers uncovered a surprising and pivotal third pathway for immune responses, which has provided a new target for novel drugs to address rheumatoid arthritis and psoriasis.
- Team also is working to help immune cells target cancer cells.

Helper Drug Makes Breast Cancer Tumors Responsive to Herceptin

- Scientists discover that adding the drug saracatinib to Herceptin shrinks previously resistant tumors.
- SRC, a known cancer-promoting protein, is identified as the crucial common downstream component of multiple resistance pathways.

UT Health Science Center at Tyler

Fighting the Flu

- UTHSC-T lead investigator reports GM-CSF protects against lethal influenza, including H1N1, in mice.
- Treatment may be of value to 500,000 people who die worldwide annually from flu.

Saving Soldiers' Lives

- Investigators determine internal mechanism responsible for contributing to airway clots and lung injuries to soldiers experiencing smoke-induced injuries.
- Study suggests that PAI-1-targeted therapy could improve outcomes, particularly for soldiers who suffer from IED explosions or other smoke-inhalation lung injuries.

Helping People Breathe Easier

- Agent found to effectively clear pleural loculation in lungs; could reduce bleeding risk and need for surgery in patients with scarring.
- Grants are forthcoming to manufacture agent and begin series of clinical trials.

Reducing Heart Disease, Stroke & Cancer

- Research yields new therapeutic targets that could be used to help prevent heart disease, stroke and cancer.

Preventing Blindness

- Research extends understanding the role of the complement system in a variety of diseases and provides a strong rationale for the use of new, complement-directed therapy for disorders such as macular degeneration, which leads to blindness.

APPENDIX 1
Research at UT Health Institutions: More Detail
Saving Lives, Training Doctors and Scientists, and Creating Jobs

UT Southwestern Medical Center

UTSWMC Story #1: Reducing the Risk of Heart Disease and Stroke

One impressive example of research conducted at UT Southwestern Medical Center is the identification of the most important cholesterol lowering target discovered in 20 years. Drs. Jonathan Cohen and Helen Hobbs discovered an extremely exciting novel target for cholesterol lowering drugs, nominally 'PCSK9.' In extensive genetic analysis of a population within the Metroplex area, these investigators found that mutations in the PCSK9 protein can result in marked reductions in plasma levels of cholesterol. It is expected that this will result in an entirely new class of cholesterol lowering drugs, and is already the subject of drug discovery efforts by some of the leading pharmaceutical companies in the U.S. Drs. Brown and Goldstein personify the team dynamic at the heart of UT Southwestern's approach to research. They shared the 1985 Nobel Prize for their discovery of the underlying mechanisms of cholesterol metabolism. Their findings led to the development of statin drugs, the cholesterol-lowering compounds that today are used by 16 million Americans and are the most widely prescribed medications in the United States. And their discovery is improving more lives every year. New federal cholesterol guidelines will triple the number of Americans taking statin drugs to lower their cholesterol, reducing the risk of heart disease and stroke for countless people.

Impact

Quality of Life: Patients take statin drugs to lower their cholesterol, reducing the risk of heart disease and stroke.

Economic: This research led to the development of statin drugs, the cholesterol-lowering compounds that today are used by 16 million Americans and are the most widely prescribed medications in the United States. New federal cholesterol guidelines will triple the number of Americans taking statin drugs. New research will result in an entirely new class of cholesterol lowering drugs, and is already the subject of drug discovery efforts by some of the leading pharmaceutical companies in the U.S.

* UTSWMC #2: Collaborating to Save Lives

Drs. Eugene Frenkel and Jonathan Uhr, professors of internal medicine and radiology at UT Southwestern, are collaborating with Dr. John Zhang, assistant professor of biomedical engineering at UT Austin, on his research on early detection of cancer through a rather simple blood test that could be applied universally.

His research combines unique, disposable microchips with a special microscope that can precisely measure tumor markers, or molecules that are over expressed in cancer cells. Invasive cancers shed tumor cells into the blood and by detecting those cells at an early stage, physicians will be able to determine a prognosis and determine the treatments that should be administered to a patient.

The promise of Zhang's research led to a $950,000 award that will fund his research initiatives over the next three years. Other collaborators include Dr. Kostia Sokolov, adjunct associate professor of biomedical engineering at The University of Texas at Austin, and biomedical engineering graduate student Eric Huang and research associate Kaz Hoshino.

The research is significant in that it enables doctors to diagnose cancer via a blood test at an earlier stage, thereby potentially increasing the cure rate.

Zhang's other early cancer detection research includes a handheld microscope enabled by laser microchip technology that could be used in low-infrastructure environments, such as those present in developing nations. Demographic data indicate that 60 percent of the 6.7 million annual global cancer mortalities and 54 percent of the 10.8 million new cancer patients occur in developing nations, where early screening tools are most often unavailable.

Zhang's handheld microscope technology has been licensed to an early stage medical devices company to develop a minimally invasive surgical endoscope with real-time micro-imaging for breast and skin cancer.

Impact

Academic: Research team includes a biomedical engineering graduate student and a research associate.

Quality of Life: It enables doctors to diagnose cancer via a blood test at an earlier stage, thereby potentially increasing the cure rate. Uses technology that could be used in low-infrastructure environments, such as those present in developing nations.

Economic: Zhang's handheld microscope technology has been licensed to an early stage medical devices company to develop a minimally invasive surgical endoscope with real-time micro-imaging for breast and skin cancer.

Funding: A $950,000 award from NIH's National Cancer Institute

* UTSWMC #3: Reata Pharmaceuticals

Reata is a UT Southwestern startup company that was incorporated in 2002. The Office for Technology Development (OTD) at UT Southwestern assembled the technology platform for the company over a two year period beginning in 2000; this entailed reviewing over 300 discoveries from UT Southwestern and MD Anderson and $1 million in project development monies provided by the OTD to advance technologies selected for the company. Since incorporation, the company has raised $215 million in private financing, the majority of which has come from private investors in Texas.

Reata is developing a portfolio of Antioxidant Inflammation Modulators (AIMs) that target Nrf2. This important biological target has been shown to protect against a broad range of diseases associated with inflammation and oxidative stress, and Reata's drugs are its most potent known inducers.

AIMs represent a breakthrough in the regulation of inflammation and oxidative stress with a number of advantages over other approaches: AIMs mimic the body's natural mechanism for resolving inflammation; AIMs regulate many inflammatory mediators simultaneously; has broad applications in various diseases including renal/cardiovascular, autoimmune, CNS, pulmonary diseases, and cancer; and simple, once-daily, oral administration.

The most advanced AIM in Reata's portfolio, bardoxolone methyl (bardoxolone), has been advanced to late-stage, pivotal trials for chronic kidney disease (CKD), a condition affecting over 26 million Americans. Bardoxolone has been shown to significantly increase estimated glomerular filtration rate and improve several other markers of renal function in CKD patients with type 2 diabetes melliitus.

Today, Reata has 110 employees and is entering a pivotal Phase III trial for a novel therapeutic agent that reverses diabetic kidney disease. In 2010, the company completed business development deals worth over $1 billion. Of these, a co-development agreement with Abbott Laboratories ranks as the largest Phase IIb partnering agreement in the history of biotechnology.

Impact

Quality of Life: Protect against a broad range of diseases associated with inflammation and oxidative stress. Has broad applications in various diseases including renal/cardiovascular, autoimmune, CNS, pulmonary diseases, and cancer; and simple, once-daily, oral administration.

Economic: Reata has 110 employees and is entering a pivotal Phase III trial for a novel therapeutic agent that reverses diabetic kidney disease. In 2010, the company completed business development deals worth over $1 billion. Of these, a co-development agreement with Abbott Laboratories ranks as the largest Phase IIb partnering agreement in the history of biotechnology.

Funding: $215 million in private financing, the majority of which has come from private investors in Texas

UT Medical Branch at Galveston

UTMB Story #1: Launching a Revolution in Personalized Asthma Care

Asthma takes a heavy toll on Texas, afflicting 2.2 million people and incurring an estimated $447 million in charges for hospital visits, according to the Texas Department of State Health Services. Researchers at UTMB have determined that complications and difficulties in treating the disease reflect the fact that asthma is actually produced by different underlying causes with their own detectable "protein fingerprints." UTMB scientists are learning to detect these "fingerprints" and apply them to the diagnosis of particular asthma subtypes, with the goal of tailoring therapies to each and producing much more effective asthma care. The work is supported by the National Institutes of Health/National Heart, Lung and Blood Institute Proteomics Center at UTMB, as well as by a $21.5 million NIH Clinical Translational Sciences Award to the university.

Impact

Quality of Life: Asthma takes a heavy toll on Texas, afflicting 2.2 million people. UTMB scientists are learning to diagnosis particular asthma subtypes, with the goal of tailoring therapies to each and producing much more effective asthma care.

Economic: People with asthma incur an estimated $447 million in charges for hospital visits. More effective asthmas care could reduce those charges.

Funding: The work is supported by the National Institutes of Health/National Heart, Lung and Blood Institute Proteomics Center at UTMB, as well as by a $21.5 million NIH Clinical Translational Sciences Award to the university.

UTMB #2: Keeping Seniors Strong, Healthy and Independent

The longer people over age 70 are able to live full and independent lives, the better, both for them and for society. They face a formidable obstacle: age-related loss of muscle mass leading to growing weakness that progressively eats away at the ability to perform daily activities and increases the risk of potentially catastrophic falls. Scientists in UTMB's Sealy Center on Aging and its NIH-funded Claude D. Pepper Older Americans Independence Center have attacked this problem on multiple fronts, examining the effects of exercise, diet, blood flow restriction in weight training, and hormone and nutritional amino acid supplementation. Using state-of-the-art techniques that allow them to precisely track muscle growth, they've been able to quantify the results of these different tactics, with the overall objective of finding the best combination of measures to increase muscle mass in the elderly and keep frailty at bay.

Impact

Quality of Life: Overall objective of finding the best combination of measures to increase muscle mass in the elderly and keep frailty at bay.

Economic: Reduce healthcare costs to seniors and keep them healthy and active.

Funding: The work is taking place in UTMB's Sealy Center on Aging and its NIH-funded Claude D. Pepper Older Americans Independence Center.

UTMB #3: Aiding Recovery from Traumatic Brain Injury through Translational Research

More than 5 million Americans have had a traumatic brain injury (TBI) that diminished their ability to perform daily activities independently. TBI is the leading cause of death in children and young adults, especially men ages 15 to 24. It is also a common cause of death among people over 75 due to falls. Medical advances have greatly improved survival rates, but the lingering cognitive effects are costly for family caregivers and to society in terms of lost productivity. UTMB scientists, as part of the Moody Center for Brain and Spinal Cord Injury Research/Mission Connect, are engaged in collaborative biomedical research that brings hope for TBI survivors. The university's team studying the continuum of TBI, from cell cultures to recovering patients, includes clinicians and researchers from Anesthesiology, Neuroscience, Biomedical Engineering and the School of Health Professions. With funding from the National Institutes of Health, the Department of Defense and the Moody Foundation, they have made important advances in monitoring brain activity in critically ill TBI patients, in rehabilitating patients recovering after TBI, and in identifying key biochemical pathways that determine whether brain cells will live or die after trauma. With this background, they have identified several promising treatments that are undergoing animal testing, including implantation of stem cells and administration of novel drugs aimed at lessening the personal and societal burden of TBI.

Impact

Quality of Life: More than 5 million Americans have had a traumatic brain injury (TBI) that diminished their ability to perform daily activities independently. It is also a leading cause of death. UTMB scientists have made important advances in monitoring brain activity in critically ill TBI patients, in rehabilitating patients recovering after TBI, and in identifying key biochemical pathways that determine whether brain cells will live or die after trauma.

Economic: Lingering cognitive effects are costly for family caregivers and to society in terms of lost productivity. UTMB researchers have identified several promising treatments that are undergoing animal testing, including implantation of stem cells and administration of novel drugs.

Funding: From the National Institutes of Health, the Department of Defense and the Moody Foundation

UTMB #4: The Galveston National Laboratory

Funded by the NIH/National Institute for Allergy and Infectious Disease, the Galveston National Laboratory (GNL) at UTMB is one of the most advanced facilities in the world dedicated to the safe study of infectious threats to human health. Infectious diseases exact heavy human and economic tolls worldwide, including in developed nations like the U.S. Our best line of defense against them, whether they emerge naturally or are used as bioweapons, is robust research. The internationally renowned researchers at the GNL are actively developing better diagnostics and new vaccines and medications for such killers as Ebola and Marburg viruses, inhalational anthrax and plague. They are leading experts in West Nile encephalitis, dengue fever and Rocky Mountain spotted fever—all of which pose a threat to Texas. They were instrumental in monitoring the 2009 H1N1 influenza pandemic and helped the World Health Organization test new rapid diagnostics for the disease. Collectively, their research has produced many new licensed and commercialized diagnostics and vaccines, and it has been key to the development of external collaborations, such as with Sandia National Laboratory. Moreover, UTMB's Biosafety Training Program is an international resource for promoting safe operation of sophisticated containment labs. The GNL is also an economic engine, with an estimated $1 billion impact to the gross state product over 20 years (according to a study by economist Dr. Ray Perryman).

Impact

Quality of Life: Researchers at the GNL are actively developing better diagnostics, and new vaccines and medications. UTMB's Biosafety Training Program is an international resource for promoting safe operation of sophisticated containment labs.

Economic: Research has produced many new licensed and commercialized diagnostics and vaccines, and it has been key to the development of external collaborations, such as with Sandia National Laboratory. he GNL is also an economic engine, with an estimated $1 billion impact to the gross state product over 20 years (according to a study by economist Dr. Ray Perryman).

Funding: Funded by the NIH/National Institute for Allergy and Infectious Disease

UTMB #5: Conquering Burns and Inflammation

UTMB physician scientists at the Blocker Burn Unit and the Shriners Hospital for Children–Galveston literally have written the book on burns, trauma care and wound healing. Their work has dramatically increased survival rates for children and adults with severe burn injury, and they boast among the best survival rates in the nation for patients with severe burn injury. Among the many advances they have made possible since their formal partnership began in the 1960s are surgical techniques to remove damaged tissue and cover wounds, pressure garments to reduce debilitating scarring, development of effective skin banks and new approaches to pain management to vastly increase quality of life. Their work has found that burn injury affects nearly every function of the body at the cellular level, including white blood cells, skin, muscle and fat. They also have found that use of certain compounds (including growth hormone, insulin and propranolol, among others) can calm the hyperactive metabolism common in burn injury and help patients maintain their weight, restore liver function, and decrease inflammation and stress responses. (It's worth noting that the work related to inflammation is informing studies on many chronic conditions such as traumatic injury, asthma, diabetes and cancer, all of which are characterized by inflammation and together affect millions of Texans every year.) On the horizon, UTMB and the Shriners Hospital are developing a new technique for culturing skin from the patient's own tissue. If the laboratory results can be translated to patient care, it will be the only cultured skin with both surface (epidermis) and underlying (dermis) layers.

Impact

Quality of Life: Dramatically increased survival rates for children and adults with severe burn injury, and they boast among the best survival rates in the nation for patients with severe burn injury.

Economic: On the horizon, UTMB and the Shriners Hospital are developing a new technique for culturing skin from the patient's own tissue. If the laboratory results can be translated to patient care, it will be the only cultured skin with both surface (epidermis) and underlying (dermis) layers.

UTMB #6: Understanding a Leading Cause of Illness in Our Children

Otitis media, commonly known as middle-ear infection, is the most common reason young children visit the doctor. Seventy-five percent of children have had at least one episode by the time they are three years old; the condition can interfere with language development and lead to learning difficulties. Treatment can include antibiotics (even though many cases are likely caused by a virus) or surgical placement of ventilating tubes to prevent recurrent infection (the second most common surgical procedure performed in children). Associated direct and indirect costs top $3.5 billion annually, and use of antibiotics to treat viral infections can lead to bacterial strains resistant to treatment. UTMB pediatric investigators have discovered that about one in five children with a cold or other respiratory infection caused by a virus develops a middle ear infection ranging from mild to severe. The findings suggest that many children with mild middle ear infections can be managed without antibiotics and has added to the body of knowledge on how best to manage this common childhood illness. Understanding that even a small decrease in prevalence would have a large impact on patients and their families, the researchers are also studying ways to prevent otitis media in the first place.

Impact

Quality of Life: Findings suggest that many children with mild middle ear infections can be managed without antibiotics and has added to the body of knowledge on how best to manage this common childhood illness. Researchers are also studying ways to prevent otitis media in the first place.

Economic: Associated direct and indirect costs of middle-ear infections top $3.5 billion annually. Proper management and prevention will reduce these costs.

UT Health Science Center at Houston

UTHSCH Story #1: Centers for Clinical and Translational Sciences: Success in Translating Therapies from Bench to Bedside

The investigators who have conducted the translational trials listed below have been trained through the educational programs of the UT-CTSA (Clinical and Translational Science Award). Dr. Mohammad Rahbar, the director of the CCTS Biostatistics, Epidemiology, Research Design (BERD) services, has been the PI of our Data Core and provides the statistical, design, and monitoring tasks for all these UT Houston-based translational studies.

Other important training functions of the CCTS have focused on research coordinator and fellowship training through various CCTS programs. Within the CCTS is a Clinical Trials Resource Center (CTRC). A New Investigator Development Program has helped our junior faculty members develop effective research proposals in a two phase process. First, they learn policies and procedures for submitting and managing UTHSC-H research grants and contracts. A second phase helps junior faculty members refine their skills for developing competitive grant applications. The CTRC course for research coordinators includes a comprehensive review of the basics of coordinating a clinical research trial. Topics include: Good Clinical Practices, Informed Consent Processes, Study Initiation and Implementation Practices, Regulatory Binders, Study Event Reporting, Study Closure, Site Quality Assurance, and Compliance, including best Monitoring Practices.

Impact

Academic: CCTS provides critical training in key areas, including research coordination and fellowship training.

Quality of Life: Bringing state-of-the-art, new therapies to patients helps save and improve lives.

Economic: New therapies can include licenses for drugs and/or technologies. In some cases, new therapies may ultimately reduce healthcare costs. Preventions and interventions also help reduce costs and lost wages.

UTHSCH #2: Examples of CCTS Success

Identifying Obesity and Diabetes in South Texas Border Region Hispanics

The UTHealth School of Public Health campus in Brownsville is located in one of the poorest areas of the United States with the very lowest levels of education in the U.S. Over half the adult population did not even graduate high school, and among those who attend the local university, the graduation rate is only 16 percent. When our campus was founded in 2001 there was little or no university level education or research in health despite some of the greatest disparities in the United States, We have now measured obesity prevalence as 50.1 percent, and prevalence of diabetes as 29.7 percent in adults over 18 years of age. Not surprisingly, there is also extensive childhood obesity with over 50 percent over the 85th percentile for body mass index. The creation of the Brownsville Hispanic Health Research Center in 2003 and the subsequent creation of the Center of Excellence in Diabetes for Americans of Mexican Descent with the current developmental grant have begun a remarkable and documentable change in this area of Texas.

Preventing or slowing the progress of diabetes and associated diseases in a community faced with numerous health disparities is a massive social, economic and medical challenge. Despite this we have some successes. These include: 1) establishment of the first Clinical Research Unit devoted to this minority population and its health disparities, 2) recruitment and retention of a randomly selected community cohort of 2,500 (Cameron County Hispanic Cohort: CCHC), documenting the extent of health disparities through this cohort and providing a springboard for clinical trials and intervention, 3) establishment of a broad and effective community-based participatory research (CBPR) structure with a well established Community Advisory Board (CAB), 4) community intervention research addressing behavioral risk factors for diabetes, and 5) development of a team of committed and distinguished collaborators who work with us to develop ideas, implement rigorous scientific studies, and disseminate findings. Prior to this COE, there was no research infrastructure or mechanism for collaboration on health disparities research within 300 miles.

Landmark Neonatal Studies

Since its inception, the CCTS has supported long term outcome studies of high risk infants and other perinatal research conducted by UT Health faculty within and outside the NICHD Neonatal Research Network. This work has resulted in 5 publications since 2006 in the New England Journal of Medicine, including three landmark studies directed by Dr Tyson and his mentees: 1) a randomized trial showing that aggressive phototherapy to prevent bilirubin neurotoxicity reduced impairment, particularly profound impairment, among extremely low birth weight infants; 2) a randomized trial showing that hypothermia—the first major advance in the care of asphyxiated newborns in the past 50 years—increased survival without disability at 18-22 months and as the CCTS helped to demonstrate this year, at school age as well; 3) a large cohort study to assess the prognosis and effects of intensive care on the long-term outcome of marginally viable extremely premature infants. This study resulted in an NICHD website tool that is widely used by obstetricians and neonatologists in counseling parents and promoting better informed decisions whether to give intensive or comfort care. With support from the CCTS, Drs. Tyson, Kennedy, and their mentees continue to have leadership roles in multiple ongoing studies that could also have a major impact on infant care within and outside the U.S. These include a multicenter randomized surgical trial rarely performed in any age group and a trial of a medical home for infants discharged from a neonatal ICU, a study that has broad implications for pediatric health care policy.

Genome Sciences

The University of Texas Health Science Center at Houston and the MD Anderson Cancer Center have a long history and dedicated commitment to use of genome sciences to improve health care. This work spans the gamut from population studies aimed at understanding genetic susceptibilities in special populations (e.g. obesity and diabetes in Mexican-Americans) to molecular diagnosis of *de novo* mutations in patients with thoracic aortic aneurysm to mutational analyses in ovarian tumors to understand response to chemotherapy. On other dimensions, genome sciences are the "golden thread" that ties UTHSC-H and MDACC into cooperative protagonists, ties the tools of translational research together across the cores, and ties the training programs simultaneously to the clinical and basic sciences. In 2010 alone, direct cost expenditures for genomic activities at UTHSC-H and MDACC amounted to approximately $80 million.

Genome sciences play three parts: improved diagnostics, novel therapeutic target discovery, and better basic sciences aimed at understanding the mechanism of human disease. –omic tools are being used to develop long-range risk scores for common chronic conditions (e.g. heart disease or recurrent cancer) that are replacing traditional risk factors (e.g. Framingham equation). It is major goal of this CCTS faculty, fellows and students to have a major role in the developing tension between traditional "signs and symptoms" and emerging –omic diagnostics.

A major goal of the genome sciences program is to use gene discovery as a 'hook" toward the identification of novel therapeutic targets. Studies have opened new doors and new chapters into inhibitors and therapeutics that would not otherwise been possible. Better health care will result from better science. By understanding the mechanism of disease, we are able to design and promote more efficacious treatment strategies and better prevention programs for young and old alike. CCTS genomics investigators have numerous examples were genome-wide linkage or association studies have

identified genes that were then followed-up with detailed mechanistic studies. Scientists are actively pursuing multiple lines of investigation in the areas of pharmacogenetics and personalized medicine.

"Firsts" in the study of Acute Stroke Therapy

The past 5 years of research have been focused on translating therapies for acute stroke from our laboratories to the bedside. We have completed pilot studies that show that we can safely increase the rates of arterial recanalization and potentially improve outcome by linking the established stroke treatment, TPA, with transcranially delivered ultrasound, or anticoagulation using a direct thrombin inhibitor. We have discovered that the transcription factor PPARγ upregulates microglia to scavenge red blood cells from the brain after intracerebral hemorrhage in rats and have completed a dose escalation safety study in humans of a PPARγ agonist for this type of stroke, for which there is currently no approved therapy. Another translation has been the demonstration that systemically administered autologous bone marrow mononuclear cells upregulate a number of epigenetic markers in the brain and improve neurological outcome after stroke. A follow up clinical study showing the feasibility and preliminary safety of this therapy in acute stroke patients, along with imaging surrogates, has been completed.

All of these studies are "firsts" and are now entering the stage of definitive efficacy testing. We have participated in landmark multicentered studies and provided leadership to the national stroke community in developing research priorities. We continue to direct the largest stroke training program in the country and one of the largest clinical programs in acute stroke therapy in terms of numbers of patients treated and enrolled into research protocols. This is accomplished locally and throughout the state of Texas via our expanding telemedicine network.

UT Health Science Center at San Antonio

UTHSCSA Story #1: Palmaz Stent

Dr. Palmaz is widely recognized for inventing the first commercially successful intravascular stent, which gained a U.S. patent in 1988 and received FDA approval for use in cardiac arteries in 1994. The Palmaz® Stent revolutionized cardiac care, with more than a two million people a year undergoing coronary artery stenting to repair clogged arteries. The stent shores up the walls of the artery after an angioplasty to prevent a collapse and blockage of the artery again. For two years in a row, his patent on the balloon-expandable stent was recognized as one of the "Ten Patents that Changed the World," published in IP Worldwide magazine, August 2002. In 2006, he was inducted into the National Inventors Hall of Fame. His early stent research artifacts are now part of the medical collection of the Smithsonian Institutions.

Impact

Quality of Life: The Palmaz® Stent revolutionized cardiac care, with more than two million people a year undergoing coronary artery stenting to repair clogged arteries.

Economic: U.S. patent in 1988 and received FDA approval for use in cardiac arteries in 1994. For two years in a row, his patent on the balloon-expandable stent was recognized as one of the "Ten Patents that Changed the World."

* UTHSCSA #2: Prolonging Lifespan through Drug Therapy

The Easter Island compound – called "rapamycin" after the island's Polynesian name, Rapa Nui – extended the expected lifespan of middle-aged mice by 28 percent to 38 percent. In human terms, this would be greater than the predicted increase in extra years of life if cancer and heart disease were both cured and prevented. The rapamycin was given to the mice at an age equivalent to 60 years old in humans. This is the first convincing evidence that the aging process can be slowed and lifespan can be extended by a drug therapy starting at an advanced age. Rapamycin was also found to improve Alzheimer's symptoms in a mouse model of Alzheimer's- Rapamycin rescued learning and memory deficits in this mouse model. *Science*, *Nature* and *TIME* magazine each proclaimed: The fact that rapamycin, an antibiotic used in transplant

patients, extended the life span of aged mice was among the most significant and exciting scientific breakthroughs of 2009.

Impact

Quality of Life: Rapamycin extended the expected lifespan of middle-aged mice by 28-38 percent. In human terms, this would be greater than the predicted increase in extra years of life if cancer and heart disease were both cured and prevented. This is the first convincing evidence that the aging process can be slowed and lifespan can be extended by a drug therapy starting at an advanced age.

UTHSCSA #3: Titanium Rib

What Dr. Melvin Smith and colleague Robert Campbell set out to do in the late 1980s was to create an artificial chest wall for a 6-month-old child born with a debilitating deformity, severe scoliosis and seven missing ribs — a child who otherwise faced almost certain death by suffocation. The Titanium Rib, invented in 1987 by Dr. Campbell, was approved by the U.S. Food and Drug Administration in 2004 after a 14-year national clinical trial, and is the first truly new lung-sparing spinal therapy for children to gain FDA approval in four decades. The Titanium Rib is saving the lives of children born with thoracic insufficiency syndrome, a disease marked by chest wall deformities, missing ribs or scoliosis that threaten normal lung capacity and growth. The Titanium Rib functions as an artificial rib and can be expanded in outpatient surgeries as children grow. The U.S. House of Representatives passed a resolution honoring a former UT Health Science Center San Antonio faculty member for his role in inventing a lifesaving device for children with spinal deformities. Rep. Debbie Wasserman Schultz of Florida sponsored the legislation with 114 cosponsors.

Impact

Quality of Life: The Titanium Rib is saving the lives of children born with thoracic insufficiency syndrome, a disease marked by chest wall deformities, missing ribs or scoliosis that threaten normal lung capacity and growth. The Titanium Rib functions as an artificial rib and can be expanded in outpatient surgeries as children grow.

Economic: The Titanium Rib, invented in 1987 by Dr. Campbell, was approved by the U.S. Food and Drug Administration in 2004 after a 14-year national clinical trial, and is the first truly new lung-sparing spinal therapy for children to gain FDA approval in four decades.

UTHSCSA #4: The EZ-IO—No More Hunting for the Vein in Trauma Patients

The EZ-IO, developed by Vidacare Corporation of San Antonio with faculty members at the Health Science Center, won the medical devices category in the Wall Street Journal's eighth annual Technology Innovation Awards. The EZ-IO provides access through the bone marrow cavity to quickly infuse blood, medications and fluids into critically ill patients who might die waiting for traditional IV lines. The EZ-IO, which allows intraosseous access through the bone marrow cavity, is a viable alternative to traditional intravenous (IV) access, which often is difficult to use in patients whose veins have collapsed because of trauma. The device, which utilizes a reusable battery-powered driver and disposable IO needle, generally is inserted into the shin just below the knee, although it can be inserted into the arm. Unlike conventional IVs, there is no need to feel for a collapsed vein. Unlike central lines, there is virtually no risk of infection. San Antonio has become the first major city to use the EZ-IO as standard equipment aboard every EMS ambulance and helicopter.

Impact

Quality of Life: The EZ-IO provides access through the bone marrow cavity to quickly infuse blood, medications and fluids into critically ill patients who might die waiting for traditional IV lines.

Economic: The EZ-IO, developed by Vidacare Corporation of San Antonio with faculty members at the Health Science Center, won the medical devices category in the Wall Street Journal's eighth annual Technology

Innovation Awards. San Antonio has become the first major city to use the EZ-IO as standard equipment aboard every EMS ambulance and helicopter.

UTHSCSA #5: Prostate Cancer Prevention

Analyses of data from the national Prostate Cancer Prevention Trial (PCPT) show that the drug finasteride does not increase the risk of high-grade prostate cancer, as experts had earlier suspected, but actually decreased the risk by 27 percent. These findings led to the recommendation that physicians prescribe the medication as a prevention agent for all men. The study of 18,882 men found that the medication finasteride, currently used for treatment of prostate enlargement, reduces a man's risk of prostate cancer. The drug also causes PSA to fall by about 50 percent. Finasteride improved detection rate of high-grade prostate cancer as well. What happens is that when finasteride shrinks the prostate gland, it makes it easier to find the cancer, so this drug not only prevents slow-growing cancers, but also helps detect and may prevent high-grade aggressive tumors that can be life-threatening to patients. These revolutionary findings were from a large study conducted by Dr. Ian Thomson, Former chair of Urology at the UT HSC San Antonio and now Director of the Cancer therapy Research Center (CTRC), UT HSC San Antonio's National Cancer Institute designated Cancer Center.

Impact

Quality of Life: Finasteride reduces a man's risk of prostate cancer, causes PSA to fall by about 50 percent, and improves detection rate of high-grade prostate cancer as well.

Economic: If used as a preventative, may help reduce costs associated with treating prostate cancer.

UT MD Anderson Cancer Center

Impact

Quality of Life: Working towards personalized care more likely to be effective.

Economic: Targeted, personalized treatments will be more effective and efficient, reducing treatment costs.

UTMDA Story #1: Targeting Therapies to Help Lung Cancer Patients

Lung cancer kills more people than any other type of cancer. New drugs that target molecular pathways help a small percentage of lung cancer patients, but currently there's no way to determine who those patients are before treatment. MD Anderson's BATTLE trial is the first lung cancer clinical trial to guide targeted therapies to patients based on molecular signatures in tumor biopsies. The promising results are a step toward personalized care and more effective, efficient clinical trials for new drugs.

UTMDA #2: More Effective Treatment for Chronic Myeloid Leukemia

Our researchers have found a more effective drug for patients who have just been diagnosed with Chronic Myeloid Leukemia. The drug, dasatinib, gets more patients to high-quality remission, and gets them there faster and with fewer side effects than the current standard of care, imatinib. Patients given dasatinib were also less likely to have their disease progress to advance stages.

UTMDA #3: Preventative Mastectomy Effective Only for Some Patients

A growing number of breast cancer patients are choosing to have their unaffected breast removed as a preventive measure. An MD Anderson study provides the first evidence that only certain patients may have improved survival from this preventative measure. They are women age 50 and younger, have early-stage disease (Stage I or II) and are estrogen receptor (ER) negative.

UTMDA #4: New Hope for Patients with Hodgkin's Lymphoma

On average, people with Hodgkin's lymphoma who fail standard therapy die in their 30s. After three decades without a new drug for the disease, MD Anderson completed a Phase I trial that showed an antibody loaded with an anti-cancer agent produced complete or partial remissions in 38 percent of patients.

UTMDA #5: New Pathway to Immune Response Key to Potential New Treatments

Discoveries by MD Anderson scientists are key to understanding inflammatory diseases (such as asthma) and autoimmune conditions (such as rheumatoid arthritis and multiple sclerosis), and are a potential weapon against cancer. People believed immune responses were limited to two pathways until our researchers uncovered a surprising and pivotal third path (Th17) launched by a new cell (T helper cell 17). This provided a new target for novel drugs, and clinical trials for rheumatoid arthritis and psoriasis are being conducted based on this work. There's also an immune response to tumors, but it's not strong enough. So the team is working to help immune cells target cancer cells. Preliminary data of autoimmunity against cancer are encouraging.

UTMDA #6: Helper Drug Thwarts Protein that Makes Breast Cancer Tumors Resistant to Herceptin

Breast cancer tumors take numerous paths to resist the targeted drug Herceptin, but MD Anderson scientists discovered that adding the drug saracatinib shrinks previously resistant tumors. They identified SRC, a known cancer-promoting protein, as the crucial common downstream component of multiple resistance pathways. Saracatinib is a new SRC inhibitor, so thwarting that protein allows Herceptin to work again in tumors that have a high amount of the HER2 protein.

UT Health Science Center at Tyler

UTHSCT Story #1: Fighting the Flu

GM-CSF reported to protect against lethal influenza in mice. Just reported in the *American Journal of Respiratory and Critical Care Medicine*, cited by BBC among other venues. It is effective in mice as prevention or treatment, including against H1N1. Dr. Amir Shams was the lead investigator for the UTHSCT Center for Pulmonary Infectious Disease Center team.

Impact

Quality of Life / Economic: This treatment could be of value for the 500K people who die world-wide of flu each year.

UTHSCT #2: Working to Save Soldiers' Lives

Control of the major fibrinolysis inhibitor PAI-1 occurs in the lung at the level of mRNA stability. This study, just published by Texas Lung Injury Institute (TLII) investigators at UTHSCT with collaborators from the U.S. Army at Fort Sam Houston in San Antonio, shows that this mechanism substantively contributes to airway clots and lung injury. PAI-1-targeted therapy will be pursued in an NIH-funded CADET grant awarded to SI and Dr. A Komissarov and UTHSCT TLII will continue to collaborate with the army to develop new treatments for smoke-induced acute lung injury.

Impact

Quality of Life / Economic: The army is very interested in this problem as survivors of IED explosions often have smoke inhalational lung injury. This study suggests that PAI-1-targeted therapy could improve outcomes.

Funding: NIH-funded CADET grant

UTHSCT #3: Working to Help People Breathe Easier

Single Chain Uriokinase scuPA effectively clears pleural loculation. In a series of high-impact publications, this PAI-1-targeted treatment was discovered by SI and colleagues as part of the first PPG awarded to UTHSCT from the NHLBI and will be continued in CADET.

TLII investigators have patented the agent and gotten the first NIH RAID grant awarded to an NHLBI team; SI and TLII colleagues and the group is moving to obtain additional funding to manufacture this agent from NIH (SMARTT program) to bring it to clinical trial testing.

Impact

Quality of Life / Economic: scuPA has advantages that could mitigate bleeding risk and the need for surgery in patients with pleural scarring, which affects about 500K people world-wide each year.

Funding: NIH RAID and CADET grants; seeking additional funding through NIH SMARTT program

UTHSCT #4: Working to Reduce Heart Disease, Stroke, & Cancer

Tissue factor signaling promotes neoplastic growth and intravascular coagulation by modulation of the protease activated receptors (PARs). In a series of high impact publications, the role of the procoagulat tissue factor in these processes was reported by Drs. Vijay Rao and Usha Pendurthi.

Impact

Quality of Life / Economic: Research yielding new therapeutic targets that could be exploited to prevent atherosclerotic heart disease, stroke and cancer.

UTHSCT #5: Working to Prevent Blindness

Complement factor H and other complement components linked to atypical hemolytic uremia syndrome and other immunologic disorders in a series of publications in high impact journals by Michael Pangburn and members of his team. This work extends understanding of the role of the complement system in a variety of diseases and provides a strong rationale for the use of new, complement directed therapy for these disorders. Dr. Pangburn is a NIH Merit award winner and was asked to provide the NIH Eye Institute with an overview of how the complement system contributes to macular degeneration and helped to develop the Eye Institute's initiative to find complement-directed therapy for this common cause of blindness.

Impact

Quality of Life / Economic: Research may yield a complement-directed therapy for macular degeneration, a common cause of blindness.

Funding: NIH Eye Institute, NIH Merit Award

Appendix 2

UT Academic Institutions: An Overview of Recent Success & More Detail

UT Arlington
UT Austin
UT Brownsville
UT Dallas
UT El Paso
UT Pan American
UT Permian Basin
UT San Antonio
UT Tyler

APPENDIX 2 Contents at-a-glance

Research at UT Academic Institutions: An Overview of Recent Success

Making Discoveries, Teaching Students, Supporting the Economy

** items are those featured in main document*

Academic Campuses

UT Arlington

Treating Children with Cerebral Palsy

- Work proposes to produce images of how brain patterns change over the course of months while patients with cerebral palsy undergo a treatment process called Constraint-Induced Movement Therapy.
- The goal is to show what is happening in the brain so that doctors can tell whether certain types of therapy will work or won't, which could lead to better treatment. Inefficient therapies could be eliminated, thereby reducing treatment costs.

College of Nursing Explores Teaching in Virtual World

- Study will examine how physicians and nurses can improve their communication skills by participating in engaging, video game-like simulations.
- Exercises will help build more effective interpersonal communications skills, which will reduce mistakes, increase patient safety and minimize malpractice claims.

New Generation of Prosthetic Gets Closer to the Real Limb

- A UT Arlington bioengineer has built a neural interface he believes will lead to a better prosthetic arm that will allow more movement and eventually sensation for military veterans who desperately need them.
- Research moves away from the head and into the appendage itself, looking for neural reliability and stability, and integrates the nerve into electrodes through nerve regeneration.

Fixing Lead Contamination in New Orleans' Soil

- An environmental science professor is aiming to prove that a phosphate known as Apatite II is more environmentally friendly and cost-effective than other phosphates for lead clean up because it does not leach excessively into surrounding soil.
- Research could lead to improved methods for cleaning up dangerous lead contamination in urban soil, which can cause behavior and learning problems as well as other ailments in children and adults.

UT Austin

Algae Biofuels

- Researchers are working on different aspects of the algae-to-fuel process, investigating the best algae to use, how to get the oil out of the algae and how to transform its oil into fuel.
- Researchers at the university's Center for Electromechanics have developed a process to extract oil from algae that imposes a high electric field on the algae for a short time and repeats the process, which releases the oil. Tests show that it can be done for pennies per gallon of oil.

Vibration Analysis Software

- Vibration analysis software developed by UT Austin aerospace engineers has significantly reduced car noise for automakers, which has allowed them to save time and money while producing a better product.
- The Automated Multilevel Substructuring (AMLS) software efficiently analyzes about 10,000 frequencies and modes of the structure so that vibration can be analyzed efficiently in hours rather than in days.

Lithium-Ion Batteries

- Lithium-ion batteries have become the power source of choice for portable electronic devices because they have higher energy density than other rechargeable battery systems. They are used for hybrid electric vehicle (HEV) and plug-in hybrid electric vehicle (PHEV) applications.
- Researchers are seeking to improve lithium-ion batteries by developing low-cost, high-energy, high-power cathode materials and nanostructured, safe anode materials for portable and transportation applications.

Monitoring Devices for People with Diabetes

- Researchers at UT Austin have developed technology that allows people with diabetes to monitor their glucose levels quickly, efficiently and painlessly.
- The device has made blood glucose testing much easier for people with diabetes, and, as a result, has led to better blood glucose control and the prevention of complications.

* Imprint Lithography for Semiconductor Manufacture

- Researchers have invented a new process for printing nanoscale structures which can be used in the production of familiar semiconductor products such as memory devices and microprocessors used in computers as well as hard disk drive information storage devices.
- Besides lower costs, the technology allows chips to become more powerful.

Rapid Prototyping

- To facilitate the manufacturing process, researchers at UT Austin developed rapid prototyping, also known as desktop manufacturing, to create computerized prototypes rather than those that are three dimensional.
- The process, which uses a laser beam to consolidate powder particles, greatly reduces design costs and time. Applications include custom orthotics, surgical planning and, potentially, implants.

Optical Skin Cancer Scanner

- UT Austin biomedical engineers developed a pen-sized, light-based, non-invasive device for detecting skin cancers.
- Use of the device would reduce the number of conventional biopsies that are needed, which could dramatically lower costs associated with such procedures, currently accounting for $6 billion in annual costs in the United States.

UT Brownsville

Scientist Leads Search for New Epilepsy Treatments

- Neuroscientist is leading team of researchers in search of new therapies in the treatment of epilepsy, particularly for the 30 percent of epilepsy patients who cannot be treated by conventional pharmacological methods.
- Through study of epilepsy's underlying molecular mechanisms, researchers hope to devise new therapies to combat the neurological disease.

Researchers Focus on Diabetes in the Community

- Researchers are focusing efforts on finding preventative measures and solutions to the diabetes epidemic in the Lower Rio Grande Valley, where the disease disproportionally affects more Texans than in other regions of the state.
- Among other things, researchers are attempting interventions to prevent diabetes and obesity in families by working with those whose parents are between 20 and 30 years of age.

Arecibo Remote Command Center

- Students can take real-time control of the Arecibo Observatory in Puerto Rico, the world's largest radio telescope, through a remote command center at UT Brownsville.
- Program concept is being replicated elsewhere, which allows for better collaboration and gives students a chance to be a part of the discovery process.

Nano Research Changing Many Areas of Life

- Experiments in nanophotonics are being led to better understand the interaction of light with matter, which could lead to development of new photonic devices that could replace traditional semiconductors for boosting computational speed.
- Other research focuses on new nanomaterials that could do everything from making weapons lighter and more efficient to creating tiny implantable biomarkers that could be used to track cancer in patients.

UT Dallas

Smartphone Interface to Improve Hearing for Profoundly Deaf

- Using a smartphone interface, profoundly deaf individuals with cochlear implants may soon be able to easily modify the settings on their hearing devices, selecting one setting for a bustling restaurant, another for a hushed library.
- Research focuses on developing new speech- and sound-processing strategies that further improve the levels of speech performance, particularly in noisy environments.

Reducing Energy Costs through the Use of Tiny Capacitors

- A UT Dallas researcher is advancing what he calls "a transformational paradigm for power management and delivery" that could significantly reduce energy consumption in battery-operated portable devices, LED lighting systems and other products.
- Use of tiny capacitors instead of bulky transformers in power converters could save energy on the order of a few dozen terawatt hours a year, which is the equivalent of several power plants' worth of electricity output.

Student Researcher Makes Nanotech Discovery

- Research led to an improved procedure for evaluating the purity of carbon nanotubes, which have the potential to revolutionize various applications, including electronics; fuel cells; super-strong materials, such as those used in body armor; and even as a delivery device for disease-fighting therapies.
- Method uses an ultraviolet-visible (UV-Vis) spectrometer – an instrument common to almost all laboratories – to measure the electromagnetic radiation absorbed by the carbon impurities and carbon nanotubes.

* Researcher Saw the Future in the Cloud

- Cyber-security researchers are focusing on data security in the booming field of cloud computing, which is an on-demand Internet-based means of accessing a shared pool of computing resources, including networks, storage and applications.
- Researchers have been recognized for their interdisciplinary work, which has involved not only computer scientists but social scientists, behavioral economists and risk analysts.

UT El Paso

Accessing Immense Amounts of Data

- To facilitate collaboration over the Internet, UTEP's Cyber-ShARE Center of Excellence was established to foster communication among technical researchers across the country and around the world.
- In recent Cyber-ShARE projects, geophysics and computational mathematics researchers worked together in studying geologic data and creating incredibly accurate 3-D subterranean images. Another project focused on vastly improving academic capabilities to collect environmental sciences data.

Opening the Tap: UTEP Desalination Research Center

- Researchers are studying desalination-related issues such as mining brine concentrate produced during the desalination process, developing small-scale portable desalination equipment to be used in remote locations, and developing processes that maximize energy and water production efficiencies.

- Efforts to improve desalination processes could dramatically increase the efficiency with which drinking water is produced as well as increase significantly the yield of drinking water.

A Researcher and Mentor: Engineering Professor Lauded for Increasing Minority Participation

- Researcher/mentor is involved in initiatives geared to expand diversity among students and graduates involved in the STEM fields: science, technology, engineering and mathematics.
- Recent research uses advanced microwave technology to provide better, quicker identification of flying targets: size, shape, propulsion, armament – all the elements required to instantly characterize swift-flying objects and enable superior decision-making.

Investigator Studies Compounds' Anticancer and Antimicrobial Properties

- A scientist is studying anticancer and antimicrobial properties of chemical compounds and their effects on cell structures, which could pave the way for improved, targeted therapies for a wide range of diseases.
- Using specialized instruments such as the confocal microscope, sections of cells can be scanned to create a 3-D image for improved examination, showing in detail the effects compounds may have on cells.

UT Pan American

*Excelling in Research and Teaching

- Collaborators have developed nanofiber production methods and equipment that enable the creation of nanofibers from a wider variety of materials than has ever before been possible.
- Cutting-edge technologies have resulted in 18 patent applications and three issued patents; and has fueled national and international teaching accolades for Dr. Karen Lozano.

Engineering Students Design Chamber to Conduct Experiments in All Environments

- Research team has been working on finding correlations between temperatures on different areas of the bearings for Amsted Rail, to determine how bearings function in extreme temperatures.
- Opportunity to engage in advanced research gave graduate students a competitive edge in the job market and enhanced the learning experience.

Video Game Helps Families Calm Autistic Children

- Scientist developed an interactive video game that helps parents or caregivers of children with autism spectrum disorders reduce disruptive or self-injuring behavior.
- Game's objective is to lower level of agitation while teaching those afflicted with autism to communicate using words. The simulation provides an interactive environment in which parents and caregivers learn to effectively implement behavioral strategies and techniques.

UT Permian Basin

A Classroom Challenge to Students: How R&D for Renewable Liquid Fuels Began at UTPB

- Classroom exercise led to more efficient process of ethanol production which uses wood from forests as feedstock and does not impact the food chain the way conventional starch-ethanol biochemical process does.
- Years-long research effort has resulted in more than $1 million in grants and several grants for producing renewable liquid hydrocarbon fuels.

Past & Present: Sports, Race & Politics

- Researcher Derek Catsam's works help readers and students understand the complex issues of sports, race and politics applicable in understanding the political events of yesterday and today.
- Research and publication of book on U.S. Civil Rights led to his association with PBS documentary, *Freedom Riders*.

Applied Research: Teaching Teachers

- Juli Ratheal has been successful in obtaining external support from state and federal grants that focus on methods of professional development for teachers in the science, technology, engineering and math fields.
- Ratheal lends her expertise to other teachers and school districts in grant-writing requests for *pro bono* funding.

UT San Antonio

San Antonio Life Sciences Institute

- Creating synergy between the UT Health Science Center at San Antonio and the University of Texas at San Antonio has led to discoveries in the areas of neuroscience, medicinal chemistry, prosthetics, regenerative medicine, prostate cancer and childhood obesity prevention.
- Project results are fueling development and, eventually, will lead to spinoff of new companies and commercialization.

The South Texas Center for Emerging Infectious Diseases

- The Center was established to advance the fields of molecular microbiology, immunology, medical mycology, virology, microbial genomics, vaccine development and biodefense.
- Also serves a very important role in providing hands-on training of undergraduates, and in supporting students in the cell and molecular biology Ph.D. program, thereby helping launch careers of a large number of students each year into promising and well-paid positions in biotechnology.

Texas Sustainable Energy Research Institute

- A $50 million, 10-year grant from CPS Energy has propelled TSERI and San Antonio into national leaders in green technology research.
- Joint solar initiative creates opportunities for students to participate in the design and installation of solar panels in pilot projects on the UTSA campus which will reduce carbon emissions by more than 250,000 pounds per year (equivalent of planting roughly 37 acres of trees) and generate 237 Megawatt hours, saving UTSA more than $60,000 per year.

Minority Advancement in Research Initiative

- In an effort to increase minority participation in technical fields, UTSA developed program that raises interest in such fields for minority students, then supports their progression from undergraduate to graduate-level status.
- In the last year alone, 15 graduates of the initiative entered doctoral programs at universities including the University of Washington, the UT Health Science Center at San Antonio and Northwestern University.

*Innovation and Commercialization in Biomedical Engineering

- C. Mauli Agrawal's research has resulted in more than a dozen patents, with others pending. The patents span the development of orthopedic implants, regenerative medicine devices, foot products for diabetics and drug-delivery stents.
- He helped form three biomedical startup companies in San Antonio and has established a joint graduate program in biomedical engineering with the UT Health Science Center at San Antonio.

UT Tyler

The Ingenuity Center: STEM Education Research

- Ingenuity Center develops externally funded research programs in science, technology, engineering and math to encourage faculty to engage in STEM-related education research.
- Since 2006, more than $7 million has been raised to support STEM education research and programming for teachers and students across Texas.

*Texas Allergy, Indoor Environment & Energy (TxAIRE) Institute

- During the past three years, TxAIRE has established a wide array of technology and economic development projects, and has funded and mentored 41 post-doctoral (1), doctoral (2), graduate level (8) and undergraduate (30) students at UT Tyler.
- Combined impact of these efforts will result in job retention, job creation and potentially even new company creation across Texas. Locally, TxAIRE already has secured more outside sponsored research funding for the engineering and computer college than all other efforts combined.

Nurse Practitioner Expansion Program

- Program seeks to increase the number of Advanced Practice Registered Nurses (APRNs), specifically Family Nurse Practitioners (FNPs) and Pediatric Nurse Practitioners (PNPs), in the northeast Texas region, with a focus on increased recruitment and retention of underrepresented minorities.
- The project includes specific objectives targeted to improve academic excellence and teaching, and will better prepare NP graduates to provide a lifetime of comprehensive, culturally competent, quality primary health care services.

Bextine Molecular Biology Laboratory

- Over the past six years, nearly 40 undergraduate and four master's students have been involved in the program, which has resulted in 10 publications with student authors and more than 100 presentations. Research experience also has greatly enhanced post-graduate opportunity and success.
  Program has led to development of products and practices that have limited damage to grapevines fro*g:* NIH Eye Institute, NIH Merit Award.

APPENDIX 2
Research at UT Academic Institutions: More Detail
Making Discoveries, Teaching Students, Supporting the Economy

UT Arlington

UTA Story #1: Treating Children with Cerebral Palsy

A UT Arlington bioengineer is working to give physicians vital information that could lead to better therapy for patients afflicted with cerebral palsy. George Alexandrakis, an assistant professor in bioengineering at The University of Texas at Arlington, has won a three-year, $1.16 million National Institutes of Health grant that will use functional near-infrared brain imaging as a tool to help guide the treatment of children with cerebral palsy. Functional near-infrared brain imaging measures the neuronal activity from the brain's surface. The goal is to show what is happening in the brain so that doctors can tell whether certain types of therapy will work or won't, and that could lead to better treatment.

The project began when Mauricio Delgado, director of neurology at Texas Scottish Rite Hospital for Children in Dallas, approached UT Arlington with a question: What activation patterns emerge in a child's brain as they are undergoing a certain therapy for cerebral palsy? Alexandrakis and his team could use the imaging to measure parts of the brain that "light up" during therapy.

The work proposes to image how brain patterns change over the course of months while patients with cerebral palsy undergo a treatment process called Constraint-Induced Movement Therapy. This treatment is taxing to the patients as it involves binding the good arm, forcing them to use the cerebral palsy-afflicted arm. The procedure is not always productive and can be costly, sometimes approaching $30,000 to perform on one cerebral palsy patient, researchers said.

Years two and three of the NIH grant work will take place at Scottish Rite Hospital and will center on testing the brain imaging device on children with cerebral palsy in an attempt to identify the hallmark brain activation patterns before treatment.

The brain optical imaging device is more portable and is more resistant to patient motion than traditional magnetic resonance imaging machines – two advantages when working with children. Alexandrakis' team will construct and test a brush-fiber functional near-infrared brain probe assembly. The device would span the entire head of a patient.

The brush fiber technology was established in collaboration with Fillia Makedon, chair of UT Arlington's Computer Science and Engineering Department. It was supported by a $100,000 grant from TxMed, a medical technologies research consortium.

Impact:

Quality of Life: Use functional near-infrared brain imaging to show what is happening in the brain so that doctors can tell whether certain types of therapy will work or won't.

Economic: This could reduce health care costs by reducing ineffective therapies and more quickly finding those therapies that will work.

Funding: Three-year, $1.16 million National Institutes of Health grant; $100,000 grant from TxMed, a medical technologies research consortium

UTA #2: College of Nursing Explores Teaching in Virtual World

The U.S. Agency for Healthcare Research and Quality has awarded nearly $1 million to researchers at The University of Texas at Arlington's College of Nursing, Baylor Health Care System and The University of Texas at Dallas to study how physicians and nurses can improve their communication skills by participating in engaging, video game-like simulations.

The project is collaboration among the three organizations aimed at increasing patient safety by providing a safe, virtual environment for physicians and nurses to learn to communicate effectively and efficiently through role-playing. Health care providers will experience real-world situations and react in the virtual setting, similar to advanced computer games. They can then build more effective interpersonal communication skills by receiving feedback and putting what they've learned into practice.

"Technologies like the high-fidelity manikins at UT Arlington's Smart Hospital™ make it possible for students to acquire and test their skills in a realistic environment where it is safe to make a mistake and learn from it," said Beth Mancini, associate dean of UT Arlington's College of Nursing and principal investigator for the study. "The development of serious gaming systems takes that capability to a new level and has the potential to transform health care training."

Numerous studies have shown that communication problems in health care sometimes leads to serious, even deadly, medical mistakes, researchers said. The Joint Commission, the national organization that accredits and certifies health care organizations, has identified communication among caregivers as a key National Patient Safety Goal. Poor communication can lead to misunderstanding that can cause medication errors or a missed opportunity when a patient's condition deteriorates.

The $969,604 award is a three-year grant. Mancini, who was recently elected president of the Society for Simulation in Healthcare, will coordinate the project. She will provide health care expertise along with Yan Xiao, director of Patient Safety Research at Baylor and a frequently published researcher in the areas of patient safety and health care communication.

Marjorie Zielke, assistant professor of arts and technology and associate director of research for the Institute for Interactive Arts and Engineering at The University of Texas at Dallas, will construct the prototype game. A pioneer in serious gaming, Zielke has already completed award-winning gaming projects to provide cultural training for U.S. soldiers serving in the Middle East and to educate nurses caring for pediatric respiratory patients.

Impact:

Quality of Life: Increasing patient safety by providing a safe, virtual environment for physicians and nurses to learn to communicate effectively and efficiently through role-playing.

Economic: Improving patient safety significantly reduces healthcare costs for patients and for doctors and can reduce malpractice costs resulting from mistakes.

Funding: U.S. Agency for Healthcare Research and Quality has awarded nearly $1 million

UTA #3: New Generation of Prosthetic Gets Closer to the Real Limb

A UT Arlington bioengineer has built a neural interface that he thinks will lead to a better prosthetic arm that will allow more movement and eventually sensation for military veterans who desperately need them.

Mario Romero-Ortega and his team at The University of Texas at Arlington have obtained a new $2.2 million grant from DARPA, the research and development office for the U.S. Department of Defense, to further the development of technology that will allow amputees to naturally control and feel bionic limbs. The grant is part of a program known as reliable neural interfacing, or RENET, led by Dr. Jack Judy, program director of DARPA's Microsystems Technology Office in Arlington, Virginia.

Neural interfaces are required to give amputees the most natural control and sensory perception. The process involves connecting the robotic prosthetic to the nervous system of the user. Current essential technology is unreliable. Human arms are controlled through thousands of nerve "channels" that allow the limb, hand and fingers to operate independently precisely. The channels allow for motion and sensory control. By contrast, the most advanced neural interface for prosthetic arms uses six to eight channels and allows only for simple movement without sensation. Neural interfaces directly implanted in the brain can provide hundreds more channels, but require invasive surgery.

What makes Romero-Ortega's research different is putting the neural interface in the limb itself. The neural interface is the tiny interfaces that allow the arm to interpret what the brain is telling it to do, and for the brain to interpret what the arm is doing. The research moves away from the head and into the appendage itself, looking for neural reliability and stability. It integrates the nerve into electrodes through nerve regeneration.

Romero-Ortega's team – which includes undergraduate and graduation students – wants to open up more of those channels to the arm through electrical and molecular engineering. These open channels will enable the body to control the prosthetic as if it were real, giving new functionality to amputees, such as military veterans who have survived catastrophic injuries to their limbs.

Impact:

Academic: Romero-Ortega's research team includes undergraduate and graduate students.

Quality of Life: A neural interface that will enable the body to control the prosthetic as if it were real, giving new functionality to amputees, such as military veterans who have survived catastrophic injuries to their limbs.

Funding: $2.2 million grant from DARPA, the research and development office for the U.S. Department of Defense

UTA #4: Fixing Lead Contamination in New Orleans' Soil

A University of Texas at Arlington environmental science professor will soon begin testing a unique method for cleaning up dangerous lead contamination in urban soil with the help of a new $498,138 grant from the U.S. Department of Housing and Urban Development.

Andrew Hunt, an assistant professor of earth and environmental sciences, will use a phosphate called Apatite II to treat plots of vacant land in New Orleans. Years of leaded gasoline use and repeated applications of lead-based paint to the outside of homes have left many areas in New Orleans and other urban environments with unsafe levels of lead in the soil, Hunt said.

Lead exposure can result in behavior and learning problems, such as hyperactivity, as well as other ailments. Babies and young children are particularly susceptible because they are more likely to put unwashed hands and objects in their mouths.

"The type of phosphate we're using has been shown to work before," said Hunt. "It binds with the lead in the soil to form a very insoluble lead phosphate mineral called Pyromorphite that, if children ingest it, will likely pass through their system harmlessly."

Hunt has been studying problems relating to health and environmental hazards in urban and indoor environments for more than two decades. He was recently appointed to serve on a panel of the Environmental Protection Agency's Science Advisory Board.

His new study aims to prove that Apatite II is more environmentally friendly than other phosphates for lead clean up because it does not leach excessively into surrounding soil. Using Apatite II also provides a more cost-effective model than traditional methods.

At Superfund sites, where clean up has few financial constraints, the method of choice to decontaminate is excavation and removal. This is usually not an option in an urban environment. So, he has been looking at low tech, cost effective remediation methods.

Impact:

Quality of Life: Improved methods for cleaning up dangerous lead contamination in urban soil. Lead exposure can result in behavior and learning problems, such as hyperactivity, as well as other ailments.

Economic: Hunt's method is more cost-effective than traditional methods of clean up.

Funding: $498,138 grant from the U.S. Department of Housing and Urban Development

UT Austin

UT Austin Story #1: Algae Biofuels

Using algae as a source of sustainable energy has gained interest recently. Algae grows quickly, prospers in water of poor quality and has possible higher productivity than any other plant-based source of fuel.

Researchers in several disciplines at The University of Texas at Austin are working on different aspects of the algae-to-fuel process. They are investigating the best algae to use, how to get the oil out of the algae and how to transform its oil into fuel.

Researchers at the university's Center for Electromechanics have developed a process to extract oil from algae. The process imposes a high electric field on the algae for a short time and repeats the process, which releases the oil. Tests show that it can be done for pennies per gallon of oil.

Impact:

Quality of Life: The capability to use algae as a renewable fuel source would reduce dependence on fossil fuels and reduce fuels derived from food crops.

Economic: The technology has been licensed to Open Algae Inc., an Austin-based company that is a member of the Austin Technology Incubator-Clean Energy Incubator.

UT Austin #2: Vibration Analysis Software

In recent years, automobiles have become quieter and more comfortable for passengers. The noise has been reduced by use of vibration analysis software developed by aerospace engineers at The University of Texas at Austin. This has allowed automakers to save time and money while producing a better product.

The Automated Multilevel Substructuring (AMLS) software efficiently analyzes about 10,000 frequencies and modes of the structure so that vibration can be analyzed efficiently. Analyses that would have taken days on a central supercomputer can be done in hours on a desktop computer.

Impact:

Academic: Several Ph.D. and M.S. students have conducted research into AMLS for the dissertations and theses. Most of the master's degree theses related to AMLS were done by students who had been undergraduates and became interested enough in vibration analysis to get a master's degree and write a thesis in the area.

Quality of Life: AMLS has enabled car manufacturers to improve the design of cars to make them quieter and more comfortable for passengers.

Economic: Nearly all of the automakers around the world license AMLS from the university and use it to make their products competitive.

UT Austin #3: Lithium-Ion Batteries

Lithium-ion batteries have become the power source of choice for portable electronic devices because they have higher energy density than other rechargeable battery systems. They are used for hybrid electric vehicle (HEV) and plug-in hybrid electric vehicle (PHEV) applications.

Researchers at The University of Texas at Austin are seeking to improve lithium-ion batteries with the use of alternative materials. UT Austin is well recognized as a leader in lithium-ion technology innovation. Prof. John Goodenough, inventor of the lithium ion battery, continues his research at UT Austin.

The researchers are developing low-cost, high-energy, high power cathode materials and nanostructured, safe anode materials for portable and transportation applications, while elucidating a basic understanding of their structure-property-performance relationships.

Impact

Academic: The fundamentals and technological aspects of lithium-ion batteries are taught in a graduate course. Several of the graduate students and postdoctoral fellows educated and trained by researchers in the lithium-ion battery area play key roles in industry in the U.S. and abroad. Undergraduate students have learned about the importance of lithium-ion technology. Undergrads also have been research lab assistants in the lithium-ion battery area.

Quality of Life: All the cathode materials currently used in lithium-ion batteries for portable applications are based on the original concepts developed by Goodenough. The whole lithium-ion industry worldwide is based on those basic materials concepts. This is clearly an economic benefit to humankind with a quality of life.

Economic: In 2007, ActaCell Inc. was founded to commercialize the university's lithium ion technology. The company develops high-power lithium-ion batteries for plug-in hybrid vehicles. ActaCell has raised more than $7 million and has 10 employees.

UT Austin #4: Monitoring Devices for People with Diabetes

The measurement of blood glucose concentration by people with diabetes has been the most frequently performed chemical analysis, performed 6 billion times each year, more often than all other analyses combined.

Researchers led by Adam Heller, a chemical engineering professor at The University of Texas at Austin, developed technology that allowed people with diabetes to monitor their glucose levels quickly, efficiently and painlessly.

They designed a thin-layer micro-coulometer *FreeStyle*™, which required such a small amount of blood that, for the first time, it was painlessly obtained.

Heller also designed a continuous, miniature, subcutaneously implanted glucose monitor based on the electrical “wiring” of glucose oxidase. In 2004 TheraSense completed clinical trials of the continuous monitor, FreeStyle Navigator™, available in the United States since 2008. Heller was awarded the National Medal of Technology and Innovation.

Impact

Quality of Life: The device made testing of the glucose level in their blood much easier for people with diabetes. As a result, tests can be carried out, which means better blood glucose control and the prevention of complications.

Economic: The technology was spun out into a company, which was acquired by Abbott Labs for $1.2 billion.

* UT Austin #5: Imprint Lithography for Semiconductor Manufacture

The increasing number of transistors being put on computer chips allows the chips to become more powerful. However, the high number of transistors causes problems in performance and manufacturing.

Researchers at The University of Texas at Austin invented a new process low-cost printing of nanoscale structures. These are the structures required for production of familiar semiconductor products like memory and microprocessors used in computers as well as hard disk drive information storage devices.

C. Grant Willson, a co-inventor, received the National Medal of Technology and Innovation. S.R. Snreenivasan, a co-inventor, received the Edith and Peter O'Donnell Award in Technology Innovation from The Academy of Medicine, Engineering and Science of Texas.

Impact

Academic: The research was conducted with grants that supported the work of graduate and undergraduate students. Many of the students have gone on to careers at IBM, Intel, AMD, Texas Instruments, Molecular Imprints and other companies and to teaching positions at major universities. Many are in important leadership positions. Most of the undergraduate researchers have gone on to graduate school. The work required students to interact across traditional discipline lines and provided an impetus for them to learn topics that were not normal parts of their formal curriculum. The students who worked on the project included chemists, chemical engineers, mechanical engineers, physicists, material scientists and computer scientists.

Economic: The inventors licensed the patents from the university and founded a company named Molecular Imprints Inc. It is the market and technology leader for high-resolution, low cost-of-ownership nanoimprint lithography machines and processes. The gross sales income of Molecular Imprints was more than $20 million in 2010. The company has more than 100 employees. The company's long-standing relationship with UT Austin is widely recognized as a model for how top research institutions can partner with business to facilitate bringing new technologies to market.

UT Austin #6: Rapid Prototyping

A holdup in the manufacturing process occurred when designers had something down on paper, but has to wait while a three-dimensional prototype came back from a shop.

Researchers at The University of Texas at Austin helped solve the problem by developing a process called rapid prototyping, also known as desktop manufacturing.

Their system used a laser beam is used to consolidate individual powder particles in selected regions.

The benefits of the process include greatly reduced prototyping cost and design time, and the capacity to achieve, in one operation, shapes that would otherwise require multiple operations or in some cases shapes impossible to manufacture with standard techniques.

Impact

Academic: Freshmen mechanical engineering students do a design that that is made on a rapid prototyping system. This gives them hands-on feedback on physical devices. Other mechanical engineering undergraduates can use the system on their projects.

Quality of Life /Economic: There are many applications that are starting to develop in the medical field including custom orthotics, surgical planning and even, potentially, implants.

UT Austin #7: Optical Skin Cancer Scanner

There are more than 1.2 million cases of skin cancer in the United States each year. Biopsies done to determine whether a skin growth is cancerous cost the health-care system more than $6 billion a year.

Biomedical engineers at The University of Texas at Austin developed a pen-sized, light-based, non-invasive device for detecting skin cancers. Use of the device would reduce the number of biopsies that are needed.

Impact

Academic: Each year biomedical engineering undergraduate seniors work on senior design project in the optical area. This is highly motivating for the students because they see a real world application for their work. The first one led to a patent disclosure with Office of Technology Commercialization. The research makes it possible to

conduct an undergraduate course, "Fundamentals of Biomedical Optics," which covers the basis for these optical techniques in medicine. Undergraduate students work on research projects, usually receiving course credit. The participation research spurs many to go on to graduate work.

Economic: Biopsies done to determine whether a skin growth is cancerous cost the health-care system more than $6 billion dollars a year. Use of this device would reduce the number of biopsies needed. DermDx Inc., a start-up company that has an exclusive license to the technology, is finalizing the design of the product and clinical trials.

Quality of Life: Once a device is on the market, it has the potential to both save lives and reduce morbidity from skin cancer. The vast majority of biopsies for skins cancer turn out to be benign, meaning the time, money and inconvenience is spent. A more accurate screening tool for skin cancer has the potential to reduce the amount of unnecessary biopsies and increase the number of necessary biopsies, saving both lives and money.

UT Brownsville

UTB Story #1: UTB/TSC Scientist Leads Search for New Epilepsy Treatments

Emilio Garrido Sanabria, M.D., PhD, delves into what goes on in neuronal cells and circuits that transform a normal brain into an epileptic brain. Dr. Garrido, a Neuroscientist in the Department of Biological Sciences at UTB/TSC, leads a group of researchers in the search for new therapeutic approaches for treating epilepsy. His research is aimed at discovering the underlying molecular mechanisms of epilepsy. By understanding what occurs in the brain during an epileptic attack, Dr. Garrido hopes to one day develop new treatments to combat the devastating neurological disease which affects more than 2 million Americans.

Dr. Garrido said that approximately 30 percent of epilepsy patients cannot be treated by conventional pharmacological methods. The challenge, therefore, is to find new drugs to help those patients whose disease cannot be treated with existing approaches. His research laboratory is federally funded by the National Institutes of Neurological Disorders and Strokes (NINDS), which is a division of the National Institutes of Health (NIH).

Dr. Garrido joined UTB/TSC as a research assistant professor in 2003. He was promoted to assistant professor in 2004 and associate professor in 2009. Over this time, he has developed a research program in the neurobiology of epilepsy and has mentored multiple graduate and undergraduate students in neuroscience research. His laboratory has adopted cell and molecular biology techniques, histology, electrophysiology and functional imaging to investigate the basic mechanisms of this neurological disorder. UTB/TSC students participating in the lab learn those lab techniques while investigating the basic mechanisms of epilepsy. They use those skills in the laboratory team's cutting-edge research to find the causes and cures for epilepsy. His research areas include development of gene therapies and nanotechnology for the treatment of epilepsy. In this area, Dr. Garrido's laboratory is collaborating with a biotechnology company, Synergene Therapeutics, and with a leader in the area of nanomedicine, Dr. Esther Chang from Lombardi Comprehensive Cancer Center at Gergetown Universty.

Dr. Garrido is very active in applying for funding, forming synergistic collaborations with other scientists and publishing his work. Currently, his research activities are supported by grants from NIH/NINDS: a Support of CompetitiveResearch Advancement Award. He also recently submitted a multiple Principle Investigator proposal with Professor Patric Stanton from New York Medical College of Medicine. The proposal is for a Research Project Grant (R01) from NIH/NINDS that will use advanced neuroimaging techniques (two-photon confocal microscopy) to address scientific problems in epilepsy. He is also currently collabotating with Dr. Romanovicz and Dr. Jones from Univesity of Texas at Austin in a project involving electron microscopy. Furthermore, Dr. Garrido's research has produced twelve publications in peer-reviewed scientific journals in the last three years which were co-authored by more than 10 UTB/TSC students.

Dr. Garrido earned his M.D. from the Institute of Medical Sciences, Havana, Cuba in 1995 and his Ph.D. in Neuroscience from the Universidade Federal de São Paulo, Brazil in 1999. He continued his education with post-doctoral training in the

department of Physiology at Hebrew University, the Physiology Institute at Humbolt University, Berlin and the University of Maryland, Baltimore, School of Medicine before joining UTB/TSC in 2003.

Impact

Academic: Dr. Garrido has mentored multiple graduate and undergraduate students in neuroscience research. Students participating in the lab learn those lab techniques while investigating the basic mechanisms of epilepsy. They use those skills in the laboratory team's cutting-edge research to find the causes and cures for epilepsy. Dr. Garrido's research has produced twelve publications in peer-reviewed scientific journals in the last three years which were co-authored by more than 10 UTB/TSC students.

Quality of Life: Working to understand what occurs in the brain during an epileptic attack in order to develop new treatments to combat the devastating neurological disease which affects more than 2 million Americans.

Economic: Would eventually lead to a licensed and commercialized treatment for epilepsy.

Funding: Funded by the National Institutes of Neurological Disorders and Strokes (NINDS)

UTB #2: UTB/TSC Researchers Focus on Diabetes in the Community

Diabetes affects many families and targets its victims regardless of age, gender, or race. It has become a leading cause of death among Americans and a gateway for other health complications. Given the severity of this disease, researchers like Anne Rentfro, PhD, RN at the University of Texas at Brownsville and Texas Southmost College (UTB–TSC) are focusing their efforts on finding preventative measures and solutions to this epidemic. Brownsville is a good place to conduct diabetes research because the disorder is so prevalent and the people there will benefit from the research resources placed in this region.

Dr. Rentfro, an associate professor in the UTB/TSC nursing program, has studied the local population in order to develop preventive measures for the disease and to document its correlation with obesity. Prevalence rates are key to combating diabetes in the Lower Rio Grande Valley. Dr. Rentfro works closely with the University of Texas Health Science Center's Regional Academic Health Center in Brownsville as one of the investigators studying diabetes and diabetes related diseases. In these local studies, over 20 percent of the population had diabetes and another 23 percent were at risk of developing diabetes. Many men had diabetes that had not yet been diagnosed (5percent). Additionally, over 80 percent of participants were overweight or obese, which places them at high risk to develop the disease.

Dr. Rentfro's research interests involve seeking interventions to prevent diabetes and obesity for families. That involves working with families between 20 and 30 years of age and developing strategies for intervention that are family focused.

About 40percent of Hispanic children between 10 and 17 years old are obese in the United States, according to the U.S.-Mexico Border Health Commission. In Texas, according to published reports, this number is even higher, at 46.8 percent with even higher numbers at the border.

Dr. Rentfro has a Bachelors of Science in Nursing from the University of Rochester in New York and a Masters Degree in Medical Surgical Nursing specializing in Diabetes with a minor in Clinical Education. In 2009 she acquired her Doctor of Philosophy in Nursing from the University of Arizona where her studies focused on working with vulnerable populations, border health, and biologic mechanisms of diabetes

The National Institute of Health's Center for Minority Heath and Health Disparities funds Dr. Rentfro's research through a grant program called Center of Excellence for Diabetes in Americans of Mexican Descent. Joseph B. McCormick is the principal investigator of this grant scheduled to run through 2013. Most of her work is done through the Clinical Research Unit (CRU) at the Edelstein Building at Valley Baptist Medical Center- Brownsville. This CRU is also NIH-funded as part of the Centers for Translational Studies Awards received by the University Of Texas Health Science Center–Houston School Of Public Health – Brownsville Regional Campus.

Work in this area requires collaboration with many researchers to be effective. Other collaborators in this project are Drs. Susan P. Fisher-Hoch, Belinda M. Reininger, and Cristina Barroso from the Brownsville Regional Campus School of Public Health and Dr. Sarasthway Nair of UTB–TSC.

Rentfro has an extensive career and has witnessed the transition of research to field implementation, based on the findings. While there are challenges facing research, the need for better health and community prosperity outweigh them. Dr. Rentfro is committed to continuing her research efforts toward finding the best ways to detect prevent and treat diabetes for the benefit of all.

Impact

Quality of Life: Seeking interventions to prevent diabetes and obesity for families.

Economic: Obesity and obesity-related illnesses such as diabetes drive up healthcare costs and often afflict those with the fewest resources. Prevention can help reduce those costs.

Funding: National Institute of Health's Center for Minority Heath and Health Disparities

UTB #3: Arecibo Remote Command Center

Getting to the Arecibo Observatory in Puerto Rico is a time-consuming task: First you fly to San Juan, then you drive an hour and a half west of the city. Budding scholars in Brownsville, however, don't have to leave their backyard to access to the world's largest radio telescope.

The Arecibo Remote Command Center, or ARCC, is a remote control and command center for the radio telescope on the UTB/TSC campus. Here, students from the high school level on up can take real-time control of the telescope for deep-space exploration.

Located in the Science, Engineering and Technology Building, at UTB/TSC, the Center was launched in 2006 by associate professor Federick A. Jenet after he received a National Science Foundation Faculty Early Career Development grant. In 2008, the NSF awarded additional funding to sponsor physics scholarships in what is now known as the ARCC Scholars program.

Jenet has a BS in physics from the Massachusetts Institute of Technology (MIT) and a PhD in astrophysics from the California Institute of Technology (Caltech). He has also served as a postdoctoral scholar at the Jet Propulsion Lab at Caltech.

Jenet has worked with data from the Arecibo Observatory since he was a graduate student, first visiting the facility in the mid-90s. His experience with the observatory led to the idea of the Center. Since Arecibo could be controlled remotely, Jenet wanted to take advantage of that, letting students could control the telescope and learning to observe and analyze.

ARCC focuses on the study of radio signal emitted by pulsars, or remnants of stars that emit radio pulses, to get more information about the formation and evolution of the galaxy. Pulsars are also being studied to help detect gravitational waves, or "ripples," in space-time predicted in 1916 by Albert Einstein.

The Brownsville program has drawn the attention of other schools in the country. The University of Wisconsin in Milwaukee, which opened the second remote command center, credits UTB/TSC with developing the concept, and now Wisconsin scholars often collaborate with UTB/TSC students.

From the start, UTB/TSC's command center has had close ties with high school students in the Brownsville area. A summer school has been designed for them, as well as regular meetings and observations during the school year. High school students are urged to not only observe but also to analyze their observations, and some have even presented their research at meetings of the American Astronomical Society. This gives high school students a chance to be part of the discovery process; they are actually doing things that any scientist would be doing.

Now a junior ARCC scholar, Anthony Ford was a loyal fan of the Command Center's outreach programs when he went to Porter High School. He hopes to earn a master's and PhD, but for the immediate future he is looking forward to working with Jenet and other ARCC scholars on a new project – setting up a new radio telescope array to probe space at low frequencies. The project would consist of a grouping of more than 500 six-foot-tall antennas over a relatively large area of land.

The project would be part of the Long Wavelength Array (LWA), sponsored by the University of New Mexico, the Jet Propulsion Lab and several other universities and institutions. LWA's goal is to have a number of these stations eventually in operation across the nation, Jenet said.

Jenet has a LWA prototype under development, but still seeking funding for the larger facility, which would probably be located off campus. Right now, the Port Mansfield area is under consideration.

Impact

Academic: Students (high school, undergraduate, and graduate) have access to The Arecibo Observatory and learn to observe and then analyze their findings. This gives high school students a chance to be part of the discovery process; they are actually doing things that any scientist would be doing. University of Wisconsin-Milwaukee scholars collaborate with UTB/TSC students. Students are involved in Jenet's research projects, including setting up a new radio telescope array to probe space at low frequencies.

Quality of Life: Basic sciences research to get more information about the formation and evolution of the galaxy. Pulsars are also being studied to help detect gravitational waves, or "ripples" in space-time predicted in 1916 by Albert Einstein.

Funding: National Science Foundation Faculty Early Career Development grant; NSF awarded additional funding to sponsor physics scholarships in what is now known as the ARCC Scholars program

UTB #4: Nano Research Changing Many Areas of Life

Assistant Professor Malik Rakhmanov has been working with the Laser Interferometer Gravitational-Wave Observatory (LIGO) project since 1994. A graduate of Moscow State University, he earned his PhD in physics from the California Institute of Technology (Caltech), which jointly operates LIGO with MIT. He has spent many years as a scientist-in-residence at the LIGO Observatory in Richland, Washington.

Rakhmanov has continued his research on gravitational wave instrumentation since coming to UTB/TSC in 2008. And he is doing experiments in nanophotonics that could lead to all-optical computing. The goal is to better understand the interaction of light with matter and use this knowledge for building new photonic devices that will replace traditional semiconductor electronic devices when computational speed is required.

The research is taking place in a new optics lab in the Science, Engineering and Technology Building. Rakhmanov and some of his students played a pivotal role revamping a former classroom into a 1400-square-foot clean optics and nanophotonics lab and getting it operational.

The state-of-the-art laboratory has areas that are protected by soft-wall, clean-room enclosures to perform precision optics experiments. It has research-grade optical tables, optics and electronics and an assortment of lasers, including the 10-W Nd:YAG highly-stabilized laser given to UTB/TSC by LIGO. Rakhmanov thinks the UTB/TSC optics lab can compete with similar labs at larger and more well-known campuses.

In the same building, associate professor Karen Martirosyan is also dealing with things on a nano level. He is focusing on new nanomaterials that could do everything from making weapons lighter and more efficient to creating new tiny implantable bio markers that could be used to help track cancer in patients. He said the major challenge now is to make nanomaterials with tunable properties,—currently very expensive to develop and manufacture—more cost-efficient.

Martirosyan, who has a PhD in chemical engineering from ISMAN-Russian Academy of Sciences and the State Engineering University of Armenia (SEUA), came to UTB/TSC from the University of Houston in September 2010. He has been the principal investigator and co-investigator for several federal and state funded research projects totaling about $2 million in the last five years. He was a participant in the 2010 Air Force Summer Faculty Fellowship Program and has been selected to the program again for summer 2011.

Martirosyan, who hopes to start a minor in nanoscience at the University, said he was drawn to UTB/TSC because of the opportunities for growth in the nanotechnology area. Rakhmanov is also optimistic about the opportunities for students at the University right now. One of his students, Liliana Ruiz-Diaz, a junior in physics, was awarded an MIT internship this summer. Another undergraduate student, Sergio Cantu, also a junior physics major, won a poster presentation award in 2009 from SPEI, an international society for optics and photonics, and the Optical Society of America (OSA) and is heading to MIT for a second internship this summer.

Impact

Academic: Students played a pivotal role in revamping a former classroom into a 1400-square-foot clean optics and nanophotonics lab and getting it operational. Research is providing undergraduate physics students at UTB with experiences that are opening up opportunities for prestigious internships and for making presentations to national and international organizations.

Quality of Life: The goal is to better understand the interaction of light with matter and use this knowledge for building new photonic devices that will replace traditional semiconductor electronic devices when computational speed is required.

Economics: Making nanomaterials more cost-efficient to develop and manufacture.

*Funding: S*everal federal and state funded research projects totaling about $2 million in the last five years

UT Dallas

UTD Story #1: Smartphone Interface to Improve Hearing for Profoundly Deaf

Attached to the inner ear of profoundly deaf people by an array of 16 to 22 electrodes, cochlear implants have restored partial hearing to more than 180,000 people. But with technology using a smartphone interface, users may soon be able to easily modify the settings on their hearing devices, selecting one setting for a bustling restaurant, another for a hushed library. Dr. Philip Loizou, director of the Cochlear Implant Lab at UT Dallas is slated to be the principal investigator on a $2.5 million project funded by the National Institutes of Health, pending approval by the FDA. This technology, which centers on creating an interface between mobile devices and FDA-approved cochlear implants manufactured by Cochlear Ltd., replaces the speech processor that cochlear implant users wear behind the ear.

Loizou's research focuses on developing new speech- and sound-processing strategies that further improve the levels of speech performance, particularly in noisy environments. The flexibility for these people to optimize their listening experience in various settings using this device will greatly improve their quality of life. The new technology will also enable cochlear implant users to get additional help by recording speech and other environmental sounds that they find particularly challenging.

The Cochlear Implant Lab is expected to be part of the growing amount of interdisciplinary research that results from the creation in 2009 of UT Dallas' Department of Bioengineering.

Impact

Quality of Life: Cochlear implants have restored partial hearing to more than 180,000 people. With technology using a smartphone interface, users may soon be able to easily modify the settings on their hearing devices, selecting one setting for a bustling restaurant, another for a hushed library.

Funding: $2.5 million project funded by the National Institutes of Health

UTD #2: Reducing Energy Costs through the Use of Tiny Capacitors

A UT Dallas researcher is advancing what he calls "a transformational paradigm for power management and delivery" that could significantly reduce energy consumption in battery-operated portable devices, LED lighting systems and other products.

Dr. Hoi Lee, who directs the Mixed-Signal and Power Integrated Circuit Group in the Erik Jonsson School of Engineering and Computer Science, said his approach would shift power management from bulky power adaptors to tiny semiconductors, thereby increasing the efficiency of power conversion and eliminating the cost of the materials needed for external adaptors.

Regarding increasingly popular LED lighting systems alone, Dr. Lee estimates that in the United States his approach could save energy on the order of a few dozen terawatt hours a year, which is the equivalent of several power plants' worth of electricity output. From a technical standpoint, his research involves using tiny capacitors instead of bulky transformers in power converters.

The National Science Foundation has awarded Lee, an assistant professor of electrical engineering, $400,000 through its Faculty Early Career Development Awards program to pursue the work. The program recognizes junior faculty who are considered likely to become leaders in their field, and this is the fifth such award received by UT Dallas engineering and computer science faculty in the past three years.

Dr. Lee's work is a very important in advancing power management circuit design for mobile platforms, critical in today's technology-based world because of the demands on sufficient power to sustain all the devices. Additionally, the economic impact is measured not only in reducing harmful carbon-equivalent emission but also on demands on our energy resources.

Impact

Quality of Life: Very important in advancing power management circuit design for mobile platforms, critical in today's technology-based world because of the demands on sufficient power to sustain all the devices.

Economics: Increasing the efficiency of power conversion and eliminating the cost of the materials needed for external adaptors. Regarding increasingly popular LED lighting systems alone, Dr. Lee estimates that in the United States his approach could save energy on the order of a few dozen terawatt hours a year, which is the equivalent of several power plants' worth of electricity output.

Funding: The National Science Foundation has awarded Lee, an assistant professor of electrical engineering, $400,000 through its Faculty Early Career Development Awards program to pursue the work

UTD #3: Student Researcher Makes Nanotech Discovery

UT Dallas undergraduate student Nancy S. Jacobsen has had an article published in the journal *Carbon* with the help of funding from the School of Natural Sciences and Mathematics Undergraduate Research Program. Dr. Paul Pantano, associate professor in the Department of Chemistry, is senior author on the paper.

The research helped develop an improved procedure for evaluating the purity of carbon nanotubes, which have the potential to revolutionize various applications ranging from electronics and fuel cells to super-strong materials used for body armor. They even have potential in biomedical engineering as a delivery device for disease-fighting therapies.

Carbon nanotube samples are analytically challenging because all the current manufacturing processes introduce carbonaceous impurities, which are difficult to quantify in the presence of the carbon nanotubes. Regardless of applications, the builders of this technology need to know the levels of carbon nanotubes in the base material and the amount of impurities.

The UT Dallas method uses an ultraviolet-visible (UV-Vis) spectrometer – an instrument common to almost all laboratories – to measure the electromagnetic radiation absorbed by the carbon impurities and carbon nanotubes. Next, the contribution associated with the impurities is subtracted, which leads to a more accurate measurement of the amount of carbon nanotubes in the sample. The research showed that the calculated percentages of some carbon nanotubes were underestimated by up to 6 percent.

Jacobsen's work would not have been possible without the help of the NSM program, which assists students in such research endeavors. Jacobsen is the first author of the paper and the sole student author – an honor for any student, graduate or undergraduate, and a testament to the semesters of work and thought that she put into her senior research project. She continues to work in the lab because she is motivated to bring research experiences to the classroom as a future high school science teacher.

NSM's Undergraduate Research Program is in its seventh year and has awarded a total of $315,000 for undergraduate research work. The School of Natural Sciences and Mathematics actively supports the participation of its undergraduate students in research. Because it is a research university, UT Dallas provides the opportunity for students such as Nancy Jacobsen to carry their research experience from the laboratory to publication in the open scientific literature. This is the first step in the launching of a career in science.

Impact

Academic: The School of Natural Sciences and Mathematics actively supports the participation of its undergraduate students in research. UT Dallas provides the opportunity for students such as Nancy Jacobsen to carry their research experience from the laboratory to publication in the open scientific literature. This is the first step in the launching of a career in science.

Quality of Life: The research helped develop an improved procedure for evaluating the purity of carbon nanotubes, which have the potential to revolutionize various applications ranging from electronics and fuel cells to super-strong materials used for body armor. They even have potential in biomedical engineering as a delivery device for disease-fighting therapies.

Economics: Improvements in current manufacturing processes would improve efficiency and performance.

Funding: Funding from the School of Natural Sciences and Mathematics Undergraduate Research Program

* UTD #4: Researcher Saw the Future in the Cloud

Three years ago, UT Dallas researchers, led by Dr. Bhavani Thuraisingham, director of the University's Cyber Security Research Center, began to bolster their efforts in the field of cloud computing which is paying nice dividends: Not only do they now have $5 million in cloud-related research, but their graduate students find they have their choice of internships and job offers.

Indeed, two recent PhD graduates have been hired by leading corporate players in the field, Amazon.com and IBM's T.J. Watson Research Center.

Cloud computing is a model for providing on-demand Internet-based access to a shared pool of computing resources, including networks, storage and applications. It's meant to make it as simple to obtain an array of electronic data resources as it is to get electricity itself. The growing demand for cloud computing stems from the need to securely store, manage, share and analyze immense amounts of complex data in many areas, including health care, national security and alternative energy.

One key to the UT Dallas group's success has been the breadth of its approach. The group of researchers is recognized for their interdisciplinary work with not only computer scientists, but with social scientists, behavioral economists and risk analysts. A major collaboration has been the focus on data security. While several companies have launched commercially available cloud systems, two areas still need significant improvements: the security mechanisms needed to protect sensitive data as well as the capability to process huge amounts Web data.

A paper by the UT Dallas cloud-computing group, meantime, is one of only 36 accepted (from among nearly 200 submitted) for presentation at this July's Cloud 2011, the fourth international conference on cloud computing sponsored by the Institute of Electrical and Electronics Engineers. Additional papers will appear in upcoming issues of the IEEE's *Transactions on Knowledge and Data Engineering* and the Association for Computing Machinery's *Transactions on Management Information Systems*.

The first tools developed can already be found in the University's cloud repository online.

In addition, complementing the research under way, Thuraisingham will introduce a new course next spring called "Building and Securing the Cloud."

Impact

Academic: Graduate students involved in the project find they have their choice of internships and job offers. Two recent PhD graduates have been hired by leading corporate players in the field, Amazon.com and IBM's T.J. Watson Research Center. Thuraisingham will introduce a new course next spring called "Building and Securing the Cloud."

Quality of Life: Cloud computing is a model for providing on-demand Internet-based access to a shared pool of computing resources, including networks, storage and applications. It's meant to make it as simple to obtain an array of electronic data resources as it is to get electricity itself. A major collaboration has been the focus on data security.

Economics: Secure cloud-computing framework being developed for multiple agencies, including the U.S. Air Force Office of Scientific Research, as well as corporations such as Tektronix and Raytheon.

Funding: $5 million

UT El Paso

UTEP Story #1: Accessing Immense Amounts of Data

Collaboration is a valuable and potentially highly productive approach in many endeavors – especially when working on and attempting to make meaningful, breakthrough advancements on projects in high-tech fields such as biochemistry and engineering.

To facilitate collaboration over the Internet, UTEP's Cyber-ShARE Center of Excellence was established – fostering communication among technical researchers across the country and around the world.

Cyber-ShARE is part of a major National Science Foundation initiative which has as a primary objective improvement of the performance of the nation's and the world's cyberinfrastructure. Generally defined, cyberinfrastructure encompasses the gargantuan amounts of useful data and high-performance computing power shared by researchers via the Internet. The whole promise of cyberinfrastructure is that it breaks down boundaries and allows scientists and educators to do state-of-the-art research

Funding of UTEP's Cyber-ShARE Center of Excellence is augmented by a $5 million grant from the National Science Foundation.

Ann Gates, PhD, is a primary investigator at the center, in addition to her other duties as UTEP professor of computer science and associate vice president for research in UTEP's Office of Research and Sponsored Projects.

Thus, computer power is further advancing interdisciplinary research, and helping achieve far-reaching objectives around the world.

From the original basis of its invaluable tradition of successful collaboration across the University, the Department of Computer Science at UTEP is now able to apply its expertise and high-performance computing centers to address problems in fields from engineering and mathematics to high-tech transportation to geology and the other geosciences.

UTEP's Cyber-ShARE Center of Excellence serves to meld expertise in these and other technical working fields to develop software applications and digital tools to gather and compute data over the Internet for the ultimate in scientific research.

"The Cyber-ShARE team envisions a center in which students and faculty from all disciplines can gather to discuss, brainstorm and search for solutions to problems," said Gates.

In one recent Cyber-ShARE project, geophysics and computational mathematics researchers worked together in studying huge amounts of geologic data and creating incredibly accurate 3-D subterranean images. Another project focused on vastly improving academic capabilities to collect environmental sciences data.

Impact

Academic / Quality of Life: Cyber-ShARE facilitates the efforts of researchers and educators across the globe in sharing highly developed information and achieving objectives that might well otherwise be unattainable.

Funding: Funding of UTEP's Cyber-ShARE Center of Excellence is augmented by a $5 million grant from the National Science Foundation

UTEP #2: Opening the Tap: UTEP Desalination Research Center

To research and address vital water needs, the UTEP Center for Inland Desalination Systems has been established – under the experienced leadership of UTEP professor of civil engineering, Tom Davis, PhD, a nationally recognized desalination specialist.

Davis has more than 40 years of research background and holds more than a dozen patents related to filtering technologies, and he believes a primary objective should be to examine methods to transform brine into products with commercial value. In fact, Davis recently received an Innovation Award in Technology and Product Development for his Zero Discharge Desalination system.

The Center for Inland Desalination Systems at UTEP is a research partner with the El Paso Water Utility, which operates the City of El Paso's inland desalination plant – one of the world's largest – which extracts brackish water from the Hueco Bolson alluvial-basin aquifer system to produce up to 27.5 million gallons of fresh water daily.

Originally, the state of Texas invested $2 million of the state's Emerging Technology Fund to create the UTEP Center for Inland Desalination Systems.

UTEP and the University of Texas System have collectively matched the $2 million technology fund investment, and an additional $2 million is being raised in sponsored research from industry partners to develop UTEP's world-class desalination research facility. CIDS researchers are studying desalination-related issues such as: mining the brine concentrate produced during the desalination process, developing small-scale portable desalination equipment to be used in remote locations, and developing processes that maximize energy and water production efficiencies.

The Desalination and Water Purification Research Program, established by the U.S. Bureau of Reclamation, awarded UTEP $500,000 to demonstrate a new desalination technology. The research is to be conducted at the Brackish Groundwater National Desalination Research Facility (BNDRF) in Alamogordo, N.M. The Tularosa Basin, the aquifer in

the region, is almost saturated with gypsum - or calcium sulfate - that renders the water unsuitable for drinking. With traditional desalination, the water would be purified through reverse osmosis. The limitation of RO is that it divides the water into two streams - 75 percent drinkable, the other 25 percent containing gypsum and other salts. Disposal of the salty waste is expensive and represents the loss of a valuable resource. Under the new technology to be tested by UTEP, it is believed that the drinkable portion of the water would increase to 98 percent.

Impact

Quality of Life / Economic: Research to improve desalination methods that would increase the efficiency of the process and increase the yield of drinkable water. Also studying desalination-related issues such as: mining the brine concentrate produced during the desalination process, developing small-scale portable desalination equipment to be used in remote locations, and developing processes that maximize energy and water production efficiencies.

Funding: The State of Texas invested $2 million of the state's Emerging Technology Fund; UTEP and the University of Texas System have collectively matched the $2 million technology fund investment, and an additional $2 million is being raised in sponsored research from industry partners; the Desalination and Water Purification Research Program, established by the U.S. Bureau of Reclamation, awarded UTEP $500,000

UTEP #3: A Researcher and Mentor: Engineering Professor Lauded for Increasing Minority Participation

In the broader nature of education, the knowledge and the benefits of experience must be passed along to those who are willing to make the sacrifices to learn and succeed under real-world circumstances.

And at UTEP, one of the many professors who fully understand this concept is Benjamin Flores, PhD, a professor of electrical and computer engineering who actively encourages his students to get involved at even greater levels of commitment.

Flores sees students of many diverse backgrounds as being capable of extraordinary accomplishments, which is why he is deeply involved in leading UTEP's segment of the highly prestigious National Science Foundation Model Institutions for Excellence program, as well as the Louis Stokes Alliance for Minority Participation.

Both of these initiatives are geared to expand diversity among students and graduates involved in the STEM fields: science, technology, engineering and mathematics.

Additionally, Flores was recently named associate dean of the Graduate School at UTEP. And to top everything off, he was personally honored by President Obama at the White House, when Flores accepted a Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring.

Flores researches more thorough, more advanced use of microwave technology to provide better, quicker identification of airborne targets: size, shape, propulsion, armament – all the elements required to almost instantaneously characterize swift-flying objects and enable superior decision-making.

These images provide accurate information that can be used to make smart decisions. For instance, mobilizing intercepting fighters can be an expensive proposition when a target is detected. Modern radar technology can be used to decide whether to just watch the target, or to dispatch the fighter. So the approach is also cost-effective.

Such is the nature of Flores' analysis: everything from how to discern exactly what a flying object is to how to deal with it most cost-effectively – which relates directly to modern combat conditions: efficiency and effectiveness with the caveat that taxpayers' hard-earned investment must be applied wisely, with a minimum of waste.

That's a template for economics in the 21st century – as exemplified by a UTEP professor in a highly technical field who encourages underrepresented minority students to get involved to the fullest.

Impact

Academic: Actively encourages his students (mainly underrepresented minority students) to get involved at even greater levels of commitment.

Economic: Creating a modern radar technology that can help to almost instantaneously characterize swift-flying objects and enable superior (and more cost-efficient) decision-making

Funding: National Science Foundation Model Institutions for Excellence program, as well as the Louis Stokes Alliance for Minority Participation

UTEP #4: Investigator Studies Compounds' Anticancer and Antimicrobial Properties

UTEP biological sciences professor Renato Aguilera, Ph.D., is a widely renowned specialist in cellular and molecular immunology. At the UTEP Border Biomedical Research Center (BBRC), Aguilera leads efforts to test an enormous number and variety of chemical compounds for anticancer and antimicrobial potential. Aguilera is director of the BBRC's Cell Culture and High Throughput Screening Facility, which has state-of-the-art equipment to test chemical compounds on multiple organisms at the same time.

In a recent year, Aguilera accepted a highly prestigious University of Texas System Stars Award, which included substantial funding. Aguilera applied those funds to obtain highly advanced instrumentation for the facility, including a high-throughput confocal microscope and a fluorescence-activated cell-sorter, and he also recently applied funding from the 2009 American Recovery and Reinvestment Act to buy another confocal microscope.

The confocal microscopes scan sections of cells – from the bottom to the top, for instance – to create a 3-D image. Examining these stacks of images can show in detail what effect a compound is having on a cell.

Aguilera has also obtained large libraries of chemical compounds, which he is closely examining for anticancer and antimicrobial properties. Aguilera said that more thorough understanding and documentation of the compounds' effects on cell structure could pave the way to improved, targeted therapies for a wide spectrum of diseases.

In addition to his research, Aguilera is director of UTEP's Minority Biomedical Research Support-Research Initiative for Scientific Enhancement (RISE) and Support of Competitive Research (SCORE) programs. These federally sponsored programs – which are accompanied by considerable investments – are intended to help increase the number of underrepresented minorities in the biomedical sciences and health professions.

Impact

Academic: Increase the number of underrepresented minorities in the biomedical sciences and health professions.

Quality of Life / Economic: Working towards improved, targeted therapies for a wide spectrum of diseases.

Funding: University of Texas System Stars Award; funding from the 2009 American Recovery and Reinvestment Act

UT Pan American

* UTPA Story #1: Excelling in Research and Teaching

Dr. Karen Lozano, Julia Beecherl Endowed Chair, Mechanical Engineering Department, UT-Pan American

Usually the $7 million in research funding received since joining the faculty in January 2000 is the first comment made when describing Dr. Karen Lozano. Her research excellence and success is recognized not only by academic colleagues at UTPA but also at Rice University where she received her PhD She is also recognized by colleagues in the State of Texas, and at the National Science Foundation from whom she received a Young Career Award (2000, and other NSF awards),

the Department of Defense, Sandia National Laboratory and the many other Federal research laboratories who have collaborated with her and continue to fund her research.

But most importantly, while pursuing her cutting edge research agenda, Dr. Lozano does not forget to focus on mentoring the next generation of researchers and many of her over 50 peer reviewed research publications and her over 100 presentations are co-authored with graduate and undergraduate students. She received the Chancellor's Award for Outstanding Teaching in 2006 and has been a role model, mentor and research supervisor for over 60 undergraduates, a thesis advisor for 22 graduate students and a research supervisor for 4 post doctoral students. The students supported by her research funding are part of the future scientists and engineers who will be the technology entrepreneurs needed to keep Texas and North America competitive in the future.

Dr. Lozano is an example of the rare talented research faculty who through both her teaching and research finds solutions to challenges through inquiry and innovation and is able to transmit the excitement of the research to her students. Many of her students would perhaps not have completed degrees without having engaged in and been challenged by the research opportunities. The undergraduate research funding has resulted in eight students choosing to pursue doctoral degrees. Currently, three have completed their doctorates and five are enrolled in doctoral programs and will soon finish. More than half of the doctoral students are Hispanic and three are women. The likelihood of these students pursuing masters and doctorates in STEM disciplines without the research opportunities, the mentoring and the support provided by Dr. Lozano was very low.

Dr. Lozano has been recognized nationally and internationally by professional engineering organizations for her research. She also has the knowledge and understanding necessary to translate university research into commercial ventures. She received the University Excellence Research Award in 2009 and was UTPA's 2010 UT System Chancellor's Entrepreneurship and Innovation Award nominee for her cutting edge research in nanotechnology. She and her various collaborators have 18 patent applications and 3 issued patents. Of special significance are the nanofiber production methods and equipment that enable the creation of nanofibers from a wider variety of materials than has ever before been possible.

The adage "necessity is the Mother of Invention" certainly holds true for Dr. Karen Lozano's research laboratory. In 2006, Lozano began to think about alternative ways to make fibers for her research projects, because funds were limited. While attending the circus with her family, Lozano had a "eureka" moment that led to the invention of new equipment and processes for creating superfine fiber. A Texas Ignition Fund grant in 2008 enabled Lozano and co-inventor Dr. Kamal Sarkar to produce prototypes of the nanofiber fabrication device.

In November, 2009, FibeRio Technology Corporation was launched based upon the technology. Within ten months of incorporation, FibeRio licensed Forcespinning™ technology for the fabrication of nanofibers, received $1.5 million from the Texas Emerging Technology Fund, won the Silver Award at the World's Best Technology Showcase and was recognized by the Society of Manufacturing Engineers as a 2010 "*Innovation That Could Change the Way You Manufacture.*" A top notch management team and a world class Technical Advisory Board, with Dr. Lozano serving as CTO, also resulted in the receipt of an investment round from Cottonwood Technology Fund to commercialize Forcespinning™ in the form of laboratory and industrial equipment.

FibeRio Technology Corporation, headquartered in Edinburg, Texas is manufacturing and selling equipment based upon the ForceSpinning™ technology. The company has fourteen professional employees, thereby supporting regional technology based economic development. Three of the employees are graduates of UTPA. Dr. Lozano's ongoing research endeavors and the technology transfer of the research knowledge continue to fuel regional, state and national growth.

Impact

Academic: Dr. Lozano received the Chancellor's Award for Outstanding Teaching in 2006 and has been a role model, mentor and research supervisor for over 60 undergraduates, a thesis advisor for 22 graduate students and a research supervisor for 4 post doctoral students.

Economic: 18 patent applications and 3 issued patents. Nanofiber production methods and equipment that enable the creation of nanofibers from a wider variety of materials than has ever before been possible. In November, 2009, FibeRio Technology Corporation was launched based upon the technology. Within ten months of incorporation, FibeRio licensed Forcespinning™ technology. The company has fourteen professional employees; thereby supporting regional technology based economic development.

Funding: $7 million in research funding (various sources)

UTPA #2: Engineering Students Design Chamber to Conduct Experiments in All Environments

Students enrolled in the University's mechanical engineering program who have been working with Dr. Constantine Tarawneh, associate professor of mechanical engineering, on testing railroad bearings created an environmental chamber to determine how the bearings function in extreme temperatures.

Temperatures in the chamber can dip to as low as -30 degrees Fahrenheit and climb to about 150 degrees Fahrenheit, which allows the UTPA students to simulate just about any weather condition in which a locomotive would travel.

The chamber, which undergraduate students created under Tarawneh's supervision as part of their senior design course work, is the latest in ongoing research and development projects the University is conducting for Amsted Rail. A team of faculty members and students, led by Tarawneh, have been performing research and development on testing bearings and other products from the company's various industries for the past five years.

Tarawneh said his research team has been working on finding correlations between temperatures on different areas of the bearings for Amsted Rail for the past two years or so. The team was able to find correlations in high temperatures, but the company also needed them to find correlations in cold ambient conditions.

To simulate different weather conditions, Tarawneh's students built the 8-foot-long-by-12-foot-wide-by-8-foot-tall chamber. The chamber, made with wood composite, fiberglass, Styrofoam and insulation, takes up about a quarter of one of the lab rooms in the Engineering Building. Its walls are about 6 inches thick.

Students said it took them the better part of a year to design and build the structure, which has allowed the team to conduct more than 50 experiments so far. They also received help in setting up the chamber from the University's Physical Plant staff who handle all the heating, ventilation and air conditioning systems.

"I think it's really cool to see everything we learn in class, how theoretical it is, and then to go back and apply it to something in real life," said Andoni Zagouris, a master's student in mechanical engineering. "Being able to do that has solidified my education and made me understand more than I could ever understand in a classroom."

Zagouris, who began working on the Amsted Rail project as an undergraduate at UTPA and whose graduate research is focused on finding correlations between temperatures on bearings and their cups, said he would not have been able to complete his research without the creation of the chamber.

The undergraduate students who designed and created the chamber said they are grateful to have had the opportunity to engage in such an advanced level of research because it gives them a competitive edge and enhances their learning experience.

David Hasler, who is graduating in May with a bachelor's degree in mechanical engineering, credits being a part of the design and construction of the chamber with landing him a job with Tesco Corporation, a global leader in the design, production and service of technology-based solutions for the upstream energy industry.

Impact

Academic: Undergraduate students enrolled in the University's mechanical engineering program who have been working with Dr. Constantine Tarawneh, associate professor of mechanical engineering, designed and built an environmental chamber to determine how railroad bearings function in extreme temperatures. The opportunity to engage in such an advanced level of research gives them a competitive edge and enhances their learning experience.

Economic: A team of faculty members and students, led by Tarawneh, have been performing research and development on testing bearings and other products from Amsted Rail's various industries for the past five years.

Funding: Funding by Amsted Rail

UTPA #3: Video Game Helps Families Calm Autistic Children

To assist those who care for children with autism spectrum disorders and who act out in disruptive or self-injuring behavior, Dr. Cheryl Fielding, associate professor of educational psychology and a Board Certified Behavior Analyst, helped create a video simulation program. The program, *Behavior Breakthroughs*, walks users through a situation in which they must help shape the behavior of a little boy (Asa) who has autism and is displaying challenging behavior. The game objective is to lower the boy's level of agitation and teach him to ask for things by using words. A demonstration of the program is available for free as an iPhone application and the full, six-level game is expected to be out on the market in May.

Behavior Breakthroughs is based on the scientific discipline of Applied Behavior Analysis, which comprises techniques and principles in reducing actions that are disruptive and increasing good behavior. Fielding said the idea for the game came from Alonzo Andrews, her mentor, who was then the director of the Autism Treatment Center in San Antonio. Last school year, the two took a group of UTPA students to work with families with children with autism in San Antonio. Fielding said that many of the parents they worked with in San Antonio, as well as other families she and other analysts have worked with, were giving in to the children's aggressive or even sometimes self-injurious behavior in order for their young ones to calm down. What they were doing was actually reinforcing the behavior. Fielding and Andrews noticed that just about every home they have visited over the years had a video game system. That's when Andrews came up with the idea to create the video game.

To develop the program, the two teamed up with Southwest Research Institute in San Antonio, one of the largest and oldest independent nonprofit applied research and development organizations in the country. Within the first three days of the application's launch, more than 1,750 people downloaded the program, and more than 3,000 downloaded the application within the first week, Fielding said. The video received much praise from fellow Board Certified Behavior Analysts at a conference last year.

The simulation not only can help parents of children with autism spectrum disorder, but also any parents.

Impact

Quality of Life: An interactive training simulation created for parents and caregivers of children and adults who display challenging behavior. The simulation provides an interactive environment in which parents and caregivers learn to effectively implement proven behavioral strategies and techniques.

Economic: Within the first three days of the application's launch, more than 1,750 people downloaded the program, and more than 3,000 downloaded the application within the first week.

Funding: Funding from Southwest Research Institute in San Antonio

UT Permian Basin

UTPB Story #1: A Classroom Challenge to Students: How R&D for Renewable Liquid Fuels Began at UTPB

During a spring semester Organic Chemistry class, while lecturing about sugars and the problems with ethanol production by fermentation, Dr. Mike Robinson challenged his undergraduate students: "Take off all six oxygen atoms from glucose (a carbohydrate) and the result will be a hydrocarbon, i.e., hexane." He realized after class that the challenge was a really good idea and wondered if anyone had ever done that. Thus, he embarked on an R&D effort with the assistance of mostly undergraduate students that were available at this primarily undergraduate Hispanic Serving Institution.

Classical fractionation of biomass to glucose has been an unsuccessful strategy. The highly reactive glucose platform continues to react under the severe conditions of a classical hydrolysis. The undesired degradation products are toxic to fermentation processes and have to be removed. Typically only about 50% of glucose is obtained. In contrast, Dr. Robinson's research team has developed a novel method of intercepting the dilute acid hydrolysis of biomass carbohydrates with simultaneous reduction of the incipient sugars that achieves complete conversion of these carbohydrates into the much more stable polyols platform. Polyols can then be completely converted directly into hydrocarbon fuels by reduction using boiling hydriodic acid as the immediate transfer agent which is eventually recycled by a coupled electrochemical means. These processes use wood from forests as feedstock and thus do not impact the food chain like the starch/ethanol biochemical process.

This research effort over many years to the present has resulted in more than a million dollars in grants and several patents for making renewable liquid hydrocarbon fuels.

While a number of publications have also resulted, it has been more rewarding that many undergraduate students were able to present their research experiences and successes at regional and national meetings of the American Chemical Society. Clearly, engaging so many undergraduate students in interesting applications of chemistry has fostered even further interest in chemistry by most of these students who continued their education and sought advanced degrees in chemistry and chemical engineering. This story demonstrates the two-way synergy of teaching and research. Teaching students sparks good research ideas, and engaging students in research early in their educational process gets them really interested and they thus perform better in their studies.

Impact

Academic: Engaging so many undergraduate students in interesting applications of chemistry has fostered even further interest in chemistry by most of these students who continued their education and sought advanced degrees in chemistry and chemical engineering.

Quality of Life: Processes use wood from forests as feedstock and, thus, do not impact the food chain like the starch/ethanol biochemical process.

Economic: This research effort over many years to the present has resulted in more than a million dollars in grants and several patents for making renewable liquid hydrocarbon fuels.

Funding: More than $1 million in grants

UTPB #2: Past & Present: Sports, Race, & Politics

Derek Catsam is engaged in an ambitious research agenda that crosses national and thematic boundaries relating to sports, race, and politics in the U.S. and South Africa. This research, which also includes books under development, allows him to draw concrete examples for his classes regarding Apartheid, global sports history and social issues related to race and politics in South African sport, including issues surrounding the World Cup. His work helps his readers and his student to understand the complex works of race and politics applicable both in understanding the past and today's political events.

He has written and published extensively on the U.S. Civil Rights Movement. His latest book, *Freedom's Main Line: The Journey of Reconciliation and the Freedom Rides* (Kentucky: 2009) has been universally well received by numerous scholarly journals. Even more exciting, he was chosen to be the "talking head/consultant" for the documentary *Freedom Riders*, which made its debut at the Sundance Film Festival in 2010, one of just sixteen documentaries chosen out of more than 800 submitted and which earned second in its award category. It will make its worldwide premiere on PBS' "*The American Experience"* in May 2011. When the *Oprah* show did an episode on the Freedom Riders on May 4, 2011, she used clips from the documentary, including one of Dr. Catsam. He attended the Freedom Riders' 50th Anniversary event in Chicago at the end of April where he chaired a panel of former Freedom Riders and other civil rights activists and sat on a panel of authors who have written books about the movement. He recently gave a talk at the Miller Center of Public Affairs at the University of Virginia that will likely be released on public broadcasting affiliates nationwide.

Dr. Catsam's research and writing agendas have been enhanced by his success in obtaining both visiting and short-term fellowships, including a David Bruce Centre for American Studies Fellowship at the University of Keele in the United Kingdom, the Institute for Southern Studies at the University of South Carolina, the John Hope Franklin Center at Duke University, the Virginia Foundation for the Humanities, and the Rothermere American Institute at the University of Oxford. As an active researcher and published author he has established a reputation as a solid scholar in the United States, Southern Africa, and in the American and African studies communities in the United Kingdom.

Impact

Academic: This research, which also includes books under development, allows him to draw concrete examples for his classes to help them understand the complex works of race and politics applicable both in understanding the past and today's political events.

Quality of Life: Research agenda that crosses national and thematic boundaries relating to sports, race, and politics in the U.S. and South Africa

Funding: Visiting and short-term fellowships, including a David Bruce Centre for American Studies Fellowship at the University of Keele in the United Kingdom, the Institute for Southern Studies at the University of South Carolina, the John Hope Franklin Center at Duke University, the Virginia Foundation for the Humanities, and the Rothermere American Institute at the University of Oxford

UTPB #3: Applied Research: Teaching Teachers

Juli Ratheal received the University's 2010 La Mancha Society Award which recognizes an outstanding on-going researcher each year at UTPB. Most notable is her success in obtaining external support from state and federal grants. Since 2008, Dr. Ratheal is responsible for over $2.5 million in externally funded grants. All of the grants focus on methods for professional development of STEM teachers, including training in content knowledge and pedagogy. The work is applied research on the new methods used for a group of actual teachers, thus improving region schools' STEM teaching while demonstrating the new techniques.

Dr. Ratheal has authored and co-authored numerous articles in professional journals since 2009; one received the 2009 Biggs-Pine Award for outstanding contribution to the *Journal of Counseling and Values*. Since June 2008, Dr. Ratheal has presented at seven national and international conferences, chaired two sessions at national conferences, and presented at numerous local and state conferences and meetings.

Dr. Ratheal continues to lead regional initiatives which include P-16 Vertical Alignment, College and Career Readiness Standards Awareness, and activities associated with AVID. She regularly assists local public, private, and charter schools with various projects for math and science instruction. Dr. Ratheal regularly assists individual teachers and school districts in writing grant proposal requesting funding pro bono. She regularly responds to requests for assistance dealing with pedagogical strategies, content knowledge development, and classroom management issues from P-12 campuses, individual teachers, and administrators.

Impact

Academic / Quality of Life: Focus on methods for professional development of STEM teachers, including training in content knowledge and pedagogy. The work is applied research on the new methods used for a group of actual teachers, thus improving region schools' STEM teaching while demonstrating the new techniques.

Economic: Improved STEM teaching helps improve college readiness. This reduces the need for students to take and universities to provide developmental ed, helping to reduce costs and time-to-degree.

Funding: $2.5 million in externally funded grants

UT San Antonio

UTSA Story #1: San Antonio Life Sciences Institute

Capturing the synergies from integrating the strengths of the UT Health Science Center-San Antonio and the University of Texas at San Antonio has been the goal of the San Antonio Life Sciences Institute (SALSI). An independent review found the goal's been achieved and declared SALSI to be the model for medical school-university partnerships. Approved by the Texas Legislature as a Special Item and funded both by the Legislature and the UT System, SALSI has produced new educational programs, innovative research projects and intellectual property moving into successful commercialization.

SALSI funding for joint research projects resulted in achievements across the range of life and biomedical sciences. SALSI has proven to be an extremely productive investment. In the first five years, SALSI generated a 173% return on investment while supporting 48 collaborative research projects. Over 120 scholarly publications have come from these projects and 20 joint inventions. Commercialization efforts are underway and have already resulted in a major success.

Impact

Academic: Development of multiple joint UTSA-UTHSCSA programs such as the Biomedical Undergraduate and Doctoral Degrees, the Doctoral Degree in Communication Disorders, the Graduate Neuroscience Training Program, the Summer Research Mentor Program for Educationally/Economically Disadvantaged Students and the Medical Humanities Initiative.

Quality of Life: Discoveries were made in areas of neuroscience, medicinal chemistry, prosthetics, regenerative medicine, prostate cancer, prevention of childhood obesity and health disparities.

Economic: Results from these projects are going on to the next steps of development leading to the spinoff of new companies and commercialization.

Funding: Funded both by the Legislature and the UT System

UTSA #2: The South Texas Center for Emerging Infectious Diseases

The South Texas Center for Emerging Infectious Diseases (www.stceid.utsa.edu) was established to advance the fields of molecular microbiology, immunology, medical mycology, virology, microbial genomics, vaccine development and biodefense. The major area of emphasis at the Center is on the pathogenic mechanisms of emerging infectious diseases.

UTSA has assembled an impressive group of researchers composed of 18 faculty members forming a multidisciplinary collaborative group with core expertise in microbiology and immunology, yet complemented by interests in bioinformatics and computational biomedical engineering. By specializing in the study of infectious diseases, especially Cholera and Chlamydia, they have created one of the premier centers for this type of research in the nation. New state-of-the art facilities, including two BSL3 laboratories within a $84M building, and the diverse expertise of the faculty belonging to the Center provide an excellent environment to answer critical questions relating to emerging and bioweapon-related diseases. The Center also serves a very important role in providing hands-on training of

undergraduates, and they support students in the Cell and Molecular Biology PhD program thereby helping to launch the career of a large number of students each year into promising and well-paid positions in biotechnology.

One example of their research success is their work in Chlamydia which targets a highly relevant world public health concern. Chlamydia is the most prevalent cause of bacterial sexually transmitted disease worldwide; it is a common cause of pneumonia and the most common worldwide cause (trachoma) of preventable blindness. There is no licensed Chlamydia trachomatis vaccine, yet this team is rapidly making progress towards this goal. One indication of the progress this team is making is an agreement with Merck in 2010 which will have significant commercial importance. These findings are also being extended to address health concerns in the developing world with a large proposal sent to the United States Agency for International Development (USAID) in collaboration with the College of Medicine in Malawi Africa.

This productive and collaborative group has secured a wide array of funding in support of their projects, including a cascade of funding from NIH and a recent 5 year/$4.6M award from the U.S. Army to create a Center of Excellence in Infection Genomics in partnership with the close by University of Texas Health Science Center at San Antonio thereby providing a secure and stable base of funding for expansion of their ambitious research agenda.

Impact

Academic: The Center serves a very important role in providing hands-on training of undergraduates, and they support students in the Cell and Molecular Biology PhD program thereby helping to launch the career of a large number of students each year into promising and well-paid positions in biotechnology.

Quality of Life: Working on development of a Chlamydia vaccine to the benefit of people worldwide.

Economic: 2010 agreement with Merck that will have significant commercial importance. A large proposal sent to the U.S. Agency for International Development.

Funding: A wide array of funding in support of their projects, including a cascade of funding from NIH and a recent 5 year/$4.6M award from the U.S. Army

UTSA #3: Texas Sustainable Energy Research Institute

In April 2010, UTSA established The Texas Sustainable Energy Research Institute (TSERI) and hired its world-class director, Dr. Les Shephard from Sandia National Laboratories, where he was vice president of Energy, Security and Defense Technologies. In only one year the TSERI has brought together a “game changing partnership” of government, industry, and academia unlike any other in the country. The institute involves faculty and students from every college at UTSA, its Center for Water Research, partnerships with the two utility companies of San Antonio (CPS Energy and San Antonio Water System), San Antonio Economic Development Foundation, City of San Antonio, Mission Verde, Green Jobs Leadership Council, Green Building Council, San Antonio Clean Technology Forum, Southwest Research Institute, the military and local industry.

A $50 million, 10-year grant from CPS Energy has propelled TSERI and San Antonio into a national leader in green technology research. A joint solar initiative creates opportunities for students to participate in the design and installation of solar panels in pilot projects on the UTSA campus which will reduce carbon emissions by over 250,000 pounds per year (equivalent of planting over 37 acres of trees) and generate 237 Megawatt hours, saving UTSA over $60,000 per year. Additional awards have come from the Department of Energy, and seed research projects are being developed through an internal Energy Research Grants (ERG) focus on the following areas: Carbon Capture, Management and Reutilization, Electrification of the Transportation Sector, Energy Efficiency and Conservation, Energy/Water Nexus, Renewable Energy Technology and Storage, and SMART Secure Distributed Grid.

These multidisciplinary projects will enable the Institute to participate in larger efforts such as the $500 million program from BP.

The TSERI exemplifies the integrated missions of teaching, research and service and contributes to academic excellence, undergraduate and graduate education, as well as economic development and quality of life benefits to the public. The Institute links scientific discovery, engineering innovation, policy deliberations and education with pragmatic implementation to realize the promise as tomorrow's global energy leader. TSERI pursues novel opportunities for technology insertion to reduce costs, improve reliability and assure responsible environmental stewardship that contributes to our energy future. The impact will drive San Antonio's economic future, coalesce our intellectual capital, serve as a magnet for thought leaders from around the nation and the globe and secure a foundation for enhanced prosperity for Texas for decades to come.

Impact

Academic: A joint solar initiative creates opportunities for students to participate in the design and installation of solar panels in pilot projects on the UTSA campus.

Quality of Life: TSERI pursues novel opportunities for technology insertion to reduce costs, improve reliability and assure responsible environmental stewardship that contributes to our energy future.

Economic: The Institute links scientific discovery, engineering innovation, policy deliberations and education with pragmatic implementation. Solar panel pilot project on campus to save an estimated $60K annually in energy costs.

Funding: $50 million, 10-year grant from CPS Energy

UTSA #4: Minority Advancement in Research Initiative

America's future leadership in science, technology and innovation requires an increasing pipeline of highly trained and motivated students entering the core technical academic pathways. With our changing national demographics, only by increasing the percentage of minority students entering in and graduating from scientific fields will America have the numbers of technological leaders required for our future. This is especially true in the biomedical research area where discoveries involving the very nature of life will significantly alter how we live. However, historically, few minority students consider or enter technical academic fields and fewer still graduate. UTSA recognized the significance of this national problem and developed an integrated approach to interesting minority students in technical fields and supporting their progression from undergraduate through doctoral degrees. This is the UTSA Minority Advancement in Research Initiative.

The UTSA Minority Advancement in Research Initiative is an integration of federally funded programs that increase the interest of minority students in entering and graduating from the fields of biomedical sciences. Students are given exciting research experiences and the mentoring and financial support needed to graduate with technical degrees. The components of the Initiative include MARC (Minority Access to Research Careers) and MRBS (Minority Biomedical Research Support). MARC provides research and professional skills development training and tuition, expenses and travel support. The MBRS includes MBRS-RISE (Research Initiative for Scientific Enhancement) and MBRS-SCORE (Support of Competitive Research). The RISE program recruits talented students and provides both financial and professional development support for up to 40, primarily minority, undergraduate and doctoral students while they pursue training in biomedical research. The RISE program supports research by faculty members that strengthens UTSA's biomedical research capabilities and provides opportunities for students to work in key research teams. The SCORE program helps UTSA faculty develop state-of-the art research teaching opportunities for students. Over 700 students have participated in this Initiative producing a record of outstanding success.

In the last year alone, 15 graduates of the Initiative entered Doctoral Programs at universities including the University of Washington, the UT Health Science Center, San Antonio and Northwestern University. A personal example of the success of UTSA's Minority Advancement in Research Initiative is Ms. Zoya Farzampour. Prior to her participation in the UTSA program, Zoya was living a day to day existence. At UTSA, Zoya received training and mentorship in neurobiology. As

she progressed through the program, Zoya was able to work in a bioresearch lab studying how the brain processes information. She graduated UTSA with an Honors Degree in Biology and was accepted for graduate studies at multiple universities including Berkeley, Yale, and Wisconsin. Zoya is currently in a PhD program in neuroscience at Stanford. UTSA's minority initiative is successfully addressing a national concern about America's future role in tomorrow's highly technical world.

Impact

Academic: Integrated approach to interesting minority students in technical fields and supporting their progression from undergraduate through doctoral degrees by providing opportunities for students to work in key research teams.

Quality of Life: Successfully addressing a national concern about America's future role in tomorrow's highly technical world.

Economic: Providing trained, experienced, highly-skilled workers for high-paying jobs in technical fields.

Funding: Integration of federally funded programs

* UTSA #5: Innovation and Commercialization in Biomedical Engineering

C. Mauli Agrawal, a San Antonio biomedical engineer, entrepreneur and dean of the University of Texas at San Antonio College of Engineering, was chosen by BioMed SA to receive the organization's Julio Palmaz Award for 2010.

Agrawal's research has resulted in more than a dozen patents, with others pending. The patents span the development of orthopedic implants, regenerative medicine devices, diabetic foot products and drug-delivery stents. He helped form three biomedical startup companies in San Antonio and served as CEO of Xilas Medical, now Diabetica Solutions, one of the first companies to receive funding from the Texas Emerging Technology Fund, created by the Texas Legislature in 2005.

Through Diabetica Solutions, Agrawal helped develop TempTouch, an infrared temperature-monitoring device used by diabetic patients who have lost feeling in their feet to take temperatures on the bottom of both feet in different spots. Higher temperatures can indicate possible ulcers, and early detection can prevent amputation.

Agrawal also has developed a shoe insole licensed to an international company and marketed over the counter to diabetics, athletes and others to prevent blisters. Sam Antonio-based OsteoBiologics Inc. has commercialized tissue-engineering scaffolds developed by Agrawal and his associates. Recently, Agrawal helped found GenOsteo Inc., a UTSA spinoff company focused on regenerating long sections of bone to benefit wounded warriors.

Agrawal established a joint graduate program in biomedical engineering with the UT Health Science Center at San Antonio.

Impact

Academic: Established a joint graduate program in biomedical engineering with UTHSCSA.

Quality of Life: Development of orthopedic implants, regenerative medicine devices, diabetic foot products and drug-delivery stents.

Economic: Helped form three biomedical startup companies in San Antonio. Has received more than a dozen patents, with others pending. Developed technology and innovations that have been licensed and commercialized.

excerpted from The San Antonio Express-News, *David Hendricks, September 8, 2010*
www.mysanantonio.com/business/local/article/UTSA-dean-to-receive-Palmaz-Award-650414.php

UT Tyler

UTT Story #1: The Ingenuity Center: STEM Education Research

Dr. Michael Odell is the Executive Director of the Ingenuity Center. His charge is to develop externally funded research programs in the area of STEM education and to develop faculty to become engaged in STEM education research. The Ingenuity Center is bringing together stakeholders in STEM education that include institutions of higher education, local education agencies, state agencies, educational service centers, informal education providers, research centers, civic leaders, and business to address the educational needs in rural Texas. The center also partners with national organizations and institutions to develop capacity and expertise, as well as increase visibility.

Since 2006, Dr. Odell has raised over $7 million to support STEM education research and programming for teachers and students across Texas. He has also engaged a number of UT-Tyler faculty in the work of the center that has led to an additional $3 million in external funding.

The Ingenuity Center manages the following projects:

- East Texas STEM Center: The Ingenuity Center is one of seven TEA-funded T-STEM Centers serving STEM Academies and schools seeking STEM designation across the state.
- UTeach Tyler: UT-Tyler is the smallest of the national replication projects funded by TEA and NMSI to increase and improve the STEM Teacher pipeline. Almost 20% of all Science and Mathematics majors at UT-Tyler are now also seeking teacher certification. UTeach provides some tuition support for students in the program.
- Project Lead the Way: The Ingenuity Center is the Texas Affiliate for the PLTW program. PLTW is a pre-engineering and biomedical career and technology program that prepares middle and high school students to enter STEM majors or the STEM workforce. The center has provided over $1.4 million in equipment to schools to implement the program. There are now over 300 PLTW schools in Texas.
- Texas Regional Collaboratives: The Math and Science Collaboratives at UT-Tyler have provided professional development to Tyler area teachers. Through a focused immersion model the center has helped raise TAKS scores at area high schools by over 40% for Hispanic students and 20% for African American students in science. Teachers receive 105 hours of professional development annually.
- UT-Tyler Math and Science Teacher Preparation Academy: Over the last two years the academy has provided a "free" master degree to 36 math and science teachers seeking to be qualified to teach dual enrollment courses. The program has also provided $2,500 scholarships to 60 undergraduate students seeking math and science teacher certification.
- Cyber-Security Training: The center also provides training to law enforcement professionals in the treatment of crime scenes where computers are involved. The training results in a certificate.
- The center is an approved provider for Texas High School Redesign and Restructuring and Mathematics Coaching. The center also co-manages a STEM focused middle school in the Tyler ISD using the Texas High School T-STEM Academy blueprint. The center continues to grow and currently provides jobs for over 14 professionals and 10 students annually.

Impact

Academic / Quality of Life: Support STEM education research and programming for teachers and students across Texas.

Economic: Improved STEM teaching helps improve college readiness. This reduces the need for students to take and universities to provide developmental ed, helping to reduce costs and time-to-degree.

Funding: Over $7 million from federal, state, industry and others; an additional $3 million in external funding

* UTT #2: Texas Allergy, Indoor Environment & Energy (TxAIRE) Institute

The Texas Allergy, Indoor Environment and Energy (TxAIRE) Institute was established at The University of Texas at Tyler campus on June 14, 2007, with funding from the Texas Emerging Technology Fund's Research Superiority Acquisition of Talent Grant. During the past three years, TxAIRE has established a wide array of technology and economic development projects. Below are summarized highlights for some of those projects.

Since its creation, TxAIRE has funded and mentored 41 post-doctoral (1), doctoral (2), graduate level (8) and undergraduate (30) students at the University of Texas at Tyler. Additionally, 10 faculty members have been participating in TxAIRE sponsored projects. During the past year, 8 research projects associated with various aspects of high performance building design have been performed by students with TxAIRE funding support and guidance. These projects include two solar domestic hot water system projects, two battery storage design projects for operating lighting and HVAC systems using battery power, an advanced concrete design project, an indoor environmental quality design project and an advanced formaldehyde sensor development project. Several of these projects could result in patentable intellectual property, representing some of the very first patentable technology ever developed at UT Tyler. Funding for these projects has come from TxAIRE as well as a federal research grants (from DoE) awarded to TxAIRE. UT Tyler is partnered with UT Dallas on two of these efforts.

TxAIRE has also performed a very large human health-related asthma study in East Texas involving over 3400 residences. The results of that effort have led TxAIRE to propose and receive competitively awarded funding from the National Institutes of Health (NIH) to implement an extension of these efforts within the National Children's Study (NCS). In close cooperation with the UT Health Sciences Center at Tyler, TxAIRE has expanded their role within the NCS to assist in redefining the strategy and method for collection of all environmental samples across the U.S. for the NCS. This could result in a very large and long-term supporting research and sample analysis role for TxAIRE under NIH/NCS sponsorship.

TxAIRE will soon break ground on two high-tech houses being built on the UT Tyler campus. The first of these demonstrates a wide range of energy efficiency features that result in a house which will consume only 50% of the energy used by an average home. The second is even more efficient and will, through the use of photovoltaic panels that generate electricity, actually generate all the power that it requires over the course of the year—a "net zero energy" home.

Energy efficiency products from over forty Texas based companies will be showcased in these TxAIRE Homes. These range from hail resistant and more reflective roofing shingles to advanced highly efficient heating and air conditioning systems. Other features include superior insulation and windows, solar hot water, highly efficient lighting, and healthy indoor air enhanced by special filtration and the use of building materials that do not contain harmful chemicals. Perhaps the best part is that these houses will be their cost—about the same amount as a conventional house, around $125 per square foot. The houses should be completed by the end of this summer and will be open for public tours and educational events immediately thereafter.

The combined impact of these efforts will result in job retention, job creation and potentially even new company creation across Texas. Locally, TxAIRE has already secured more outside sponsored research funding for the Engineering and Computer College than all other efforts combined. The long-lasting impact of TxAIRE upon the curriculum, faculty, students, and intellectual property generation at UT Tyler is therefore also expected to be significant.

Impact

Academic: TxAIRE has funded and mentored 41 undergraduate, graduate, and postdoctoral students. Eight research projects associated with various aspects of high performance building design have been performed by students with TxAIRE funding support and guidance.

Quality of Life: Improved building standards and technology resulting in improved air quality and energy efficiency.

Economic: Several of these projects could result in patentable intellectual property, representing some of the very first patentable technology ever developed at UT Tyler. Job retention and creation, and potentially even new companies, across Texas.

Funding: Funding from the Texas Emerging Technology Fund's Research Superiority Acquisition of Talent Grant; funding from the National Institutes of Health/National Children's Study

UTT #3: Nurse Practitioner Expansion Program

The Nurse Practitioner Expansion Program is a HRSA funded project of $1.4 million extending through 6/30/2013. The overall goal is to increase the number of Advanced Practice Registered Nurses (APRNs), specifically Family Nurse Practitioners (FNPs) and Pediatric Nurse Practitioners (PNPs), in the northeast Texas region. The purpose is to increase recruitment and retention of underrepresented minorities, use Community Based Participatory Research (CBPR) in order to meet the needs of the communities served, increase cultural competence and knowledge of ageism and address the health care needs of children living in poverty.

The population of the northeast Texas region is projected to increase 24 percent by 2040, with the population of people of Hispanic descent increasing 260 percent. The nursing workforce lacks the racial and ethnic diversity of the current patient population as over 70 percent of nurses are Caucasian. Part of the strategic plan is to increase minority faculty and students. In year one of the grant, 28 percent of the students admitted were from ethnic minorities. Of the second admission cohort (fall 2011), 26 percent of the students are from an ethnic minority background. Although we have had difficulty finding faculty, despite national searches, we recently were able to hire a new PhD prepared FNP faculty member who is Hispanic. She will be joining our faculty this summer. We are currently advertising for a second new minority faculty position.

The use of Community Based Participatory Research (CBPR) in order to meet the needs of the communities served is a major component of the grant. A nationally known speaker and expert on CBPR, Dr. Carolyn Jenkins, conducted a workshop for the students and faculty in the fall semester. Dr. Jenkins facilitated the identification of ways to implement CBPR both in the classroom and in practice. An initial outgrowth of this occurred this spring when students and faculty participated in a trip to Guatemala and while there, held four focus groups to determine the health care needs as seen through the eyes of the Guatemalan people. In future trips, plans are to build on this beginning research to develop programs to better meet the health care needs of the population. Students are also identifying CBPR projects for their local communities.

The project includes specific objectives targeted to improve academic excellence and teaching. Curriculum review and revision is being conducted to incorporate or extend content related to CBPR, increasing cultural competence and knowledge of ageism. The project will better prepare NP graduates to provide a lifetime of comprehensive, culturally competent, quality primary health care services.

Impact

Academic: Increase recruitment and retention of underrepresented minorities. Improve academic excellence and teaching. Curriculum review and revision is being conducted to incorporate or extend content related to CBPR. Students and faculty participated in a trip to Guatemala. In future trips, plans are to build on this beginning research to develop programs to better meet the health care needs of the population. Students are also identifying CBPR projects for their local communities.

Quality of Life: Increase the number of Advanced Practice Registered Nurses, specifically Family Nurse Practitioners and Pediatric Nurse Practitioners, in the northeast Texas region. Improve the level of care and cultural competence of practitioners.

Funding: HRSA funded project of $1.4 million

UTT #4: Bextine Molecular Biology Laboratory

The Bextine Molecular Biology Laboratory strives to achieve success in several areas when a research idea is being approached. Success can be measured by the number of publications that are produced, the patentable properties that are developed, or the delivered products to the stakeholders that funded a project. Success must also be determined by the educational opportunities that were provided and the success of the students involved in the project.

The greatest research success story to date in the Bextine Molecular Biology Laboratory has been the progress over the past six years towards lessening the impact of Pierce's Disease of Grapevine to U.S. grape producers. This disease system involves an insect (the Glassy-winged Sharpshooter), a pathogen that is transmitted by the insect (*Xylella fastidiosa*), and a valuable crop plant that is negatively impacted. The main goal of the research program has been investigations into the interaction between the insect and the pathogen (essentially uncovering greater knowledge of the basic biological phenomena), with an emphasis on developing methodologies (agricultural practices, vector control strategies, etc.) and products (RNAi, viral and bacterial products) that will limit the damage of this disease. To that end, we have developed products and practices that are currently being employed. This has resulted in industry benefits and overall happy grape producers.

Over the past six years, nearly 40 undergraduate and 4 master's students have been involved in this program. This has resulted in 10 publications with student authors and over 100 presentations. Almost more important than this production is the opportunities that this research experience opened for these students following graduation. All four of these MS students are currently perusing PhD's. The undergraduates involved have also moved on with their educational pursuits. Some have gone directly into PhD programs following their time in the Bextine Molecular Biology Laboratory, which is uncommon in this area of research.

Impact

Academic: Over the past six years, nearly 40 undergraduate and 4 Master's students have been involved in this program. This has resulted in 10 publications with student authors and over 100 presentations. This research experience had significant impact on their post-graduation opportunities and success.

Economic: Developed products and practices that are currently being employed to limit the damage to grapevines from Pierce's Disease.