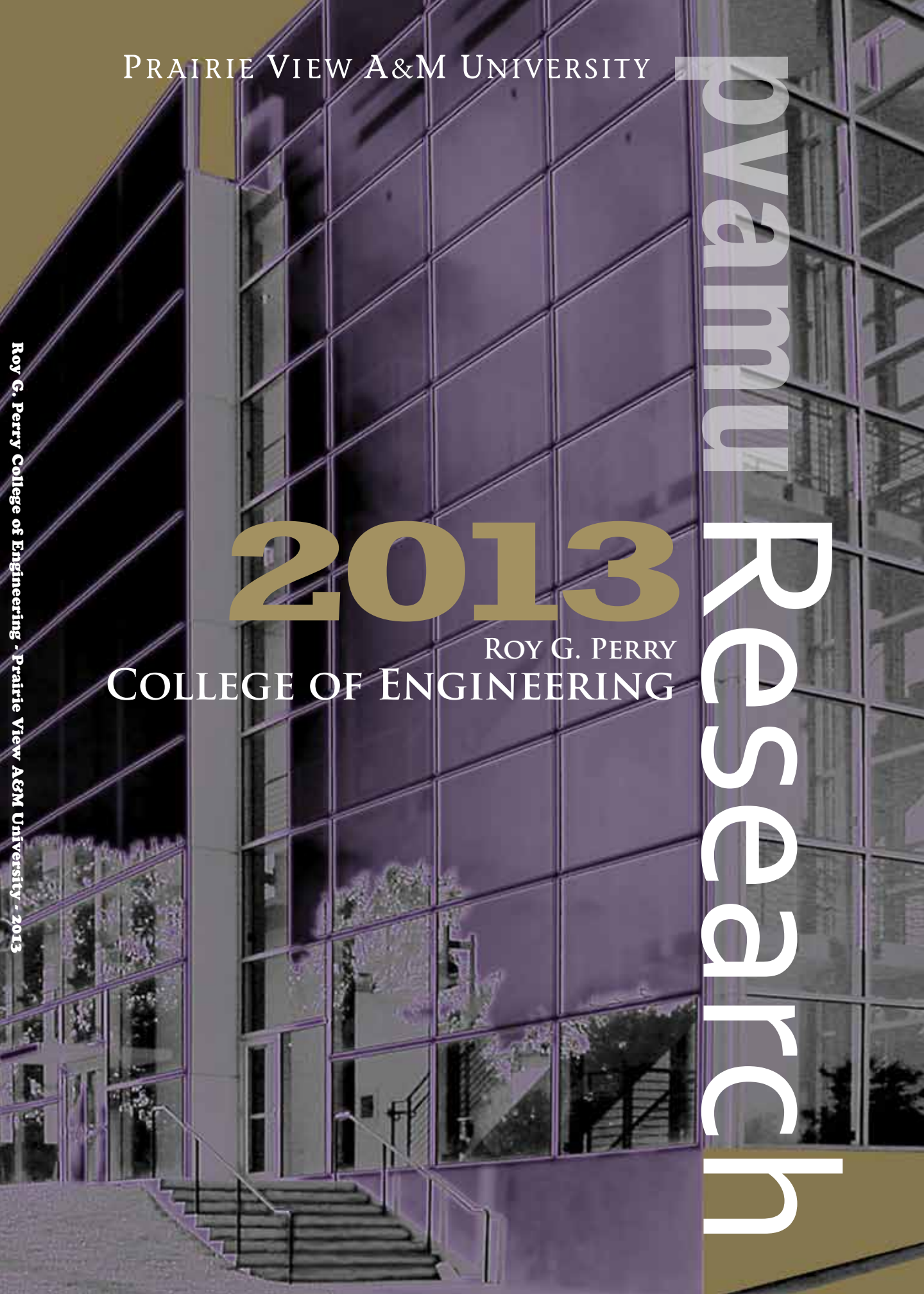


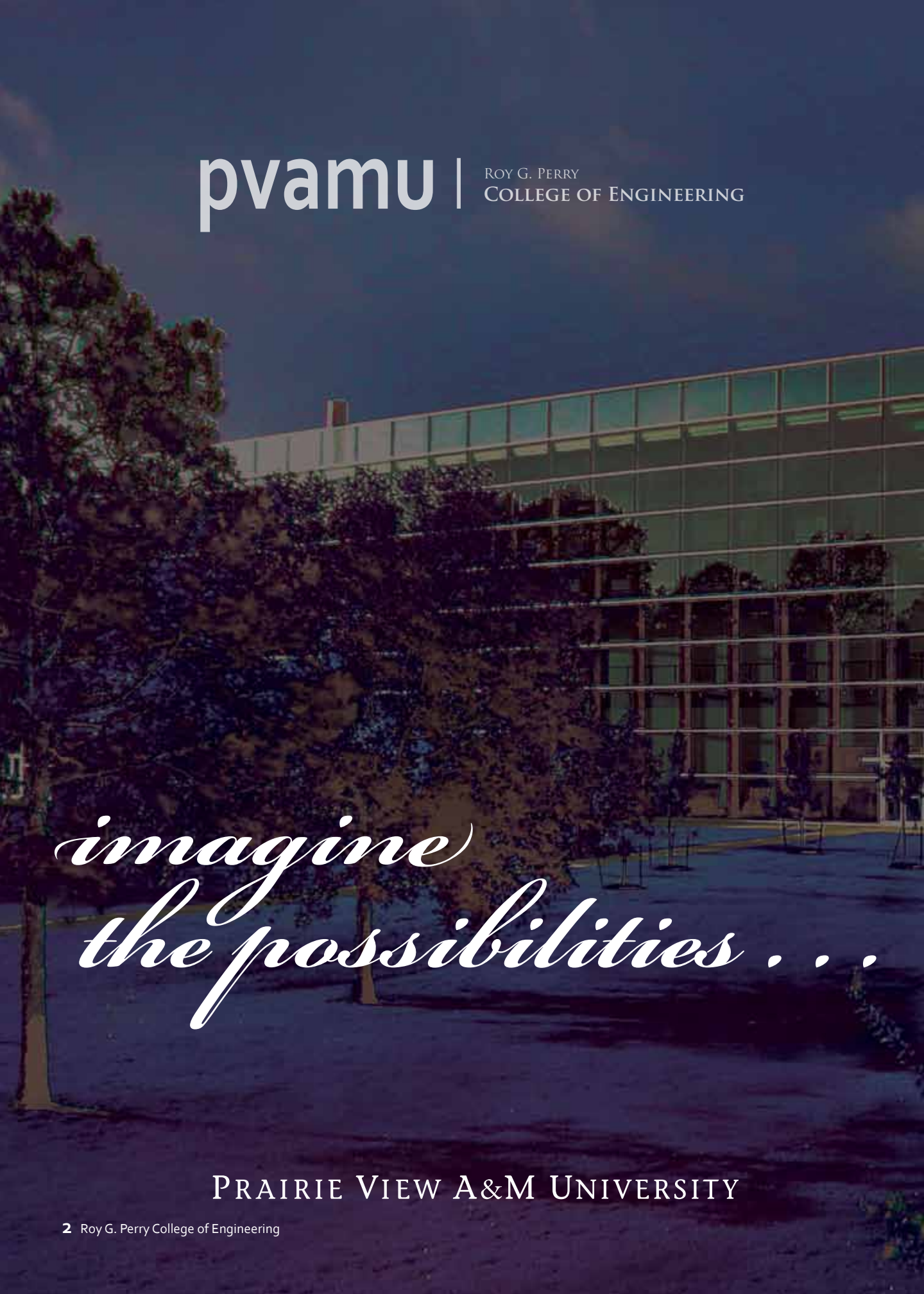
Prairie View A&M University

Annual Research

2013

Roy G. Perry
College of Engineering

Roy G. Perry College of Engineering - Prairie View A&M University - 2013


pvamu | Roy G. Perry College of Engineering
imagine the possibilities . . .
Prairie View A&M University

since 1876 engineering

Our Research Mission

The Roy G. Perry College of Engineering is a unique community of students, faculty, staff and scholars dedicated to the advancement, sharing and communication of knowledge in the field of engineering. Housed in a five-building engineering complex on the Prairie View A&M University main campus, the most highly focused component of the college is student learning.

Undergraduate and graduate programs are structured for discovery, applied learning, interpretation and the communication of learning through shared interactive courses and laboratories designed to engage students and faculty alike.

The Roy G. Perry College of Engineering is dedicated to strengthening the University's commitment and educational policies in ways that prepare students to become dedicated and productive members of society. The College's educational process relies on educating the whole student, providing tangible and intangible intellectual tools that prepare each one for his/her coming role of leadership and career accomplishments.

pvamu research

Roy G. Perry College of Engineering affiliations that appear in this publication include these home departments: Chemical Engineering (ChE), Civil and Environmental Engineering (CEE), Computer Science (CS), Electrical and Computer Engineering (ECE), Engineering Technology (ET), and Mechanical Engineering (ME).

imagine the possibilities . . .

MESSAGE FROM THE DEAN

College of Engineering Making Strides in Advanced Research

Dean and Professor
KENDALL T. HARRIS
Roy G. Perry
College of Engineering
(ME)

Welcome to the Roy G. Perry College of Engineering where our research and attention to the academic challenges faced by today's students make us uniquely qualified to prepare the next generation of highly-trained and self-motivated scientists and engineers. Please take the time to learn about the remarkable people who lead our students in truly transformative research and critical thinking every day.

This research magazine showcases a broad spectrum of programs where engineering at Prairie View A&M University has, for 137 years, been a local contributor to and an international leader in teaching, research and service.

Our publication profiles much more than the exciting information about our new $5 million center focused on energy. Multi-million dollar upgrades to our engineering instructional laboratories are also mentioned here. So is our military-driven research to keep American soldiers safer on the world's battlefields.

Look for exciting research on our new digital platforms, attitude-changing Texas Gulf Coast ecology studies, innovative bioinformatics programs and next generation wireless networking advances.

The Roy G. Perry College of Engineering is no longer a small fish in a big pond. We enjoy a seven percent enrollment increase annually. Last year, the College was awarded $8 million in research funding. I expect both of these data points to increase dramatically during the coming year. Texas A&M University System Chancellor John Sharp is initiating a $100 million research program shared between Prairie View A&M and Texas A&M over the next three years.

Historically, the College of Engineering provides more than $400,000 annually in undergraduate scholarships and more than $300,000 in awards for engineering graduate students. Additional stipends take the form of our Regent's and Presidential Scholarships while significant augmentation of our students' budgets comes from corporate, private and governmental sources.

Please take the time to learn more about our research and enjoy the graphics and photos relating to the exceptionally talented people who truly make higher education happen every day. This magazine is dedicated to research, but it's also about our bright, enthusiastic, talented, dedicated and success-oriented students who chose the Roy G. Perry College of Engineering to help them prepare for a lifetime of success in their engineering careers. They are, after all, our reason for being on "The Hill."

Dean Kendall Harris demonstrates the Virtual Reality Laboratory for representatives of the U. S. Army Corps of Engineerrs, Galveston District. Brigadier General Thomas Kula and Col. Christopher Sallese in the foreground are joined by other representatives of the Galveston District headquarters.

BIOFUELS, WIND ENERGY

$5 Million CEES Center Tackles Energy Alternatives

> Biofuels research tries to understand the reaction pathways of fast pyrolysis and how they affect the final composition of bio-oil and other by-products as process variables are introduced to optimize yields and quality of specific chemical species present in the bio-oil. We want the development of environmentally sound and industrially feasible lignocellulosic biomass hydrolysis using ionic liquid catalyst for cellulosic-ethanol production and development of catalytic conversion as strategies for upgrading bio-oil to useful fuels. Wind energy research looks at turbine blade construction with considerations for aerodynamic blade load, fluid dynamics and structure analysis.

Professor
RAGHAVA KOMMALAPATI
(CEE)

CEES is the newest research gem in the Roy G. Perry College of Engineering's line-up of multi-million dollar programs that provide the university's researchers, undergraduate and graduate students with the fiscal and academic support they need while honing the university's scientific and technical reputation nationwide.

ORGANIZATIONAL CHART
Center for Energy and Environmental Sustainability - CEES

Center Director Dr. Raghava Kommalapati said CEES focus is intended to uncover innovative technical solutions in the fast-evolving energy arena. The program should engage faculty and researchers and their students in work that will lead to the science and technology breakthroughs needed to fill critical gaps in the future utilization of environmentally responsible and sustainable energy solutions everywhere.

Biofuels research under the direction of Dr. A. Amarasekara, Dr. P. O. Biney, and Dr. M. Gyamerah addresses the need to curtail greenhouse gases (GHG) by advancing bio-renewable substitutes for depleting fossil based hydrocarbons and significantly reducing the nation's dependence on foreign oil.

CEES wind energy research by Dr. Z. Huque, focuses on optimizing wind energy production efficiency by determining the optimum shape of turbine blades along with the appropriate materials required for turbine blade construction.

Research on energy and environment is focused on (1) determining the environmental impact of continued utilization of fossil and nuclear fuels; (2) assessing the regional effects of various emission control strategies; and (3) identification of back-end fuel cycle and waste management strategies for safe operation of nuclear power plants. The Center employs 12-15 undergraduate students as undergraduate research assistants and 6-10 graduate students.

BIOINFORMATICS RESEARCH

"Cloud" Brings Sunshine to Computer Science Research

Assistant Professor
YI LU
(CS)

"With the fast development of Cloud/services computing research, it is now possible to process large amounts of data which requires large computing resources that could previously only be done in a large research facility. Now, Dr. Lu and a graduate student utilize the public Cloud computing facility on Amazon EC2 and private Cloud computing facility within the Prairie View A&M University to develop a new software program that can be used to speed up data processing for the bioinformatics research."

A Computer Science Department assistant professor and his undergraduate research assistant have worked to keep the Prairie View A&M University (PVAMU) Computer Science Department's "head in the clouds" with new bioinformatics research capabilities that significantly speed up the processing of large amounts of data needed by today's scientists.

Dr. Lu uses the technical talents of junior undergraduate student and research assistant Jamin Ashley in the utilization of the public Cloud computing facility available on Amazon EC2. He added to that capability a new private Cloud computing facility within the Prairie View A&M University environment.

To make it work, the team developed a new software program that can be used to speed up data processing for future bioinformatics research. Bioinformatics scientists can now get their results much faster than ever before.

Lu and his colleagues have scured additional grants from the National Science Foundation. One in the amount of $394,222 for high performance computer cluster computational research draws in Dr. Suxia Cui, Dr. Lei Huang, Dr. Dhadesugoor Vaman and Dr. Yonghui Wang. The second for $296,140 is a targeted infusion project that seeks to foster innovation and excellence in computing systems through the establishment of a new laboratory that adds Dr. Kiranmai Bellam and Dr. Akhtar Lodgher to the team.

Undergraduate student researcher Jamin Ashley, right, and Dr. Yi Lu make adjustments to the Computer Science Department's IBM Cloud Computer Laboratory server rack while working on bioinformation issues.

BATTLEFIELD COMMUNICATIONS

CeBCom Research Improving Defense-Related Systems

The nation's defense systems and the United States military communications technologies needed to help keep America safe are serious business to Dr. Dhadesugoor R. Vaman and his team of research faculty, engineering students and collaborators who form the Army Research Office (ARO) Center of Excellence for Battlefield Communications Research (CeBCom).

ARO Center's mission is to help the U. S. Army achieve national excellence in telecommunications research, technology transfer and focused education through almost a decade of collaborations with the Department of Defense and other national entities.

Established in 2004, the center has received continuous funding of $600,000 annually for nine years, using the $5.4 million in funding for the development of significant technologies focused on defense-related programs that also provide deep educational and academic support for Prairie View A&M University's undergraduate and graduate students working within the Roy G. Perry College of Engineering.

CeBCom is heavily engaged in the design of bandwidth efficient cluster-based mobile ad hoc network architecture that provides the military with scalability in the number of radios and elasticity of cluster sizes that allow radios to join and depart clusters at random. The center's research has already produced real-time three-dimensional tracking of soldiers, ground vehicles and air vehicles to one-foot accuracy on the battlefield.

Organization Chart
ARCO Center of Excellence in Battlefield Communications Research
CeBCom

Endowed Professor
DHADESUGOOR VAMAN
(ECE)

> **Over the past nine years, the center has succeeded in establishing graduate programs that have achieved national preeminence while creating opportunities that attract and utilize well-qualified faculty and students. The center has guided eight Ph.D. students, twelve master's students, and nine more doctoral students who are currently working, as well as more than 30 undergraduate researchers**

MEMBRANE, THIN FILM TECHNOLOGIES

Global Teams Helping To Solve Complex Engineering Problems

Associate Professor
FELECIA NAVE
(ChE)

> **Student development is a critical focus of the Nave Lab. Undergraduate research opportunities and faculty relationships are significant factors contributing to the success and preparation of the students. In the Nave Lab, students are supported to achieve their research, academic, and professional goals while increasing their knowledge and honing their skills as individual researchers while working as part of multi-disciplinary teams.**

The Membrane and Thin Film Research Group at Prairie View A&M University conducts basic and applied research in the area of advanced membrane technologies for applications in water purification biosensors, bioseparations, and controlled drug release. The Group is led by Dr. Felecia M. Nave, Associate Professor of Chemical Engineering and Associate Provost & Associate Vice President for Academic Affairs.

Nave Lab research focuses on the synthesis, design, and characterization of robust materials with tunable properties that can provide high selective separations to address key improvements of several biological processes. Of particular interest is the use of hydrogel membranes for a range of biological applications including bioseparations, biosensor controlled release devices and artificial organs, to name a few. Hydrogels are attractive because of their open mesh structure, tenability, biocompatibility and mild operating conditions. However, these materials typically provide limited selectivity between proteins of similar size and have low protein loading. To overcome these limitations, the membranes are functionalized with immobilized metal affinity ligands to increase their potential use and application.

Over the past year, Dr. Nave has maintained long-standing relationships with faculty across the U.S. and budding relationships with international partners in the membrane research field. She and Dr. Audie Thompson (post-doc) worked to develop and refine a training model that supports student development as leaders and independent researchers.

The model is informed by experience and engineering education research data from study conducted by Dr. Nave and colleagues that identifies factors that impact the success of African American students in engineering at HBCUs.

A student researcher works to improve biological processes in the Nave Lab.

VIRTUAL SCULPTING SYSTEM

Integration with Virtual Reality Creates PowerWall Modeling

A mechanical engineering associate professor working with the National Science Foundation is investigating a virtual sculpting modeling and virtual reality simulation technique that should provide a new tool for complex freeform solid modeling with heterogeneous materials.

Dr. Xiaobo Peng and three graduate and undergraduate students are developing the project which has integrated the VR sculpting system with the PowerWall VR system on campus. The new methods provide stereoscopic visual and haptic force feedback allowing designers to better understand 3D shape geometry.

Currently, the infrastructure of a virtual sculpting system has been developed which allows the designer to create complex product design in an intuitive manner. The system was integrated with the PowerWall VR system. Two issues have been researched. These are stereoscopic visual feedback and haptic force feedback. The research enables a modeling and simulation system in which the designer will appreciate a much better understanding of the 3D shape geometry. Figure 1 shows a student working with the virtual sculpting system.

The professor is also collaborating with Texas A&M University on a new research project whose objectives include (1) assessing the role of expertise on CAD modeling procedures, (2) determining if an expert's modeling procedures, metacognition, and epistemologies can be objectively deemed preferable to those of novices, and (3) investigating the role of learner-centered and contextual exercises on the adoption of preferred modeling procedures and manifestation of adaptive expertise.

A Prairie View A&M University student works with the haptic interface and PowerWall System at the Virtual Reality Laboratory. This integrated system is capable of stereoscopic visual feedback and haptic feedback.

Associate Professor
XIAOBO PENG
(ME)

"The investigation of a virtual sculpting modeling and virtual reality simulation technique for complex freeform solid modeling with heterogeneous material is showing great promise in areas that are expected to pave the way for designers to create complex product designs in an intuitive manner."

WIRELESS NETWORKS HUMMING

Emerging Research Into Smart Grids, Genomic Signal Processing

Associate Professor
LIJUN QIAN
(ECE)

"We are building a research testbed primarily of software-defined radio (SDR) platforms for wireless monitoring and surveillance. We plan to establish a unique research capability to further enhance existing research and to create new projects and interactions for faculty and students. Specifically, we provide students with unique hands-on experiences in the theory and practice of an entire range of experimental wireless and cognitive radio techniques."

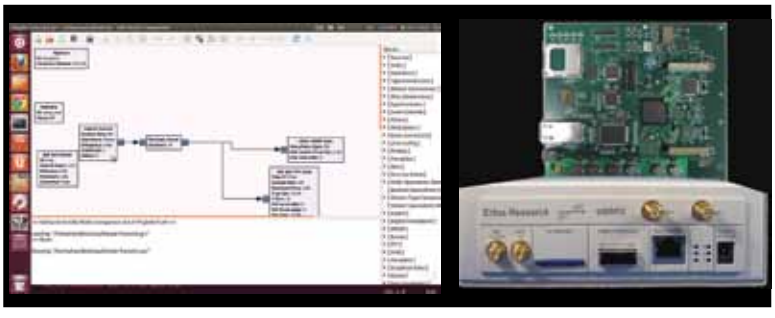
Associate Professor Dr. Lijun Qian in the Wireless Communications Lab (WiComLAB) has been focused on wireless network design including mobile ad hoc networks employing cognitive radio and wireless sensor networks as well as security issues involving such networks. Other emerging research areas include technologies like smart grid and genomic signal processing.

Several projects were initiated in 2012 and, together with two other research initiatives, represent more than $1.3 million in outside funding for projects in the Department of Electrical and Computer Engineering.

Currently, researchers are focusing on designing the next generation of hierarchical heterogeneous wireless networks that will provide much-needed interoperability in future mission-critical applications. Grants for modeling and control genetic regulation in biological networks using advanced signal processing and control theory will bring innovations to the current drug development process, especially in oncology. Cancer remains a high unmet medical need with many patients waiting for better treatment.

Qian and his team are working on the development of a smart grid simulator for multidisciplinary teaching and research through August 2015. These researchers hope to build a cleaner, more efficient and competitive economy and create new jobs with the "smart grid" project. The three are transforming their individual research on control, power and communications into curriculum development and laboratory modernization to strengthen undergraduate teaching in power and energy areas as a pipeline for industry.

The software-defined radio-based testbed should help the next generation wireless networks in areas of monitoring and surveillance. Testing will also verify theoretical results and produce a testbed to establish unique research.



The GNU Radio Software, left, is an open source development toolkit providing signal processing blocks to implement software radios. The software is used in concert with the Universal Software Radio Peripheral v2 (USRP2), right, in the Wireless Communications Lab for experiments and real-world radio systems.

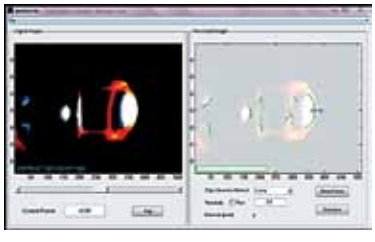
HIGH PERFORMANCE COMPUTING

Hyperspectral Images, Data Compression and Analysis

When she's not advising Prairie View A&M University (PVAMU) graduate students or educating undergraduates, Dr. Suxia Cui spends every minute she can spare researching projects ranging from classifying hyperspectral images to compressive sensing-based data compression and analysis in a high performance computing environment.

Her expertise in digital image processing has already led the Advancing Women in Engineering and Technology in HBCUs (ADVANCE-PAID) group to select her for the National Science Foundation's 2011 SEED Grant to continue her image enhancement and video coding research. NSF also approved a 2012 Collaborative Individual SEED Grant Award for Cui that allows her to expand her work with Dr. Xiaoqing (Cathy) Qian of Alabama A&M University's Mechanical Engineering Department.

The cooperative work seeks to develop an image processing algorithm for the operation of a Mach 4 supersonic wind tunnel where shockwaves present significant energy and power change testing challenges. Dr. Cui uses high speed cameras to record sequences of images during testing which are then used to record efficient and precise data analysis. Her shockwave detection software is a user friendly interactive system that can precisely detect the distance between shockwaves and the device under test, significantly improving testing procedures.



Dr. Cui developed user friendly, interactive shockwave detection software, above, that can precisely detect distances and significantly improve testing procedures.

Other research involves the U. S. Department of Agriculture where she works with Dr. Eric Risch in Cooperative Agriculture, Dr. Yonghui Wang in Engineering Technology and Dr. Jiao-ao Lian in Mathematics as well as Dr. Steve Suh at Texas A&M University. This project seeks to develop a Decision Support System (DSS) on irrigation where crop field information is collected by a wireless sensor network and accessed through an Information Communication Technology (ICT) system in real time.

Dr. Cui recently obtained an NSF grant to build a high performance computing cluster at the Roy G. Perry College of Engineering (COE). She, along with Co-PIs Dr. Lei Huang in Computer Science, Dr. Yonghui Wang in Engineering Technology, Dr. Yi Lu in Computer Science and Dr. D. R. Vaman in Electrical Engineering, are working to establish a high performance computer center to enhance the COE's computational capability.

Associate Professor
SUXIA CUI
(ECE)

"Opportunities for strong collaborations like the 2012 SEED Grant offered by the National Science Foundation (NSF) strengthen the research presence in the Roy G. Perry College of Engineering and expose both graduate and undergraduate students toward more challenging and cutting-edge research."

CRESSE CENTER ADDS X-RAY SOURCE

Goal to Train PVAMU Students in Radiation Research On Track

Professor
RICHARD WILKINS
(ECE)

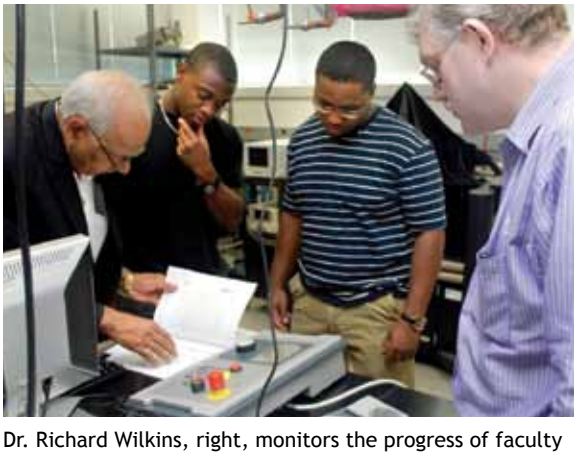
"Our research touches the lives of many of the nation's brightest, talented and enthusiastic college students with a love of research and learning. Our objectives have always included efforts to increase this university's contributions to the essential pipeline of underserved minorities eager and well-qualified for the future challenges to America's leadership role in space exploration."

The Prairie View A&M University Center for Radiation Engineering and Science for Space Exploration (CRESSE) keeps its five-year $5 million National Aeronautics and Space Administration (NASA) radiation research focused on finding answers that will lead to new protective materials for future astronauts involved in deep space missions.

The CRESSE research goal concentrates on multiple testbed designs that simulate planetary surfaces so that realistic space radiation experiments can be created on Earth using proton and neutron beam facilities throughout the country. Five scientists are charged by NASA with providing relevant and reliable data on radiation dosimetry, shielding, modeling and the long-term effects of radiation on space vehicle electronics.

A dual objective is to train university students in radiation engineering and fortify the pipeline of underserved minorities qualified to transition into the aerospace workforce. Through 2013, CRESSE research is expected to critically impact other high-profile national and international challenges faced by medicine, national defense, homeland security and new areas of technology, especially those related to energy.

Research capabilities were expanded recently with the installation of a new X-RAD R150 module and controller in a shared laboratory on campus. Acquisition of the source was expedited through the center's collaboration with the Department of Electrical and Computer Engineering. The study of total ionizing dose effects on power transistor devices using nanotechnology is of interest to NASA and commercial entities. Two current Ph.D. and one master's theses will benefit. More than 200 students have performed with exceptional academic accomplishment since the center's partnership with NASA began in 1995.



Dr. Richard Wilkins, right, monitors the progress of faculty researcher Ramesh Dwivedi, left, during the installation of a new X-Ray source. Undergraduate researchers Brandon Norman and T'Ron Gooch help their mentors sort through the manual for the unit obtained in collaboration with Dr. John Fuller in Electrical and Computer Engineering.

HIGH END TECHNOLOGY

New Approaches Cutting Student Frustration in Labs

> We use NEXYS 2 and NEXYS 3 circuit boards and XILINX technology that allows students to build projects by adding circuit elements in the work-space or by writing Hardware Description Language (HDL) codes. The end product for each procedure is to create a one-bit file, then a downloader called ADEPT is used to transfer the student file into the XILINX field programmable gate array platform. Once downloaded, the hand wired circuit runs in the FPGA platform and allows students to perform experiments on the circuit using inputs, outputs, switches, toggles and LEDS.

Lecturer
NRIPENDRA SARKER
(ET)

Two Prairie View A&M University professors working in the Engineering Technology Department at the S. R. Collins Building are teaching students to build digital logic circuits using transistor-transistor logic (TTL) gates in an initiative that offers improved and direct hands-on experience to the academic process.

Both say, as electronic circuits grow in size and complexity, a student's learning speed gets slower, adding frustration in the building and debugging process of circuits constructed on breadboards.

Undergraduate students in Dr. Sarker's class are focused on the professor's demonstration of new high-end circuit boards that show promise for boosting student confidence in the laboratories.

Dr. Mohan Ketkar, associate professor and interim department head, and Dr. Nripendra Sarker have initiated new labs using the traditional method of chips on breadboards, then moved students to the more complex circuits using Multisim software, an educational tool to help teach electronics engineering programs in colleges and universities.

Last year, Dr. Sarker upgraded PVAMU's digital logic and hardware design labs to the industry level by introducting Field Programmable Gate Array (FPGA) technology.

In February and September of last year, both Dr. Sarker and Dr. Faizul Islam attended two updated FPGA design flow workshops at the University of Houston.

PANTHER TRACKS MOBILE

Undergraduate students developing class schedule application

Assistant Professor
KIRANMAI BELLAM
(CS)

Partnering with the National Science Foundation and Thurgood Marshall College Fund helps computer science assistant professor provide a nurturing research environment for undergraduates while developing an innovative new mobile application to help all PVAMU students stay on track for graduation.

Dr. Kiranmai Bellam, an assistant professor of computer science, is working with the National Science Foundation (NSF) and Thurgood Marshall College Fund to foster innovation and excellence in undergraduate students from computing disciplines. The goal is to nurture these students to design and implement innovative computing systems in order to create next generation innovators.

In one project, two undergraduate students are working to create an innovative platform-independent mobile application called "Panther Tracks Mobile" that allows PVAMU students to track their completed classes and schedule their upcoming semester classes right up to their graduation date, based on their specific degree plan and other specifications. The app helps students stay on track for graduation.

APP uses PhoneGap API to run one source code on both iOS and Android devices. The application is being designed with both students and faculty in mind. Panther Tracks Mobile also allows faculty members to manage their advisees, providing access to student records and helping them plan course enrollment for the upcoming semester.

The core of the application is built with HTML, CSS and JavaScript code including several mobile libraries like jQuery. Base code is compiled using the PhoneGap API to run on each native device. The actual application then communicates with a central MySQL database using PHP functions, all of which are hosted on a Linux web hosting server.

Major functionality of the app has been developed and is currently under testing. The team plans to release Version 1 of the app to faculty and students by the beginning of fall 2013.

Dr. Bellam is also working on two other research projects; (1) Improving Fault Tolerance and Energy Efficiency in Storage Disk Systems, and (2) Humanitarian Free and Open Source Software Development.

Dr. Kiranmai Bellam, center, guides Hazar Kahera, left, and Dezshaun Meeks through a research project at the IBM Blade Center located in the S. R. Collins Building. The project seeks to create next generation innovators in computer disciplines.

TEAM APPROACH TO HYDROLOGY

PVAMU Assistant Professor Joined by TAMU, UH Researchers

Project Director Dr. Iftekhar Ahmed of the Civil and Environmental Engineering Department, and his Co-PIs at Texas A&M University (TAMU) and the University of Houston (UH) have been successfully navigating a rigorous research agenda since 2011 under a major three-year $500,000 Capacity Building Grant of the U. S. Department of Agriculture (USDA).

The research theme is geared toward the creation of scientifically and statistically valid models to study hydrologic influence on soil organic carbon (SOC) loss.

Co-principal investigators are Dr. Tom Boutton, a Regents Professor in the Department of Ecosystem Science & Management at TAMU; and Dr. Kyle Strom from the Civil & Environmental Engineering at UH. The research agenda has opened doors to ongoing collaborative efforts with the PVAMU Agricultural Extension Program and Texas Agrilife Extension Service.

The greatest impact of the project in the short term is the exposure of PVAMU through regional student success in its pursuit to introduce novel science in daily research agendas through collaboration with nationally and globally renowned scientists and engineers from TAMU and UH.

The path to positive impact has been assured by the volunteering interests of the public in providing soil samples from the Buffalo Bayou Study Watershed to cover a 60 square mile area at the completion of the project.

Undergraduate student research assistants in the Stable Isotopes for Biosphere Sciences Lab at TAMU have prepared the isotope ratio mass spectrometer to run soil and sediment samples from the Buffalo Bayou Watershed study area.

Those at UH have navigated the Bayou in a boat to install suspended sediment samplers and provided feedback to the project director and the local parks and flood control management agencies.

PV undergraduate students have taken their work to local conferences where they have received notable applause accompanied with significant advanced support.

Dr. Iftekhar Ahmed consults with graduate student Abdullah Kavin who is pursuing his maser's degree in engineering with a water resources thrust.

Assistant Professor

IFTEKHAR AHMED

(CEE)

"The greatest impact the project has brought in the short term is the exposure of PVAMU through regional student success in its pursuit to introduce novel science in daily research agendas through collaboration with nationally and globally renowned scientists and engineers from Texas A&M University and the University of Houston."

PRECISION AGRICULTURE

New Agriculture Robots Poised for Growing Field Takeover

Associate Professor
YONGHUI WANG
(ET)

Prairie View A&M University (PVAMU) and Texas A&M University (TAMU) researchers are issuing a new challenge to die-hard fans of the The Old Farmer's Almanac with their development of advanced robotics technology and new unmanned agriculture robots that are gaining favor in the fertile crop growing technologies now referred to as precision agriculture.

Unmanned agriculture robots are becoming widely used in the field and engineers equipped with agriculture robotics knowledge are in high demand by today's high-efficiency, high-producing operators everywhere, according to Dr. Yonghui Wang, associate professor in the Engineering Technology Department.

The multidisciplinary nature of the project provides a collaboration platform between Dr. Wang, Dr. Eric Risch, a research scientists with the Cooperative Agriculture Research Center; and Dr. Jian-Ao Lian, a professor in the PVAMU Mathematics Department. Collaborators also include researchers from TAMU. Mr. Kevin Lee works as the technician for his project.

"It is critical to offer robotics training to ensure students at PVAMU are adequately prepared for the new agriculture job market," said Dr. Wang. His project concentrates on the construction of an agricultural robotics lab that can be easily accessed by students for both the engineering and agriculture programs.

"We are providing students with the opportunity to improve their hands-on experiences with cutting-edge agriculture robotics technology," Dr. Wang said. The lab facilities can be used as tools for preparing and qualifying students for today's agriculture industry and for attracting new students to related programs.

Today, the Unmanned Agricultural Robotics System (UARS) includes a remotely-controlled vehicle platform populated with a crop volume scanner, a normalized difference vegetative index (NDVI) sensor, a hyperspectural radiometer and a Global Positioning System (GPS). The ground-based automatic crop condition measuring systems will help farmers of the future maximize the economic and environmental benefits to crop pest management through precision agriculture, Dr. Wang notes.

PVAMU's unmanned agriculture robot is put to the "precision" test while researching the device's capabilities in recent field trials.

THERMAL SCIENCE TOUCHES EVERYONE

Students Acquiring Engineering Knowledge, Professional Skills

The Thermal Science Research Center (TSRC) at Prairie View A&M executes basic and applied research, development, and design in the engineering scope of thermal science.

TSRC's research emphasizes the development and design of a physical model to couple heat transfer measurements and modeling, single-phase and two-phase flow measurements and correlation development. Interdisciplinary design and development of enclosed natural convection modeling and measurements and mixed convection modeling are also emphasized.

TSRC moves forward in mutual verification, data production and reduction, and advancements in product, component or process development. Research results may be applied to fusion reactors, cooling of electronic components, and other high heat flux applications. The current research in the TSRC includes conjugate heat transfer, nucleate and sub-cooled flow at boiling temperatures, aerospace and aeronautical high heat flux applications through experimentation, engineering modeling, and engineering simulation.

Research goals extend to new heights involving national and international alliances in areas of fusion reactor technology, and advanced aerospace and aeronautical component development. Collaborating alliances consist of faculty, national laboratory personnel, and industrial personnel within the United States, Europe, Japan, and the former Soviet Union.

The mission of the TSRC is to address complex coupled physical problems of physics and engineering goals of the future, thus, providing gateway solutions. The resulting knowledge aids in the improvement of energy transfer and transport in a variety of systems such as living systems, electronic systems, aerodynamic and space systems, laser systems, nuclear systems and others.

Widespread use, life, and controlled operations may be dramatically increased through the physical understanding and predictability of energy transfer processes within and surrounding the system.

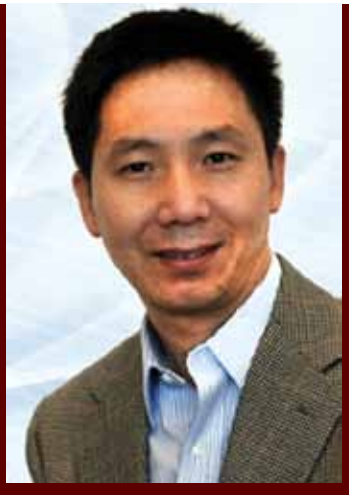
Dr. Ronald D. Boyd, right, and graduate student Cordell Booker, investigate ways to correlate high heat flux amplification.

Distinguished Professor
RONALD BOYD
(ME)

"In the TSRC, students learn how to work diligently as a team and simultaneously complete individual tasks. Students benefit greatly by applying acquired engineering knowledge and professional skills learned from dedicated involvement with the TSRC, thus, using these special tools to tremendously aid in a successful career."

3D GRAPHICS MAKING LIFE EASIER

Advances in Smart Human Computer Interface Systems



Associate Professor
YONGGAO YANG
(CS)

"3D Graphics like those used in gaming, smart devices and human computer interface systems are all the rage. These applications are deeply embedded into our daily lives so the Computer Science Department at Prairie View A&M University is studying and developing new software for these systems that has the potential to improve the quality and enjoyment of life."

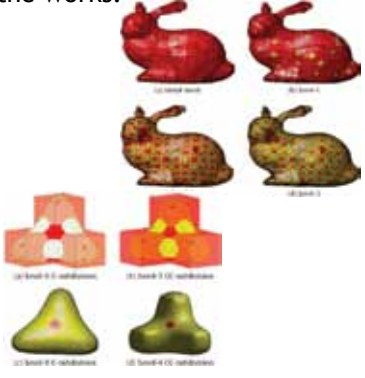
Smart computerized systems, stunning advances in 3D graphics and intuitive new computer interface devices have not gone unnoticed by Dr. Yonggao Yang, an associate professor in the Computer Science Department and his colleagues at Prairie View A&M University.

One of the researcher's major focus areas is in new schemes for 3D surface design, expanding on the remarkable animation studios and computer animation film work of Pixar which, in 1998, introduced subdivision schemes for 3D surface design. Based on the initial triangular or quadrilateral mesh, subdivision schemes are being employed by Yang to adjust coordinates of initial vertices, generate new vertices, replace original mesh with more and smaller polygons and make surfaces of 3D objects smoother. Today, these techniques are widely used for surface construction and scalable geometry in the gaming industry. Yang's team has developed several new and C^2 continuity subdivision schemes to enrich this area.

Smart devices and apps have also caught the department's attention with Yang and his colleagues working to develop several smart human computer interface systems including a Remote Resident Power Monitor and Control System that permits the use of smartphones, iPads or computers to remotely monitor and control their home lighting and appliances in real time while they are away.

Another project will turn the Nintendo Wiimote into a handheld computer mouse, allowing users to control, for example, a projection screen with a Wiimote via Bluetooth. Once connected, the computer knows exactly where the Wiimote is pointing on the screen and responds accordingly to mouse-like movements.

Amazing advances are anticipated with the PVAMU team's work on the Smart e-Receptionist, a smart computer application capable of sensing approaching visitors, orally greeting them, understanding their voiced questions, then responding by voice with appropriate answers. Limited self-learning capability through "accumulated knowledge" through visitor interactions is also in the works.



New technology breakthroughs in 3D object design are popular themes for Computer Science Department researchers led by Dr. Yonggao Yang. The team has developed several new C^2 continuity subdivision schemes.

FGPA SYNTHESIS LAB

Making the Connection Between Theory, Practical Implementation

The Field Gate Programmable Array (FGPA) Synthesis Laboratory, founded in 2009, is a teaching and research facility developed to improve student learning by connecting classroom theory to real life applications. Dr. Pamela Obiomon, Associate Professor in the Department of Electrical and Computer Engineering, said students in the lab have the capability to define the behavior of a system based on classroom theory and to rapidly build a prototype with FPGAs. In addition, software programs are used to place and route the circuits to develop an integrated circuit (IC) chip.

Lab equipment is housed in rooms 119 and 125 at the New Electrical Engineering Building and consists of the latest Dell computers with Xilinx ISE 13.4 CAD tools, the Virtex 5 FPGA and Digilent's Basys2 and Nexys2 circuit development platforms based on a Xilinx Spartan 3E FPGA. Verilog and VHDL are the hardware descriptive languages used for simulation, synthesis, and implementation.

The FPGA synthesis lab is used to conduct practical projects for the undergraduate courses and graduate research. Obiomon said a series of prototypes have been developed for classroom and senior projects including robot controllers, electronic motor controllers and a traffic signal event controller. Also, research is being conducted to develop a nuclear radiation detector.

The ECE Department has partnered with the Agriculture Department to develop a system-on-a-chip (SOC) to be utilized in the food safety industry.

The lab will continue to improve student learning by connecting theory with the practical implementation. It will also continue to bring students from various disciplines together to solve real world problems utilizing the industry standard tools in the lab to build SOCs with FPGA rapid prototype platforms.

Prairie View A&M University student researchers work out a real-world problem in the FPGA Synthesis Lab.

Associate Professor
PAMELA OBIOMON
(ECE)

"A multidisciplinary team of students from the Electrical and Computer Engineering Department (ECE), the Biology Department and the Chemical Engineering Department has been developed to design a System-on-a-Chip (SOC) using FPGA to detect biosignals to identify various types of bacteria."

TEXAS GULF COAST ECOLOGY

Finding Better Ways to Gather, Monitor Ecosystems Data

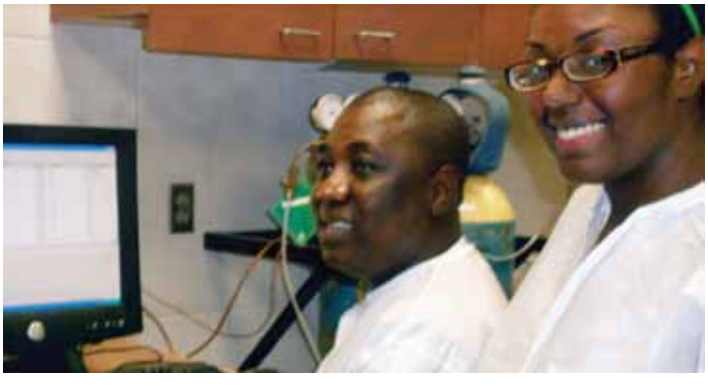
Senior Research Scientist
SAFWAT SHAKIR
(ChE)

The Texas Gulf Coast Environmental Data (TEXGED) Center is a key player in supplying researchers and decision-makers with the information they need to plan and assess environmental problems along the U.S. Gulf Coast's southern region. The center conducts research in environmental science areas such as bioremediation technologies using biological agents such as earthworms and soil microorganisms to monitor global climatic changes.

The Texas Gulf Coast Environmental Data (TEXGED) Center at Prairie View A&M University continues to be a key player in supplying researchers and decision-makers with information and data they need to plan and assess environmental problems along the Texas Gulf Coast region.

Established in 1995 with funds from NASA and a half-million-dollars in funding from the Small Satellites Initiative, the center has gone on to participate in and collaborate with the Jet Propulsion Laboratory in the use of special sensors for the gathering of data used by NASA and the National Oceanic and Atmospheric Administration (NOAA).

A TEXGED leader, Dr. Safwat Shakir, said the center collects data from space through NASA and transfers the information to a database system. "The information serves as a tool for predicting environmental changes in the Gulf Coast Region, for producing methodology for risk assessment of the ecosystems, and studies water stress in field crops while building a spectral library of agricultural crops using special instruments to collect ground truth data. New initiatives involve using its spectral library with new software for detecting environmental problems in the Gulf of Mexico – specifically the study of sea surface temperatures in the Gulf that impact biological activities. The center participated with 17 minority serving institutions in a request for $18.3 million in new funding from the National Science Foundation (NSF).



Graduate student Onemous Herrera and undergraduate LaWanda Christopher work through a data-gathering session at the Texas Gulf Coast Environmental Data (TEXGED) Center at PVAMU.

pvamu Facts

Roy G. Perry College of Engineering Faculty-Staff Spring 2013

Faculty	75
Staff	17

Dr. Kendall Harris, Dean
Roy G. Perry
College of Engineering

Dr. Shield Lin, Associate Dean
Roy G. Perry
College of Engineering

Dr. Irvin Osborne-Lee, Head
Dept. of Chemical Engineering

Dr. Raghava Kommalapati, Interim Head
Dept. of Civil & Environmental Engineering
Director
Center for Energy and Environmental Sustainability

Dr. John Attia, Head
Dept. of Electrical Engineering

Dr. Jianren Zhou, Head
Dept. of Mechanical Engineering

Dr. Yonggao Yang, Interim Head
Dept. of Computer Science

Dr. Mohan Ketkar, Interim Head
Dept. of Engineering Technology

Dr. Ronald Boyd, Director
Thermal Science Research Center

Dr. Annamalai Annamalai, Director
Center of excellence for
Communications technology Research

Dr. Dhadesugoor Vaman, Director
Army Research Office
Center of excellence for Battlefield
Communications Research

Dr. Richard Wilkins, Director
Center for Radiation Engineering and
Science for Space Exploration

Growth in Research

2006-07	$6.4 million
2007-08	$6.6 million
2008-09	$6.9 million
2009-10	$7.1 million
2010-11	$7.4 million
2011-12	$8.0 million

Graduate Students

The Roy G. Perry College of Engineering maintains a reputation for integrating theoretical knowledge with advanced hands-on industrial experience, making our graduates some of the most sought-after engineers and researchers in the country.

We offer:

- MSCIS - Computer Information Systems
- MSCS - Computer Science
- MSENG - Engineering with concentrations in Chemical, Civil or Environmental and Mechanical
- MSEE - Electrical
- PhD - Electrical

PVAMU Pride

Founded in 1876, Prairie View A&M University is the second oldest public institution of higher education in Texas.

COE Student Profiles

Ranked 6th nationally in number of all African American Engineering Graduates

Ranked 7th nationally in number of bachelor's degrees in engineering awarded to African Americans

Ranked 7th nationally in percentage of bachelor's degrees in engineering awarded to women

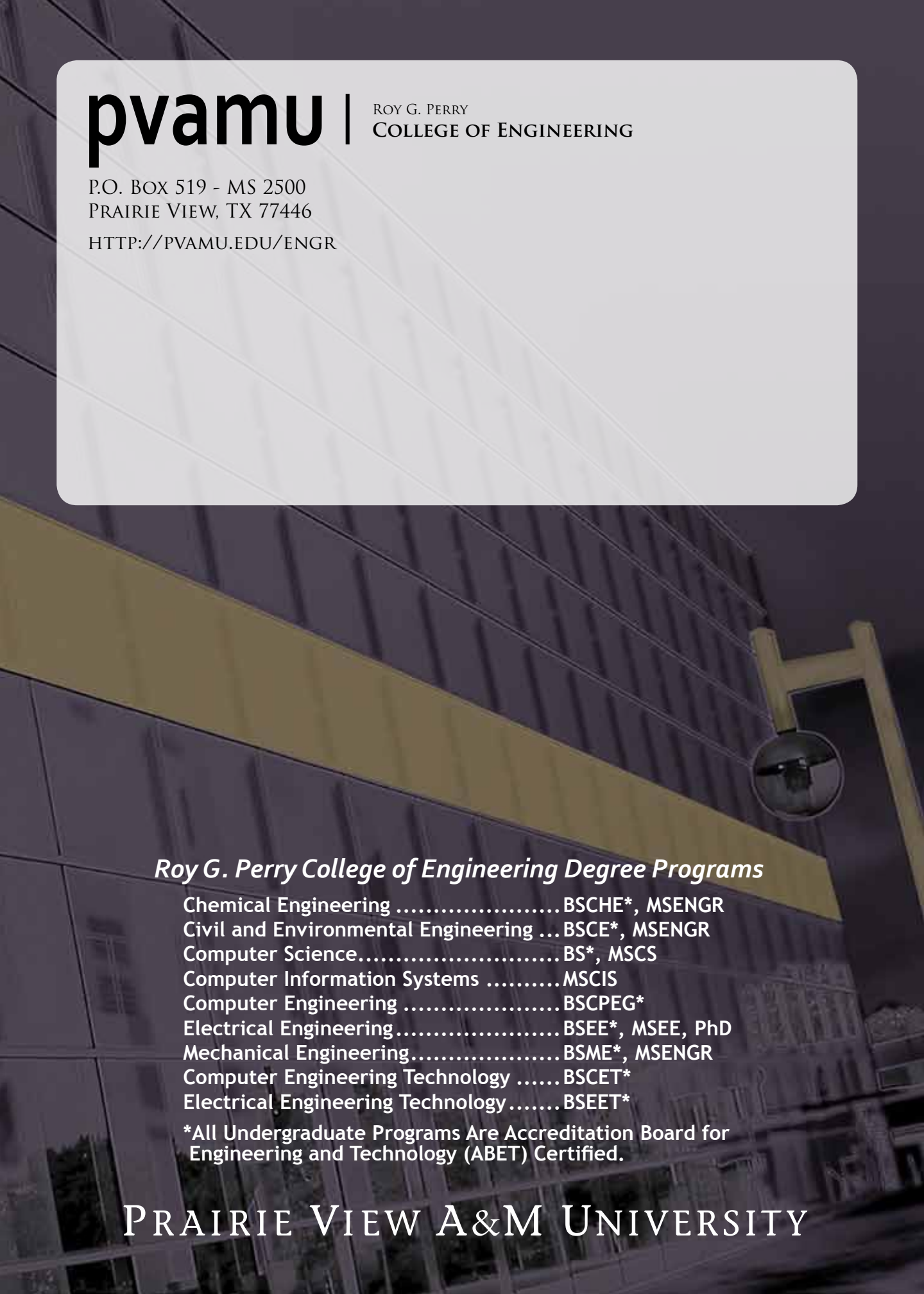
1,102 Undergraduate and 125 Graduate Student Enrollment (Fall 2012)

65% Males, 35% Females

86% African American Undergraduate Students

76% of Students indigenous to State of Texas

164 Undergraduate Degrees in Engineering Awarded (Fall 2011/ Spring 2012)



pvamu | Roy G. Perry College of Engineering

P.O. Box 519 - MS 2500
Prairie View, TX 77446
http://pvamu.edu/engr

Roy G. Perry College of Engineering Degree Programs

Chemical Engineering	BSCHE*, MSENGR
Civil and Environmental Engineering	BSCE*, MSENGR
Computer Science	BS*, MSCS
Computer Information Systems	MSCIS
Computer Engineering	BSCPEG*
Electrical Engineering	BSEE*, MSEE, PhD
Mechanical Engineering	BSME*, MSENGR
Computer Engineering Technology	BSCET*
Electrical Engineering Technology	BSEET*

*All Undergraduate Programs Are Accreditation Board for Engineering and Technology (ABET) Certified.

Prairie View A&M University