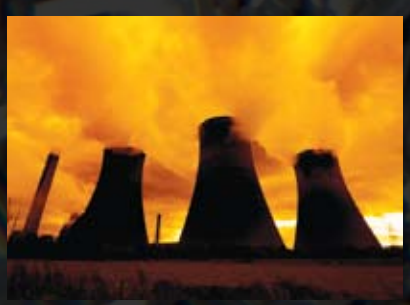
Evolution

NORTH CAROLINA A&T STATE UNIVERSITY

>> RESEARCH MOVING FORWARD

BIOMEDICAL RESEARCH ATTACKING ILLNESS AT THE NANO LEVEL



NUCLEAR ENERGY AFTER FUKUSHIMA

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FROM THE **VICE CHANCELLOR**

CELESTINE A. NTUEN, PH.D.

INTERIM VICE CHANCELLOR FOR RESEARCH & ECONOMIC DEVELOPMENT

Emergence & Convergence

Emergence is a phenomenon that results from the interactions of many behaviors. In studies of complex systems, emergence is what happens when new ideas or entities appear. It represents unpredictable, stochastic circumstances—the "aha!" moment in a laboratory. Convergence is the interaction of interdisciplinary and transdisciplinary sciences and technologies toward solving a common problem.

Paradigm shifts driven by concepts in emergence properties and convergence in technology are about to invalidate the status quo in scientific inquiry. For example, funding agencies are moving away from funding single investigators to funding more collaborative teams—interdisciplinary and cross-disciplinary scientists converging to address a common problem. These are the opportunities for which our existing and emerging research clusters were designed. The biomedical research described in this issue is a good example.

I urge our faculty and students to think about emergence and convergence and be ready to embrace the changing dynamics of research and funding policies. These concepts have much to offer North Carolina A&T. I'd like to know what you think. Join me on the Aggie Research Blog, http://aggieresearch.wordpress.com/, for a more thorough look into these issues and please share your thoughts on the opportunities of our emerging and converging world.

Sincerely,

CELESTINE A. NTUEN, PH.D.
Distinguished University Professor
Interim Vice Chancellor for Research and Economic Development

The Aggie Research blog: http://aggieresearch.wordpress.com/
Twitter @aggieresearch ... Facebook: Aggie Research
http://www.ncat.edu/~divofres/

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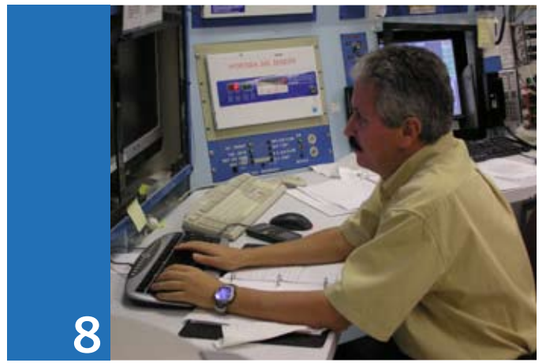
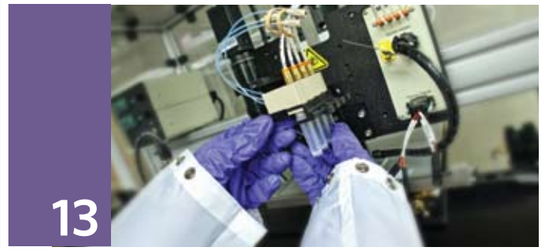


>>FEATURES

>>DEPARTMENTS



ON THE COVER: A microscopic view of a biodegradable polymer of the type used in drug delivery.

ENERGY RESEARCH & TECHNOLOGY

A Call for Papers

The 2nd International Conference on Green & Sustainable Technology

The Center for Energy Research & Technology at North Carolina A&T State University
presents
The 2nd International Conference on Green & Sustainable Technology

Monday November 7, 2011
and
Tuesday November 8, 2011

Greensboro, North Carolina
To be held at the O'Henry Hotel and the Proximity Hotel, the 1st LEED platinum-certified hotel in the United States

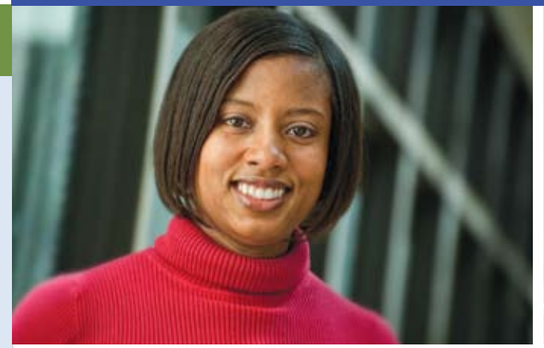
Three Parallel Conference Tracks:
Green Energy
Green Technology
Green Construction

Abstracts due April 15, 2011
Papers due August 15, 2011

Call for Papers and more info:
http://greenconference.ncat.edu

A technical conference for researchers and practitioners in engineering, renewable energy technologies, construction, construction materials and related fields. Papers are invited on such subjects as biodiesel, bioethanol, biomass, fuel cells, gasification, smart grid technology and other green energy topics; energy-efficient housing; reduction of waste and pollution; maintenance and building operation; reduction of costs; siting and landscaping; materials and efficiency; sustainable design; operation and maintenance optimization and other issues relating to buildings, structures and materials.

Aggie Research Briefs



PICTURED LEFT TO RIGHT:
Dr. Stephanie Luster-Teasley; the Proximity Hotel, site of the 2nd International Conference on Green and Sustainable Technology; Dr. Gary Lebby; and Dr. Joseph Stephens.

Noted & Notable

Dr. Stephanie Luster-Teasley (Civil, Architectural and Environmental Engineering) has been named one of the Triad area's 40 Leaders Under 40 by *The Business Journal*. ■ **The Center for Energy Research and Technology** and the **U.S. Department of Energy** hosted the North Carolina Smart Grid Technical Conference in Greensboro. **Dr. Gary Lebby** (Electrical and Computer Engineering) was a featured speaker. ■

New UNC system president, **Tom Ross,** made his first official visit to the campus in February. His day included meeting researchers at the Fort IRC and touring the Engineering Research Center labs and the Ford Scientific Visualization Lab. ■

Dr. Alice Stewart (Business Administration) was the first-place winner of the Graduate Admission Council's Ideas to Innovation Challenge. She was awarded a cash prize of $50,000 for her idea to allow management education students to craft customized degree programs closely aligned with today's information-based technology. ■

The UNC Board of Governors has approved A&T's proposal to offer a **M.S. degree in nanoengineering** through the Joint School of Nanoscience and Nanoengineering. The first students will be admitted this fall. A&T's proposal for a Ph.D. program is expected to be approved soon. ■

Dr. Goldie Byrd (Biology) has been named dean of the College of Arts and Sciences. She is the Nathan F. Simms Endowed Professor of Biology. ■ **Dr. Solomon Bililign** (Physics) was recognized as one of 100 "iconic figures" in the STEM disciplines from Africa, Europe, the Caribbean and United States by the Festival Mondial des Arts Negres in Dakar, Senegal. ■

Thirty-four faculty members from more than a dozen departments attended a workshop on research funding in the **social and behavioral sciences**. It was the second in a series of workshops for researchers in the university's newest research cluster. ■

Currently active faculty bloggers include **Dr. Joseph Stephens** (Psychology), "meta-meta-cognition" (https://professorstephens.wordpress.com/) and **Valerie Nieman** (Journalism and Mass Communication), "Valerie Nieman 3.0" (http://valerienieman.blogspot.com/). ■

Dr. Beryl McEwen (Business Education), president of Delta Pi Epsilon (DPE), presided over the organization's National Research Conference. DPE is the premier research organization in business education. ■ **Dr. Krishna Kasibhatla** (Economics) has been appointed editor of the *Global Journal of Finance and Banking Issues*. ■

The **North Carolina Department of Transportation** has awarded the university $1.5 million to establish two programs unique to HBCUs: a curriculum to develop students' expertise and understanding of acquiring real estate and right of way for transportation projects and a construction contractor technology certification program. ■

Upcoming international conferences hosted by North Carolina A&T: The Joint School will host the **Commercialization of Micro-Nano Systems Conference** at the Grandover Conference Center in Greensboro next August 28-31. ■ The Center for Energy Research and Technology will host its second **International Conference on Green and Sustainable Technology** in Greensboro next November 7-8. (See column at left for details.) ■

This year's chairs of the university's research compliance committees are: **Dr. Karen Smith-Gratto** (Curriculum and Instruction), Institutional Review Board; **Dr. Leonard Williams** (Center for Excellence in Post-Harvest Technologies), Institutional Animal Care and Use Committee; **Dr. Margaret Kanipes** (Chemistry), Institutional Biosafety Committee; and **Dr. Zerihun Assefa** (Chemistry), Radiation Safety Committee. ■

Twenty-one high school students visited the Fort IRC in February for **"The Colors of Innovation,"** a Black History Month event hosted by the Division of Research and Economic Development. The students toured labs; learned about research, innovation and African American inventors; and heard from the first African American woman to receive a Ph.D. in electrical engineering, Dr. Sandra Johnson of IBM. ■

Among the top new research grants received so far in fiscal year 2011: $999,452 from NSF to **Dr. Yevgenii Rastigejev** (Mathematics), "Center for Advanced Multi-Scale Computational Algorithms"; $540,000 from NSF to **Dr. Abdollah Homaifar** (Electrical and Computer Engineering), "Collaborative Research: Mining Climate and Ecosystem Data"; $499,890 from the National Institute of Food and Agriculture to **Dr. Mohamed Ahmedna** (Center for Excellence in Post-Harvest Technologies), "Post-harvest processing of peanut and wheat products to reduce inherent allergens"; $429,259 from the Army Research Office to **Dr. Shanthi Iyer** (Nanoengineering, JSNN), "Oxide-Based Transistors for Flexible Displays"; and $388,844 from USDA to **Dr. Lijun Wang** (Natural Resources & Environmental Design), "A Reactive Distillation Process for Upgrading Bio-Oil to Transportation Fuels and Bioplastics." ■

Dr. Sanjiv Sarin (Industrial and Systems Engineering) has been named interim associate vice chancellor for research and dean of graduate studies. He has served as the associate dean for the College of Engineering for the past nine years. ■

A&T has joined with **Indiana University** and 11 HBCUs in a partnership aimed at increasing the number of African Americans pursuing careers as researchers and scholars in science, technology, engineering and mathematics disciplines. ■

The **Department of Computer Science** has been awarded $135,000 from Google, Lockheed-Martin and State Farm for undergraduate research assistantships and scholarships. ■

A&T has been chosen by the Association of American Colleges and Universities as one of 13 HBCUs for the **Preparing Critical Faculty for the Future** program, which will help women of color on the faculty in the STEM disciplines become strong academic and administrative leaders. ■

STAY CURRENT:

To keep up to date on research and researchers at North Carolina A&T, visit the Aggie Research blog, http://aggieresearch.wordpress.com/.

PROVOST DR. LINDA THOMPSON ADAMS Q & A

the research agenda

DR. LINDA THOMPSON ADAMS CAME TO NORTH CAROLINA A&T LAST FALL AS PROVOST AND VICE CHANCELLOR OF ACADEMIC AFFAIRS. SHE HAD BEEN DEAN OF NURSING AT OAKLAND UNIVERSITY IN TROY, MICHIGAN. ADAMS RECEIVED HER BACHELOR'S AND MASTER'S DEGREES IN NURSING FROM WAYNE STATE UNIVERSITY AND HER MASTER'S AND DOCTORATE IN PUBLIC HEALTH FROM JOHNS HOPKINS UNIVERSITY. *EVOLUTION* TALKED TO HER ABOUT RESEARCH AT NC A&T AND ABOUT HER OWN BACKGROUND IN RESEARCH.

BY DAVID ARNEKE

The chancellor points to research as one of the key elements of his top priority, which is to enhance the intellectual climate of the university. How does research do that? How does it impact A&T's various constituencies: students, faculty, alumni and community?

I see research as one of the main pillars of the work that we need to be doing here on our campus. A university is a place where you are not only teaching the next generation of scientists—we also want them to learn how to discover and understand some of the critical issues that are facing this world and our community. The research agenda drives that thirst for new knowledge that is solution-driven to solve critical social problems or critical problems facing our planet.

I see A&T fitting into this in several ways. We are a STEM [science, technology, engineering and mathematics]-based university where science and technology and engineering drive a lot of the work we do. At the same time, we also have to pay attention to our role as a land grant university and as a university that has been historically focused on issues facing communities of color. I think that if you look at the portfolio of research on this campus, we are paying attention to those problems and to problems that are facing people all over the world. I look at the problems of the environment, which we are doing research on. I look at problems in health, and we are doing research in that. And I look at problems in energy, and we're also focused on that, as well as food and food security and the problems of infrastructure. All of those things are challenges not only to North Carolina, but they're challenges that people are facing everywhere.

What challenges does A&T have to overcome to achieve its potential in research?

It's shifting the culture. We have traditionally been a university with a mission of teaching and service. When you add research—high-volume research—to that focus on teaching, you need different people to drive that. So it's really looking at how we strategically bring in talent to help drive our university to an area where we're much more engaged in research and in encouraging people to choose to come to us to build their research careers, faculty and students alike. If we do that and if we do that in a consistent way all over this campus, we can become a university where there's active engagement and involved faculty who are fully funded to try to solve some of these problems.

I think that to become a preeminent university by the year 2020, we have to have more faculty involved in the research part of our campus and see research as something that you can get other people to invest in. People invest in research that is going to solve problems that are important to the community, important to the nation and important to the world.

That's a big agenda. How can a university with such a diverse research profile make sure it's having an impact commensurate with the money and effort being poured into its research?

We need to identify areas within each school and college on this campus that we can be best-in-class in. But we need also to look at how the best science is done across disciplines. You need a multidisciplinary kind of team where content and thought and research are converging toward a solution. Problems are so complex today that you can't solve them if you stay within your own area.

When you were a full-time faculty member, how big a part of your work was research?

My first job as a full-time faculty member was all research. I didn't teach at all. I was involved in what you would call social and behavioral research, looking at problems of children who were in the juvenile justice system and had been involved in delinquency and delinquent behavior. I was conducting surveys and collecting information from states all over the United States to understand more about some of the social and behavioral and environmental determinants that lead to children getting involved in that type of behavior. I was funded completely to do that work by the National Institute of Juvenile Justice and Delinquency Prevention and the Maternal and Child Health Bureau. And so since I was fully funded, I didn't have to teach. That was at Johns Hopkins.

If you could give researchers, faculty and students, one piece of advice about conducting research, what would it be?

I think the one piece of advice I would have is to follow your passion. Because it is hard work and it can be tedious, the only way you can stick to it is if it's something you really are interested in and if it's something that you have a passion for. The passion allows you to have the persistence to pursue that kind of work.<<

SENIOR RESEARCHER, JUNIOR RESEARCHER & ROOKIE OF THE YEAR

2011 RESEARCH EXCELLENCE AWARD WINNERS

Dr. Mulumebet Worku — SENIOR RESEARCHER OF THE YEAR

position	Professor of animal sciences, School of Agriculture and Environmental Sciences.
research interests	Immune systems of cattle, goats, and sheep to help reduce disease, improve food safety and promote animal and public health.
awards committee quote	"Awesome!"
career highlights	Principal investigator (PI) or co-PI on 29 successful grant proposals worth a total of more than $7.5 million since coming to A&T in 1999; 2007 Teacher of the Year in the School of Agriculture and Environmental Sciences; has taught agricultural genetics, bioinformatics, dairy cattle production, microbiology and techniques in biotechnology; developed the school's course in bioinformatics and genome analysis.
background	Ph.D. and M.S., both in animal sciences, University of Maryland; B.S. in animal sciences, University of Alemaya in Alemaya, Ethiopia.

The Senior Researcher of the Year award is presented annually to a tenured faculty member.

DR. ZHICHAO LI — OUTSTANDING JUNIOR RESEARCHER

position	Professor of industrial and systems engineering, College of Engineering.
research interests	Modeling, simulation and optimization of advanced manufacturing processes.
awards committee quote	"A highly active, innovative and skilled researcher."
career highlights	Since coming to A&T in 2008, he has received a National Science Foundation CAREER research award, published eight scholarly papers and had two more accepted for publication; A&T's research Rookie of the Year in 2010; has taught computer-aided design and computer-aided manufacturing, integrated product and process design and advanced special topics in industrial engineering: lean thinking for the renewable energy era.
background	Ph.D. in industrial engineering, Kansas State University; M.S. in industrial engineering and bachelor's degree in mechanical and electrical engineering, both from Tianjin University of Technology and Education in Tianjin, China.

The Outstanding Junior Researcher of the Year award is presented annually to a tenure-track faculty member.

Dr. Elham "Ellie" Fini — ROOKIE OF THE YEAR

position	Assistant professor of civil engineering, College of Engineering.
research interests	Sustainable alternatives for asphalt binder, infrastructure nondestructive testing and evaluation, highway design.
awards committee quote	Her research ability is "extraordinary" and "exceptional."
career highlights	Currently the lead investigator on four National Science Foundation grants; has developed a sustainable infrastructure material laboratory, filed two patent applications and published four journal articles; has taught transportation and pavement design, advanced material characterization, transportation engineering, civil engineering and construction engineering and management.
background	Ph.D. in civil and environmental engineering, University of Illinois at Urbana-Champaign; M.S. in civil engineering, Sharif University of Technology in Tehran, Iran; B.S. in civil engineering, Isfahan University in Tehran.

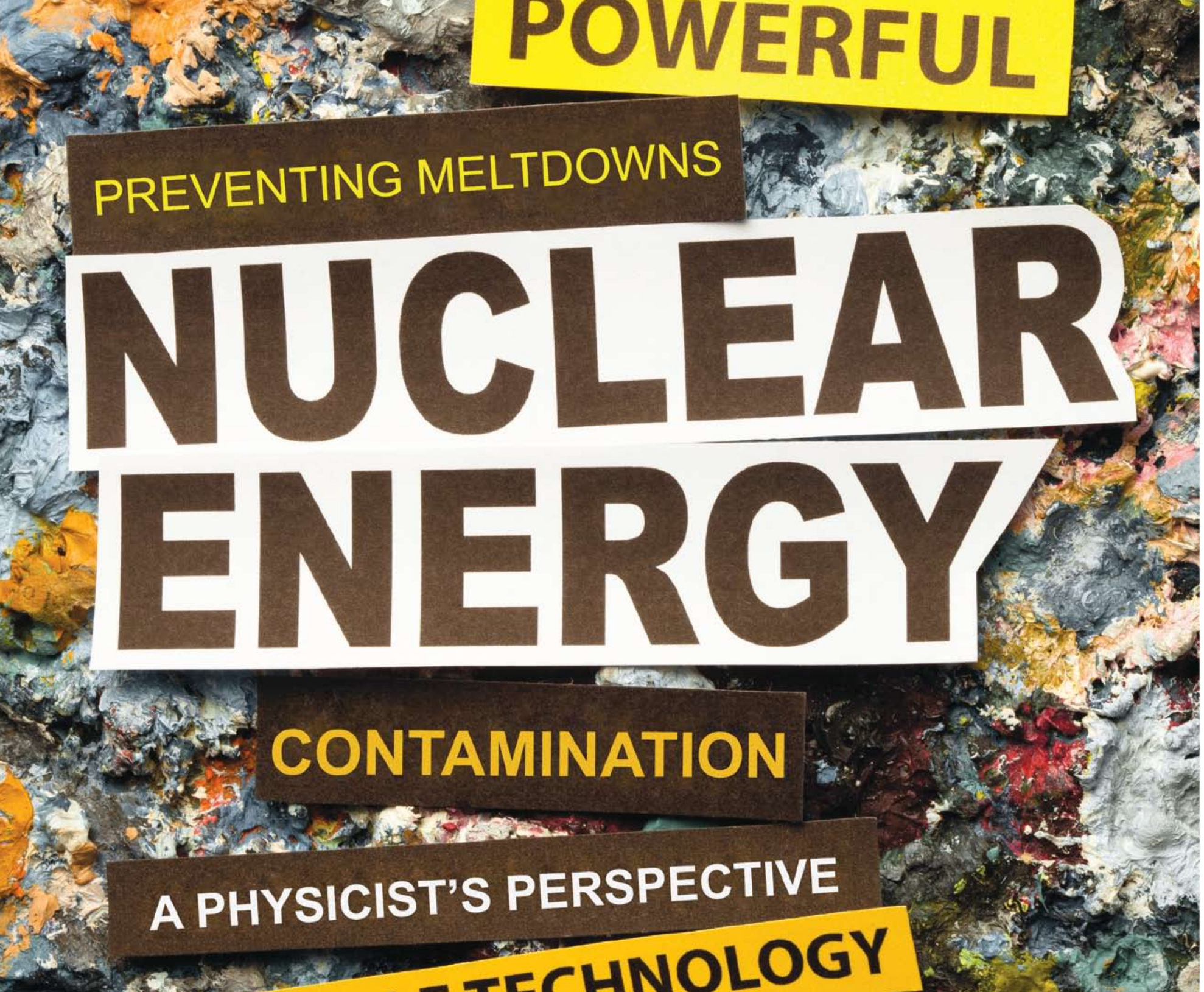
The Rookie of the Year Award is presented annually to an untenured faculty member in his or her second year of tenure-track teaching and research at the university.

Each college and school at the university has the opportunity to nominate a candidate in each category. This year's nominees included:

Senior Researcher of the Year: Dr. Yusuf Adewuyi, Department of Chemical & Bioengineering, College of Engineering; Dr. Lyubov Kurkalova, Department of Economics and Finance, School of Business & Economics; and Dr. Tyra Whittaker, Department of Human Development and Services, School of Education.

Outstanding Junior Researcher: Dr. Zhaoqiong Qin, Department of Manufacturing Systems, School of Technology.

Rookie of the Year: Dr. Quintin Boston, Department of Human Development and Services, School of Education; and Dr. Jenora Waterman, Department of Animal Sciences, School of Agriculture and Environmental Sciences.

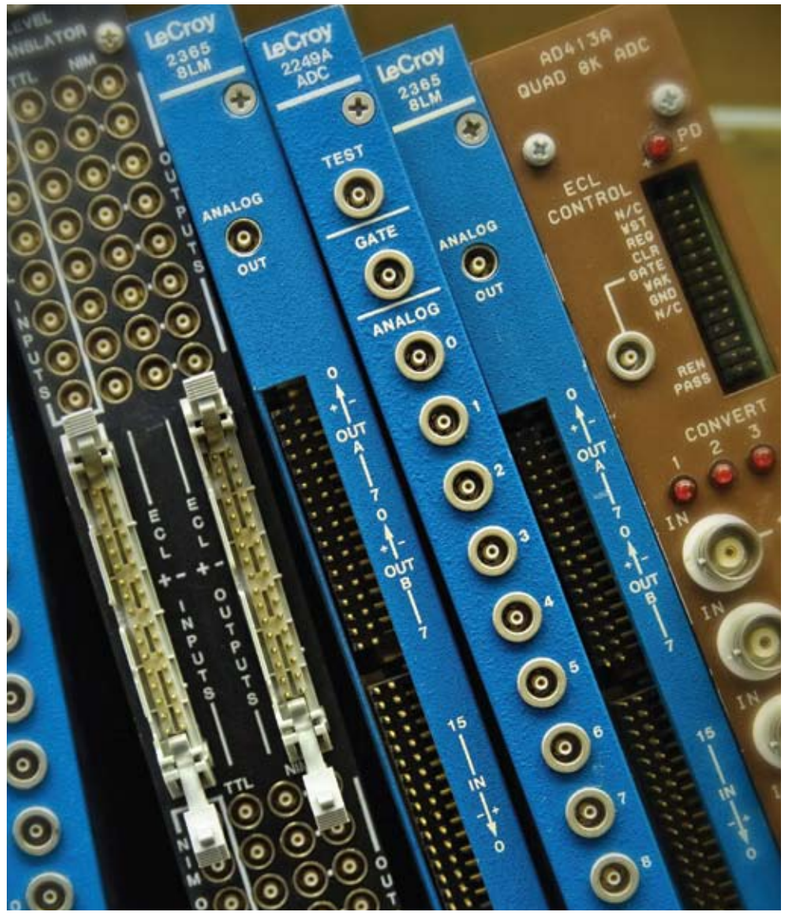


BY DAVID C. WALL

PHYSICS CHAIR WEIGHS IN ON NUCLEAR ENERGY

THE SIX NUCLEAR REACTORS LINED UP SIDE BY SIDE ON THE NORTH SHORE OF JAPAN AT THE FUKUSHIMA DAIICHI POWER PLANT CAST AN OMINOUS SHADOW FAR BEYOND THE LOCATION OF THE WORLD'S THIRD MAJOR NUCLEAR PLANT ACCIDENT.

CURRENTLY, THERE ARE 104 NUCLEAR POWER REACTORS OPERATING IN THE UNITED STATES. TWENTY-THREE ARE OF THE SAME AGE AND CONSTRUCTION AS THOSE AT FUKUSHIMA DAIICHI. HOW SAFE ARE THEY? WHAT ARE THE IMPLICATIONS FOR THE UNITED STATES? WHAT ARE THE LESSONS THAT CAN BE LEARNED? AND WHAT IS THE FUTURE OF NUCLEAR POWER IN THIS COUNTRY?



Ahmidouch in his laboratory surrounded by equipment that he and his students used in their experiments of cosmic partial detection.

Dr. Abdellah Ahmidouch is a nuclear physicist and chair of the Department of Physics at NC A&T. He received his Ph.D. from the University of Geneva, where he worked on an experiment at CERN, the European Organization for Nuclear Research, which is home of the Large Hadron Collider, the world's largest particle accelerator.

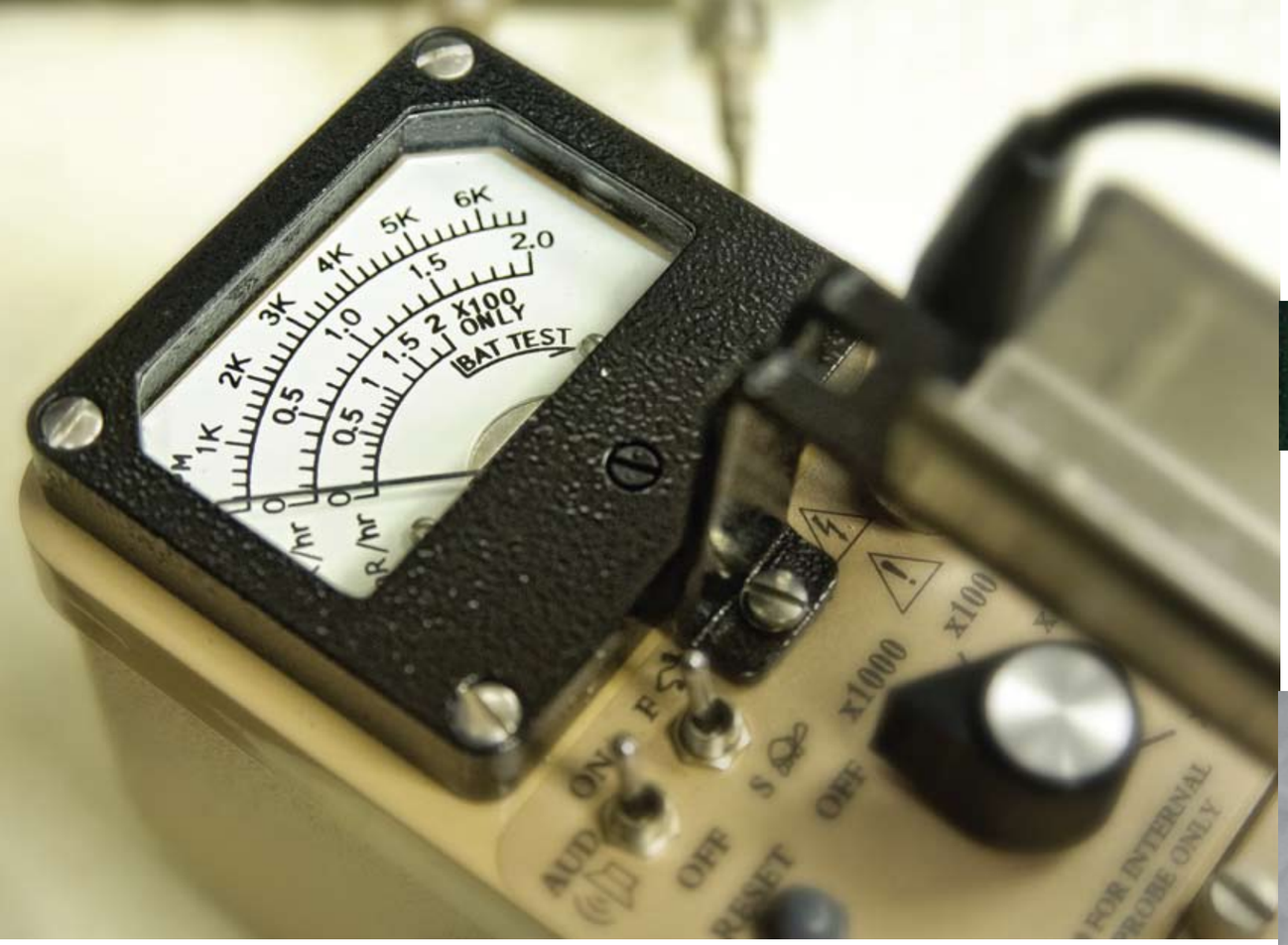
His immediate response to the Fukushima Daiichi disaster is one of mild disbelief at the suspension of basic common sense: "Isn't it strange that they built six nuclear reactors on the ocean front of a country that has an established history of seismic and tsunami activity?" But, despite the severity of the event, he remains optimistic about the continued use of nuclear energy.

"I don't think the accident in Japan will stop the current movement toward additional nuclear power," he said from the nuclear physics lab in Marteena Hall, "but it will make people more careful. Those reactors had three layers of safety, and they all failed."

The first line of defense was to insert the control rods, which shuts down the reactors. "But even with the control rods in," Ahmidouch says, "there is still some radiation in the reactor and the water cooling system is necessary. The same applies to the storage area where the spent fuel rods are kept. Just because the reactor is shut down doesn't mean this is a safe environment. Cooling water needs to be pumped continuously."

The second line of defense is the backup diesel generators, which kick in when the primary source of electrical power is lost, reestablishing the ability to pump cooling water into the reactor cores and waste storage areas.

"This also happened," Ahmidouch explains. "However, 20



minutes later, the tsunami waves arrived and swamped the generators."

When the diesel generators stopped working, the third, and last, safety option came on line: batteries. This source of power was able to maintain water flow for the next eight hours, which was their designated life span. At the end of that time, the pumps fell silent for good and the situation really began to heat up.

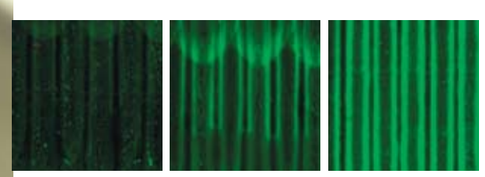
"It's obvious now that current safety features, those used on plants that were constructed 30 years ago like Fukushima, are not enough," Ahmidouch says. "Much more has to be done. And that's an engineering problem. It's not difficult—people have to think of safeguards against the so-called very low probability events. Can it be 100 percent safe? Probably not, but one needs to push the safety limits further and further."

As to the larger question of how to supply the nation's energy needs, Ahmidouch does not believe there is a singular solution as to how we can eliminate the use of fossil fuels, reduce greenhouse gases, improve air quality and stop contributing to global warming.

"Probably you would solve it with contributions from a mix of sources," he says. "Definitely clean, green energy would be a component. Would it be enough? The answer is no, not at this time.

"You need to complement the green energy production with some other sources, and most of those have greenhouse gas problems. Nuclear power is the only source that is clean in that sense, and it is the only one capable of providing energy at a large enough scale without unwanted emissions. The quantity of energy you can get out of a nuclear power plant is enormous compared to solar or wind. And as the demand for energy keeps on increasing, what are you going to do?" <<

BY DAVID C. WALL



BIOMEDICAL RESEARCH

NANOENGINEERING, BIOTECHNOLOGY & BIOENGINEERING

THE GREAT OPPORTUNITIES IN SCIENCE TODAY LIE AT THE INTERSECTIONS OF MULTIPLE DISCIPLINES. BIOMEDICAL RESEARCH AT NORTH CAROLINA A&T IS AN ESPECIALLY GOOD EXAMPLE, BRINGING TOGETHER NANOENGINEERING, BIOTECHNOLOGY AND BIOENGINEERING—ALL INTERDISCIPLINARY FIELDS THEMSELVES—IN A HIGH IMPACT FIELD THAT GENERATES STRONG INTEREST AMONG FUNDING AGENCIES AND THE GENERAL PUBLIC ALIKE.

Attacking Illness at the Nano Level

DRUG DELIVERY

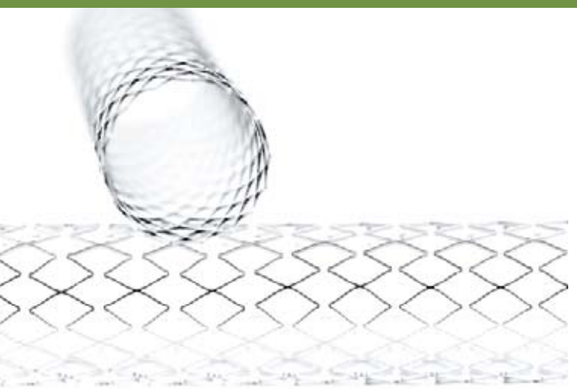
CARDIOVASCULAR STENTS

OXYGEN/SKIN GRAFTS

TISSUE REGENERATION

The interdisciplinary nature of biomedical research favors an institution like A&T. As a land grant institution, the university has historic strengths in engineering, agriculture, the basic sciences and more. With that history and the diverse skills of the researchers who embody it today, the university is well positioned to take a leadership role in the field.

A&T's emerging capabilities in biomedical research offer a prime example of the resources the university brings to such new endeavors and of the potential impact that A&T researchers can have. One place on campus where all of these factors come together is in the lab of Dr. Salil Desai. His interest in nanoscale manufacturing is leading him into groundbreaking work in a variety of fields with revolutionary medical potential, including drug delivery, stem cell differentiation and tissue regeneration.



Desai is an associate professor in the Department of Industrial and Systems Engineering. He is on the research team for the NSF Engineering Research Center for Revolutionizing Metallic Biomaterials and is an adjunct associate professor at Wake Forest University's Institute for Regenerative Medicine. He is also an affiliate faculty member at the Joint School of Nanoscience and Nanoengineering.

His diverse activities come together in his role as director of A&T's Integrated Nano and Bio Manufacturing Laboratory. For Desai, each project begins with a vision and, ideally, ends with something that will have an impact beyond the laboratory.

"Once you have a vision, then the next thing to do is to work towards a concept," he says. That work includes writing a proposal, getting research funding and then developing a product, "a deliverable," which could be an invention or maybe a scientific finding.

> Defining Dr. Desai's efforts is his desire to engineer a hybrid approach to direct-write micro and nano manufacturing—a nano/micro-scaleable process that allows a researcher to move effortlessly from one scale to the other.

"What we really seek is to discover fundamental phenomena, fundamental processes and learn more about how these things work," Desai says. "Then, once we understand, we want to go back and apply those findings to real-life products which can be of benefit."

Desai's core area of research lies in the development of nano/micro manufacturing processes that enable the fabrication of features across different length scales. These processes have wide applications that span from biomedical applications including drug delivery and stem cell differentiation, as well as semiconductors and sensors in the electronic field. This research is funded by the NSF Young Investigator (Career) Award.

"Desai investigates direct-write processes which aim at depositing entities directly onto a substrate without the need of pre- or post-processing operations," Desai says, explaining that usually there are multiple steps involved in conventional nano/micro manufacturing. "But the process I am trying to develop allows the deposition of minuscule fluid media which can contain chemicals, drugs, or nano materials onto a substrate."

One example of the droplet based direct-write process is for the fabrication of drug delivery carriers. "These carriers can encompass immunotherapy drugs or standard drugs such as Tylenol. What you put in there is not the issue; how these carriers release their drugs is the critical part here. And my research focuses on the design of these capsules so that you can tune the characteristics of how they function—whether you want a fast release or a slow release or an extended release. Thus, each carrier type can have a different drug release profile."

A closely related area of Desai's research looks at applying the direct-write technology to deposit anti-proliferative drugs to make cardiovascular stents [d2] more readily accepted by the body. These bare metal stents are primarily used to enlarge a constricted artery that has been closed by plaque. This work falls under the NSF-ERC thrust on cardiovascular devices.

"When you insert this stent, the metal actually adheres to the walls of the artery, and expands its walls. But, because it is a foreign body, the arteries start to generate a fibrous material that encapsulates the stent and blocks the blood flow.

"Now, this is contrary to the notion of why you put a stent in there." so we want to develop a drug loaded polymeric coating on the outside of the stent that will inhibit the development of these fibrous cells. The body will understand, 'Okay, you have to back off,' and the stent will stay in place for a long time."

But, Desai explains, that there are additional issues with stents coated only with drugs. The drug may come out very fast or may leach out too soon, so Desai is collaborating with researchers at the University of Pittsburgh to encapsulate drugs within a polymer. The polymer is tough and flexible enough to conform to the shape of the stent and, at the same time, releases the drug at the appropriate rate.

"Being in the research field, you get enormous freedom to ask,

'What's the next thing you can do?'"

"It is like a membrane," Desai says, "and because the polymer is soft, the body's response—the cell response —is much better than having a direct metal-to-cell contact. As the polymer degrades over time, it releases the drug, which keeps the fibers away. So the challenge is to selectively and very systematically put the polymer and the drug onto the metal stent."

Desai's work in drug delivery has led him into a closely related project: delivering oxygen particles for new tissue growth. When tissue constructs are grown artificially, he explains, all of the materials you need can be present, but the tissue is often starved for nutrients, especially oxygen, without which the tissue will die.

"I am searching for entities that will sustain the supply of oxygen and allow the tissue to grow," he says, pointing out that oxygen starvation is not just a problem in the lab, but in the field as well—a problem made more immediate and challenging because of severe injuries suffered by soldiers serving in Iraq and Afghanistan.

"It's a real challenge in vivo, or at the patient site," Desai says. "When soldiers are injured and have skin grafts, the new skin probably does not sustain long enough because the underlying tissue is starved of oxygen. The grafts fail and they have to go through multiple procedures before one is successful."

A research project associated with Wake Forest takes Desai further into tissue regeneration, specifically stem cell differentiation for tissue regeneration. Desai explains that his research is about trying to mimic the natural re-growth process of the human body, and he offers the example of a scratch on the arm to illustrate his point.

Profile DR. SALIL DESAI

- *Ph.D. and M.S. in industrial engineering from the University of Pittsburgh; B.S. in mechanical engineering from the University of Mumbai (VJTI)*
- *Associate professor in the Department of Industrial and Systems Engineering*
- *Principal investigator (PI) on nine grants; co-PI on six others*
- *2009 recipient of the National Science Foundation's prestigious CAREER award for early-career researchers*
- *Has published four book chapters, 20 journal publications and 31 refereed conference publications*
- *Holds one international patent and has two pending*
- *Active in course development and teaching at A&T*
- *Willing to apply his expertise beyond the university level, most recently serving as judge at Jefferson Elementary School's 2011 science fair*

Profile JESSICA L. PERKINS

Jessica Perkins (pictured above with Desai) is a doctoral candidate in the Department of Industrial & Systems Engineering at NC A&T. In addition, she is a Title III fellow funded by the U.S. Department of Education. Jessica is researching a novel manufacturing method to develop multilayer coatings for biomedical applications. Her current research focuses on developing controlled release coatings for cardiovascular and thoracic devices. Using a customized direct-writing inkjet method, Jessica is investigating the underlying release kinetics of biological agents from different types of bio-compatible polymers.

"Typically, how nature does it," he says, drawing his finger across his forearm, "is that when you have a cut, different enzymes and different growth agents are immediately secreted. They throw out a signaling mechanism for the underlying stem cells to grow into skin cells, and the scratch is healed."

Different enzymes generate specific signals depending on their location in the body. Stem cell technology tries to accurately and systematically put these growth factors, which Desai says will differentiate stem cells, into a cellular matrix.

> . . . in the future tissues and organs may repair themselves, eliminating the need for transplants and their risk of tissue rejection.

"The point here is again to define a manufacturing technology that can deliver different growth factors at precise locations within a 3D architecture. When the stem cells come into contact with the growth factor, they regenerate different cells."

By mimicking this behavior in a lab setting, Desai and his team of doctoral researchers plan to build simple tissue constructs. But the dream is larger than any laboratory experiment.

"The dream is to develop organs—complex organs," he says. "You look at any given organ, and it is composed of different types of cells all lined together in a network with a matrix; certain components are there, but these are also very complex, three-dimensional constructs. In the flasks in the lab we can always make these things happen, but it's very hard for us to put things together like nature does it."

Desai admits these are only the initial steps in a long process. He sees his role with medical doctors and chemists as putting the research together in an orchestrated fashion to make a useful concept so that in the future tissues and organs may repair themselves, eliminating the need for transplants and their risk of tissue rejection by the body. The stem cells used will come from the patient, which will make chances of rejection almost negligible.

"But again," he admits, "this is still a dream. We are beginning at one end with something as simple as skin grafts, and we will then move on to complex organs." <<

DEPARTMENT CHAIR AND ASSOCIATE PROFESSOR, ECONOMICS AND FINANCE

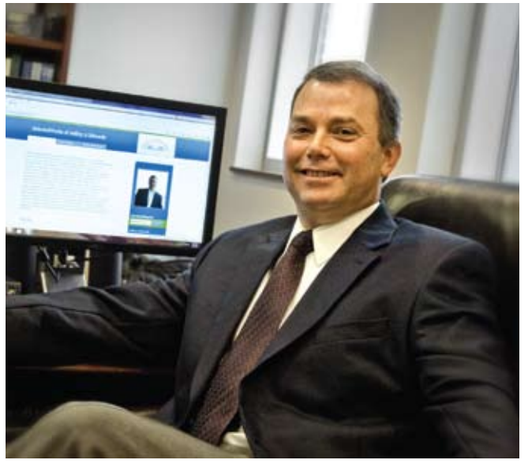
QUICK FACTS

Teaching interests: Macroeconomics, econometrics, money and banking

Research interests: Applied macroeconomic growth and development, statistical adequacy of econometric modeling, cross-country growth volatility spillovers, water resource utilization

Personal Interest: Evaluating the impact water and sanitation privatization has had on macroeconomic variables, as well as rural versus urban attitudes toward municipal water rationing

Water shortages. Wasteful usage. Rising prices. Is there a workable solution?



For articles written by Edwards visit: http://works.bepress.com/jeffrey_edwards/

Dr. Jeffrey Edwards

The nation's largest aquifer is running dry, leaving 2.3 million people and a significant percentage of the nation's farms with hard choices about water conservation. Those choices are getting even tougher as more farmers are switching from soybeans and wheat to growing more water-intensive corn to supply the region's booming ethanol industry—another big water user.

The Ogallala Aquifer covers 174,000 square miles in the High Plains just east of the Rocky Mountains. It covers parts of eight states, running from the Texas Panhandle north into South Dakota. Although most of the area is sparsely populated, the region's economy is 80 to 90 percent agricultural, and that's where the water goes. The use of water for irrigation is rising fast.

The aquifer, once 1,000 feet deep in places, is now dry in substantial areas and is falling dramatically throughout the semi-arid region. The rivers are too small to provide relief. Only the largest communities can afford to bring water in via aqueducts, pipelines or trucks.

Dr. Jeffrey Edwards, chairman of the North Carolina A&T Department of Economics and Finance, is leading a team of researchers working to develop a model for the Ogallala's cities and towns to identify water-conservation measures that are most effective and most likely to be acceptable to a community. Co-principal investigators include Dr. Luba Kurkalova and Dr. Mark Burkey of the Department of Economics and Finance and faculty members from Texas Tech University in Lubbock, Texas, and Angelo State University in San Angelo, Texas. The project is funded with $757,000 from the National Science Foundation.

The team has surveyed 3,000 residents of 29 of the largest cities and towns in the aquifer region; most have a population under 5,000. While much of the data is still being processed, the early results are encouraging, Edwards says.

The most effective way to conserve water is by raising prices, but that's considered political suicide by local officeholders. However, that fear may not be as well founded as politicians think.

"What we think we're finding is that people are seeing water wasted on a regular basis, and they'd like to see local governments do something about it," Edwards says.

Regulatory solutions, such as restrictions on water use, are more expensive and easier to evade.

"The overwhelming majority of people don't trust their neighbors to comply with water conservation regulations, but it's almost impossible to circumvent a pricing policy," he says.

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PROFESSOR OF BIOLOGICAL ENGINEERING

Dr. Manuel Reyes

Farmers in Cambodia and the Philippines are caught in a vicious cycle, destroying their farmland at a rapid rate by over-tilling and planting the same crops repeatedly, with increasingly poor results. Dr. Manuel Reyes is introducing a new cycle: minimal soil disturbance, diverse species rotation and continuous mulching.

Reyes, professor of biological engineering in the Department of Natural Resources and Environmental Design, says the idea is to make the unnatural process of farming mimic the natural cycles of tropical rain forests. There, leaves fall from the trees and form mulch around the base. As trees progress through a natural life cycle, there is intense biological activity in the ground as living biomass dies and degrades. The trees act as a bio-pump, bringing the nutrients back up from the ground through the trees' deep roots via new growth in a sustainable, cyclical way, which results in a stable ecosystem.

"Can tropical rain forests be copied at the field level?" Reyes asks. "The answer is definitely, 'Yes!' And that's a biomimicry [the mimicking of life using imitation biological systems] we are introducing in Western Cambodia and the Philippines."

The practice is called conservation agriculture, and Reyes says it offers farmers in wet, tropical climates the best chance at maintaining permanent, sustainable harvests. It has been proven to reverse soil erosion and degradation, and increase crop yield and profits.

Minimal soil disturbance is facilitated by continuous mulching and diverse species rotation. "In a tropical environment an enormous amount of biomass can be created because there's no winter and stalks can really grow very quickly—in just 60 to 75 days, boom, that tall," he says, reaching high above his head to illustrate his point.

Such a significant amount of biomass has extremely deep roots, Reyes explains, and when the plants are pushed over they not only create very thick mulch, but as the roots start dying, it creates biological activity that helps improve the quality of the soil to such

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QUICK FACTS

Education: Ph.D., engineering science: agricultural engineering, Louisiana State University; M.Ph. Silsoe College, Cranfield University, England; M.S. and B.S. in agricultural engineering, University of the Philippines Los Baños

Recent awards & honors: Gamma Sigma Delta, NC A&T Chapter 2008 Teacher of the Year, School of Agriculture and Environmental Sciences 2008 Excellence in Teaching Award and School of Agriculture and Environmental Sciences, 2008 Collaboration Award

Making the unnatural, natural: Reyes shown in the Phillipines standing on a plot bordered by fodder grass and creeping forage legume.

Reyes has coined a term. Natuculture: any human-made system that mimics nature in human-disturbed landscapes.

ASSISTANT PROFESSOR OF MATHEMATICS

QUICK FACTS

Education: Ph.D., University of Notre Dame; M.S., University of Notre Dame; M.S., Moscow Institute of Physics and Technology

Current research topics: Tropical cyclone dynamics, air-sea interaction, analysis of numerical errors associated with numerical modeling of global chemical pollution plumes propagation, spatial redaction algorithm for computational modeling of global chemical transport in the atmosphere

Philosophy: "As an applied mathematician, you're always trying to solve problems of practical interest, and you can see the result and see that people need that outcome, and they are grateful."

The algorithms that Rastigejev develops help atmospheric scientists determine where polluted air is headed and how quickly it will get there.

Dr. Yevgenii Rastigejev

In 2010, it was volcanic ash from Iceland; in 2011, radioactive plumes from Japan. In both cases, the world asked the same questions: Where is it going, how much of it is going to get there, and when?

And in both cases, the answers weren't very helpful because modeling atmospheric activity on a global scale is an extremely slow and not very accurate process. Dr. Yevgenii Rastigejev and a team of researchers at North Carolina A&T are working on a way to make such predictions more quickly and accurately. The National Science Foundation (NSF) has awarded Rastigejev a grant of $999,000 to establish a Center for Advanced Multi-Scale Computational Algorithms. The grant is part of the NSF's funding for HBCU Research Infrastructure of Science and Engineering (RISE) awards and will last for three years.

"This work is part of a much larger effort to understand the chemical composition of the atmosphere and chemical transport in the atmosphere both locally and globally," he says. "How is the atmosphere influenced by human activity? How do we address problems like degradation of air quality, increase in the abundance of tropospheric oxidants including ozone, depletion of stratospheric ozone and also climatic changes like global warming?

Simulations and modeling codes used to study air quality have been around since the late 1970s, but, without the computational capabilities of today's supercomputers, they lacked the flexibility to track secondary sources of pollution and the sensitivity to include areas such as particulate matter and toxins. The numerical codes used today by atmospheric scientists to model the transport of chemical pollutants in the atmosphere are much more accurate and reliable but they have diffiiculties associated with large amount of numrical data and high computational cost of memerical simulation of complex multi-scale problems.

Chemical mechanisms for atmospheric modeling may include hundreds of chemical species and thousands of reactions, Rastigejev says. "These codes are huge," he says. "and it makes a computational

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Rastigejev has been awarded $999,000 from NSF to establish a Center for Advanced Multi-Scale Computational Algorithms.

ASSOCIATE PROFESSOR, HUMAN DEVELOPMENT AND SERVICES

Dr. Tyra Whittaker

North Carolina A&T's Rehabilitation Counseling Program is on the verge of a defining moment—the creation of a Ph.D. in Rehabilitation Counseling Program. It will be a critically needed program in many ways, and it will have a special distinction: It will be the first such Ph.D. program at a historically black college or university (HBCU).

Dr. Tyra Whittaker and grant-writing partner Dr. Miriam Wagner received word last fall of a $1 million grant from the U.S. Department of Education, Rehabilitative Services Administration Agency, to establish the program. It was the latest in a series of successful proposals co-authored by Whittaker, an associate professor of human development and services, and Wagner, the chair of the department. "This grant is a 'mountain top' experience for the university, for HBCUs and for the profession of rehabilitation counseling," Whittaker says.

Whittaker says that, ideally, the plan is to have the program up and running by spring 2012, pending approval by the A&T trustees, the University of North Carolina General Administration and the UNC Board of Governors. The program is designed to expand research focused on addiction, violence and trauma among racial and ethnic minorities, she says. It may include an on-site counseling clinic that will serve the local community.

Initially, there will be 10 students, seven full-time and three part-time; the plan calls for admitting a cohort of the same size the following year. Two additional faculty members will also be required. "We don't want to have more than 20 to 30 students in the program at one single time," she explains. "We want to produce high quality clinicians, researchers and faculty who will greatly impact the field."

Research will be another important goal of the doctoral program. "We've found that there is a lack of literature focusing on people of color with different types of addiction or disabilities," she says, "so our doctoral candidates will conduct research on different racial and ethnic

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QUICK FACTS

Education: Ph.D. in rehabilitation, Southern Illinois University-Carbondale; M.A. in guidance and counseling, Xavier University of Louisiana

Areas of Expertise: Multiculturalism and counselor education; life care planning; mentoring and counselor education; recruitment and retention of people of color in academia; disability awareness and sensitivity training

Goals: To advance the cause of persons of color with disabilities and addictions through research, grant writing and mentoring and to be a voice for those who are considered invisible or silenced by society

A voice for those who are considered invisible or silenced by society.

Whittaker will use the grant to address the critical shortage of rehabilitation counselors by providing the next generation of instructors.

DEPARTMENT CHAIR AND ASSOCIATE PROFESSOR, PHYSICS

QUICK FACTS

Education: Ph.D. in physics, University of Geneva ; M.S. in physics, Joseph Fourier University, Grenoble, France; B.S. in physics, Mohammed V University, Rabat, Morocco

Current Research Topics: Experimental intermediate energy physics, nuclear energy, medical physics

Philosophy: To advance science for the benefit of mankind

Publications and Awards: Published over 100 articles, 60+ in refereed journals; awarded the senior research award of the College of Arts and Sciences in 2007 and the Dean Special Recognition Award in 2002

Ahmidouch in his lab explaining how he and his students scatter particles.

"[Research] can lead to growth in industry and can result in a wide array of unexpected advancements that have everyday applications."

Dr. Abdellah Ahmidouch

Research at North Carolina A&T is heavily focused on the applied side, as you might expect at a land grant university. But that doesn't mean there's no basic research being done here.

"What we are doing now in experimental physics will have practical application 60, 70, maybe 100 years from now," says Dr. Abdellah Ahmidouch, associate professor and chair of A&T's Department of Physics. While the goal of some basic research may appear to be simply to gain information for information's sake, there is a powerful synergy between fundamental research and innovation.

"The discovery from one bit of research can lead to growth in industry," he says, which can then "result in a wide array of unexpected advancements that have everyday applications."

Ahmidouch is currently involved in fundamental research at Thomas Jefferson National Accelerator Laboratory in Newport News, Virginia, where A&T is a partner university. He and his colleagues are studying the nucleon and its structure. "We're looking into how matter is made and how the nucleus of the atom reacts ," Ahmidouch says. His work is funded by a grant from the National Science Foundation.

Nucleons are protons and neutrons, the two particles that make up the atomic nucleus. Protons and neutrons are made up of quarks, which are currently believed to be smallest particles in existence, the smallest constituent pieces of all matter.

"As of now, we [physicists] don't think that quarks have sub-particles, but that isn't really known," Ahmidouch says. "So we study the features of the nucleon based on the features of its constituents —how they turn around each other, how they interact with each other. Each one will have its own quantum features.

"The question is: How do you investigate the behavior of the proton and neutron based on their individual characteristics?"

The answer, he says, is to scatter particles into nucleons and see what takes place. "It's like looking with a microscope. There is a theory behind the action but this research is mainly experimental."

Asked what he is experimenting on now, Ahmidouch reaches for what he calls a particle detector. The detector, and many others like it, were constructed by students in the Physics Department. Ahmidouch and his students take the detectors to the Jefferson Labs, where they perform their experiments in collaboration with students from other partner institutions.

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KHALIAH HUGHES

DOCTORAL STUDENT, INDUSTRIAL & SYSTEMS ENGINEERING

FLUID POWER TECHNOLOGY IS CONSTANTLY EVOLVING. UNFORTUNATELY, THE RESEARCH THAT DRIVES THE EVOLUTION FOCUSES ALMOST EXCLUSIVELY ON TECHNICAL PERFORMANCE WHILE HUMAN FACTORS ARE GENERALLY UNEXPLORED. AS A RESULT, A SUBSTANTIAL DEGREE OF POTENTIAL IMPROVEMENT IN EFFICIENCY IS NEVER REALIZED.

"Many of these systems are controlled by a human operator, so if the human operator can't effectively understand how to utilize the systems' controls, gauges and monitors, the system is not going to operate at an efficient level," says Khaliah Hughes, a fourth-year doctoral student in industrial and systems engineering. "The developers need to put more emphasis on the design of those systems and consider how the operator is going to effectively utilize those controllers to get the system to operate at the expected level of efficiency."

If that seems like an obvious point, consider how many simpler systems suffer from the same problem: The non-intuitive interfaces of many cellphones are a familiar example. In the case of fluid power systems such as hydraulic excavators, Hughes brings the perspective of an industrial engineer to the work of the mechanical engineers who design the systems.

"They tend to concentrate solely on the mechanics of the systems, like combustors, pistons and actuators," she says. When they do take the human operator into account, the focus tends to be on ergonomics, like the comfort of the seat, rather than the cognitive aspect—how the controls are going to impact the user's thinking patterns and work methods. "A lot of times in industry, there's a resistance to considering human cognition because they think it's abstract and that you can't put numbers on it. They want to see numbers, numbers, numbers."

To get numbers, Hughes used an integrated approach to better model human performance in fluid power systems. She developed a framework that brought together cognitive and physical components and developed procedures to integrate various performance factors and simulation tools. Her research found a significant difference in performance predictions with the integrated versus non-integrated model.

"It could be implemented on a very small scale all the way up to a large scale," Hughes says.

Hughes published an article on her work last fall in the Journal of *Human Factors and Ergonomics in Manufacturing and Service Industries*. She is working on papers for two other journals. Her work has been presented at the Industrial Engineering Research Conference, the Applied Ergonomics Conference, the Symposium on Human Interaction in Complex Systems and the International Fluid Power Conference.

Hughes's research was done as part of A&T's work as a member of the Center for Compact and Efficient Fluid Power, an NSF Engineering Research Center led by the University of Minnesota. A&T's research focuses on human performance modeling and user-centered design. Other members of the team are Georgia Tech, the University of Illinois, the Milwaukee School of Engineering, Purdue University and Vanderbilt University. <<

QUICK FACTS

Education: Ph.D., industrial and systems engineering, to be awarded in May; B.S., industrial and systems engineering, NC A&T

Faculty advisor: Dr. Steven Jiang

Hometown: Burlington

Professional experience: Internships at Goodyear in Danville, Va., and SAS Institute in Cary

Career plans: Industrial research and development

DANIEL OLDHAM

UNDERGRADUATE, CIVIL ENGINEERING

HERE'S A RECYCLING OPPORTUNITY OF IMPRESSIVE SCALE: THE UNITED STATES SENDS 11 MILLION TONS OF USED AND DEFECTIVE ASPHALT SHINGLES TO LANDFILLS EVERY YEAR. AND THE NATION NEEDS 700 MILLION TONS OF ASPHALT A YEAR FOR ROADS, PARKING LOTS AND OTHER PAVEMENT NEEDS.

Couldn't those shingles go into the next repaving of Interstate 85 or the street in front of your house? Asphalt is asphalt, right? Ideas that simple often are too simple to work, but in this case the answer is yes. Asphalt pavement consists of asphalt binder and aggregate; recycled shingles can take the place of some of that increasingly expensive asphalt binder, which is derived from petroleum. The recycling process is cost-effective, too. It consists essentially of cleaning extraneous material, such as nails and wood, from the shingles, grinding them and mixing them into an asphalt mixture.

Recycled shingles are already going into asphalt now, but only on a limited scale. Junior civil engineering major Daniel Oldham says that 23 states allow a relatively small amount of recycled content in their asphalt. "The most that's being used is 10 percent," he says. "We're trying to see if we can get that increased."

Oldham is researching a key limiting factor. Asphalt mixture containing recycled shingles is significantly harder than asphalt made completely of virgin petroleum. "If you use too much shingle content, the asphalt mixture will be too stiff," Oldham says. "Mixtures with high stiffness are hard to mix and compact. They also crack in cold weather. That's why many states don't want to use them now."

No comprehensive study has been done on the feasibility of using higher percentages of shingles in pavement. So, Oldham is investigating the rheological characteristics of asphalt containing recycled shingles and the physiochemical interaction between shingles and other constituents in asphalt pavements.

One intriguing possibility lies in a related line of research being conducted by engineering graduate student Boubacar Zada, who is working with Oldham's academic advisor, Dr. Ellie Fini, to investigate the use of swine manure to produce a modifier for asphalt binder. The "bio-binder" makes the asphalt softer while improving its resistance to cracking. "So if we use shingles in conjunction with bio-binder, that might make a good combination," Oldham says.

The right combination could allow for asphalt with a higher recycled shingle content, diverting more shingles from landfills while also finding a productive use for an even more problematic substance.

Oldham will give a presentation on his research at the North Carolina General Assembly as part of the UNC system's "Research in the Capital" showcase of undergraduate research and at the American Society for Engineering Education's Southeastern Section Conference in Charleston, South Carolina. These are timely opportunities, as the issue of recycled shingle content in asphalt is becoming a hot topic among researchers. "With crude oil prices going up, I'm sure there's going to be more emphasis on it," Oldham says. <<

QUICK FACTS

Class and major: Junior, civil engineering

Faculty advisor: Dr. Ellie Fini

Hometown: Seagrove

High school: Faith Christian, Ramseur

Career goal: Considering graduate school

EDWARDS continued from page 18

The most effective approach appears to be a combination of regulation and pricing. The project will give local governments a model to identify the balance that their residents are willing to support, a process applicable to communities far beyond the Ogallala. With drought an increasing concern across the nation, the implications are "huge," Edwards says. "This project is really gaining momentum."

The U.S. Department of Agriculture agrees. It recently gave the project its Project of Excellence Award, even though USDA itself didn't fund it. USDA doesn't look at behavioral issues, but concentrates on technical matters such as irrigation efficiency and drought-resistant seeds. If it's open to a more holistic approach, Edwards says, that may be a sign that it could fund further research on an issue that is becoming more critical with each growing season. <<

WHITTAKER continued from page 21

minorities in the rehabilitation process to increase that body of literature."

The idea to seek out funding to begin a doctoral level degree had its seeds in the enormously successful master's degree program in rehabilitative counseling that is currently in place at A&T. Whittaker points out that there are currently well over 90 students in the master's program with another 368 students spread out across all of the counseling programs within the School of Education.

So when Whittaker and Wagner saw there was grant funding available to build the capacity of minority-serving institutions to develop programs in rehabilitation counseling, they went for it.

"We wrote for the maximum amount of funding we could get," she says, and, despite formidable competition, they prevailed. Now they must hire staff, institute a national search for the highest quality students, create a curriculum and gain approval from the Board of Governors. "There is a lot to do, but there is a huge need, a critical shortage of rehabilitation counselors. Our program will help meet that need by equipping and graduating the next generation of faculty, researchers and clinicians." <<

The Ogallala Aquifer and overlying states. Source: USGS at http://capp.water.usgs.gov/aquiferBasics/ext_hpaq.html

REYES continued from page 19

an extent that it becomes porous, helping to increase infiltration, reduce runoff and control erosion.

"We're mimicking the forest," Reyes says. "We are making the unnatural, natural. And at the same time, we are producing crops. We are also saving in labor, time and energy. Before, the farmers had two plowings and a harrowing to prepare a field, but now we use what I call a pizza cutter. It slices the ground open, seeds drop in, and it covers them back up."

Reyes's work is funded by a $1.3 million, three-year grant from the U.S. Agency for International Development. Dr. Osei-Agyemang Yeboah of the Department of Agribusiness, Applied Economics and Agriscience Education is co-principal investigator. The project also will involve training four Ph.D. and four master's students.

Conservation agriculture is in use on about 200 million acres around the world, Reyes says. "All of these efforts are in the theme of making the unnatural, natural. It is natuculture. That's a new term I'm trying out: na-tu-culture. It refers to any human-made system that mimics nature in human-disturbed landscapes." <<

RASTIGEJEV continued from page 20

simulation study very difficult. One simulation of global chemical transport could last, very easily, several weeks.

"We proposed to develop a multi-scale computational reduction algorithm which will speed up and increase the accuracy of those computations used in simulation models." A simulation that used to take three weeks will be possible in, perhaps, two days.

Rastigejev is an assistant professor with a dual appointment in Mathematics and in Energy and Environmental Systems. He is also a member of the team for the NOAA Interdisciplinary Scientific and Environmental Technology Cooperative Science Center, which is led by A&T. His collaborators are his two department heads, Dr. Guoqing Tang of Mathematics, and Dr. Keith Schimmel of Energy and Environmental Systems. Rastigejev will hire two Ph.D. students, a postdoctoral researcher and several master's students to help run the calculations.

He also plans to establish extensive collaborations with other departments at A&T and outside the university. One such association already in place is with the Lawrence Berkeley National Laboratory in California. <<

AHMIDOUCH continued from page 22

"What we are trying to detect are particles coming from space. These detectors are very sensitive and can detect a single particle down to the photon level," Ahmidouch says. The work is done in collaboration with other Jefferson Labs partners. "We produce the detectors, others bring in different components, and, together, we mount everything as a collaboration."

Ahmidouch reminds us that while it may not be immediately apparent, this type of fundamental, physics-based research may have practical applications.

"Was there a practical reason for sending a man into space?" he asks. "It did not really accomplish anything. But look at the benefits that have been derived from that effort in terms of scientific knowledge." <<

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