Research, Innovation & Outreach

Volume Five

New Faces
New Places
New Solutions

University of South Alabama

RESEARCH, INNOVATION

President Gordon Moulton

From the President:

Finding new solutions to the challenges of our times is a vital mission of modern higher education. More than ever, our society depends on universities to be torch-bearers for progress through the creation of new knowledge and the sharing of innovation in service to humanity.

The most effective solutions to great challenges often come when problems are viewed with new eyes. Thus, the University of South Alabama is committed to providing fertile ground for the newest generation of problem-solvers.

This issue is dedicated to introducing the newer faces at the University of South Alabama, whether they are the up-and-coming members of their professions, or established individuals who have been attracted to USA in the recent past. This also introduces new places — the physical improvements to our campus in support of our missions of teaching, research, outreach and health care.

Whether seeking new treatments for cancer, improving our K-12 schools, stimulating our region's economic growth through industry partnerships, protecting our coastal environment, enriching lives through a better understanding of our art, music or cultural heritage, or a myriad of other priority areas, USA is working to create new knowledge and propose new solutions.

USA is dedicated to providing the vital mind power needed to enhance the educational, health care and economic progress of the Gulf Coast region and beyond.

Gordon Moulton
President

Russ Lea, Ph.D.,
Vice President for Research

From the Vice President for Research:

This publication, subtitled "New Faces, New Places, New Solutions," speaks volumes to the strategy that the University of South Alabama is taking during these tough economic times. Although our ability to predict our immediate future seems a bit cloudy, two things are certain—we are attracting some of the best new faculty and we are building some of the best facilities in which to work and play.

We can dwell on the uncertainties of our future, or we can dwell on the mission at hand by educating students, fulfilling the needs of the region's workforce, creating new innovations and providing high quality health care. Any one of the above tasks is daunting unto itself, but this university is thriving, and well prepared to respond to the next wave of prosperity.

This issue of our research publication should provide you many examples of the kinds of people and the kinds of facilities that are required to make a modern university competitive, engaged with its community, and responsive to the taxpayers and their children. As the stories unfold, I hope you appreciate the breadth of experience and talents of the faculty who have chosen to share their future with this University. I have already witnessed the entrepreneurial spirit of these new faculty members and I am so excited to be part of the leadership team helping them achieve great things for our university and community.

The emerging wave of prosperity will demand new knowledge and require bold new thinking and actions to improve our abilities to innovate and prosper. Just imagine:

- what resources we have committed to make this happen
- what innovative technologies we have invested in to enrich our capabilities
- what teaching and learning facilities have been built to compete with the global workforce

In this environment and that which we are building we intend to "Super Size Your Mind!"

Best wishes,
Russ Lea
Vice President for Research

On the cover: Some of the many faces who are making a difference at the University of South Alabama. (Clockwise from upper left): Jason Guynes, chair of visual arts; Dr. Gail Jefferson, assistant professor of mechanical engineering; Dr. Laurie Owen, scientific director of the Mitchell Cancer Institute; and Dr. Andre' Green, assistant professor of leadership and teacher education.

and Outreach

Volume Five

Research, Innovation and Outreach is published by the University of South Alabama Office of Public Relations and the Division of Research Administration.

Doctors Plus Researchers Equals Hope

Dr. Laurie Owen is researching the link between ultraviolet exposure and skin cancer, a particularly big problem in the South.

USA Mitchell Cancer Institute By the Numbers…

- 250 physicians, researchers and staff
- 44,000 patient treatment encounters this year

For appointments or information call (251) 665-8000 or 1-800-330-8538 or visit www.usamci.com

Facing page: In addition to her research duties, Dr. Owen is working to obtain patents on research done by her colleagues at the USA Mitchell Cancer Institute.

Dr. Laurie Owen
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Scientific research can be a slow and meticulous process, but for patients who are dealing with cancer, the disease can be frighteningly fast and hopeless. The physical design of the USA Mitchell Cancer Institute helps both the researchers and the patients, says MCI scientific director Dr. Laurie Owen.

Patients can look through the glass walls of the research labs and see that people are constantly working to find new treatments for cancer and new ways to detect cancer earlier, when it is easier to treat.

Scientists looking from the other side of those glass walls see people who need new treatments now, creating a sense of urgency for the researchers. That sense of urgency is a key part of the MCI culture, according to Owen.

A Mobile native and a USA graduate, Owen left the area years ago for a successful career in academia and to become a founder of a privately held biotechnology company, Biolegend.

When MCI director Dr. Michael Boyd recruited her home, he invited her to what she describes as "the perfect job for me, combining science, entrepreneurship and mentoring."

She hasn't forsaken her own research into ultraviolet exposure and skin cancers. "It's a huge problem, increasing every year, particularly in the South," she says. She is especially intrigued by superficial spreading squamous cell carcinoma, less common than other squamous cell cancers but with a tendency to spread and metastasize, making it especially dangerous.

One of the key elements of Owen's position is obtaining patents on scientific work and finding the business backing to take the discoveries to the next level.

Swift Biotechnology, a startup company headed by Greg Grice and Mike Chambers with financial backing from MCI's "angel investors," has been selected as the facility's commercial partner for screening products. Owen is pleased that Swift has been designated as among the top 20 startup companies for the year by Alabama Launchpad. Grice and Chambers have offices at MCI to build the synergy among all layers of the discovery process, she says.

A new screening test for ovarian and endometrial cancer, developed by Dr. Rodney Rocconi and his team at the MCI (see story on page 4) is the first product that Swift Biotechnology will try to bring to market. "We hope it is the first of many," Owen adds.

To date, MCI has filed four full patents and has six provisional applications.

Bringing more discoveries to market is not an impossible dream, according to Owen. MCI's emphasis on "use-inspired" research draws scientists who want to work on development of solutions to specific problems, rather than the more fundamental basic research options.

"There's a great interaction between clinical staff and researchers," she says.


UNIVERSITY OF SOUTH ALABAMA
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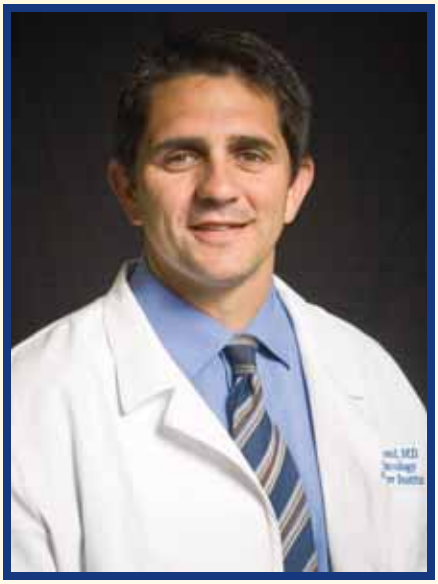
MITCHELL
CANCER INSTITU

Saving Lives Through Earlier Cancer Detection



Rodney Rocconi, M.D., gynecological oncologist at the USA Mitchell Cancer Institute.

Facing page: Dr. Rocconi uses a colposcope to detect cancerous cells. He is actively involved in the diagnosis and treatment gynecological cancer, as well as in cancer research.

UNIVERSITY OF SOUTH ALABAMA
MITCHELL CANCER INSTITUTE
COMPREHENSIVE ONCOLOGY HEALTHCARE & RESEARCH

For appointments or more information about the USA Mitchell Cancer Institute call (251) 665-8000 or 1-800-330-8538 or visit www.usamci.com

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Cancer stem cells, or progenitor cells, comprise only a small percentage of tumor cells yet are believed to be solely responsible for the aggressiveness of the tumor. If you could stop these cells from reproducing, you could stop the cancer process, says gynecological oncologist Dr. Rodney Rocconi, who is the Abraham A. Mitchell Clinical Cancer Research Scholar at the Mitchell Cancer Institute.

"Once we understand the mechanisms of those cells, we may be able to develop more effective therapies," he says.

His focus is on ovarian cancer, the deadliest form of gynecologic cancers, with over 20,000 new cases diagnosed each year in the United States and 16,000 deaths.

The problem is that the disease has no easily recognizable symptoms, and there is no effective screening test. Most women are not diagnosed until the disease has progressed to stage three or four, so the cure rate is dismal.

"The standard treatment is aggressive surgery and chemotherapy," Rocconi says. While most women respond to initial therapy, the cancer usually returns and when it does, it is very difficult to treat.

That high remission and return rate is due to the very nature of the cancer stem cells. These cells have the ability to self-renew and are naturally resistant to chemotherapy. Failure to eradicate cancer stem cells completely allows the cancer to regenerate. The ultimate cure depends on killing cancer stem cells. But in order to do this you have to know what makes them different in the first place and why they are so resistant to traditional cancer treatments.

He's now working to find those molecular differences between "regular cancer cells" and ovarian cancer stem cells. It's a hot topic for cancer researchers, Rocconi notes. Rocconi's research is two-fold – in addition to trying to understand the mechanism of the cells to help develop targeted therapies, he is looking for a screening test to diagnose early stages of cancer.

"When we diagnose ovarian cancer in early stages, it is usually by accident. But when that happens the cure rate increases to about 90 percent." Rocconi says. "If we can develop a test to diagnose it early, we can make a change in this silent killer."

Collaborating with Drs. Michael Finan and Lewis Pannell at the MCI, Rocconi's desire to develop a screening test has moved quickly and a patent has been filed. FDA approval will hopefully be complete in less than two years. The screening test is based on differences in proteins and their level in women with ovarian or endometrial cancer compared to women who do not have the disease.

"We intend initially to test women who are at high risk for the disease. If they have these biomarkers, additional tests can confirm whether cancer is in fact present," says Rocconi. "Hopefully, with this screening test, women with ovarian cancer will be diagnosed earlier when the cure rate is substantially higher."

Fighting Lung Disease at the Molecular Level

Curiosity is the hallmark of the biochemist, says Dr. William Gerthoffer, chair of the department of biochemistry and molecular biology in the USA College of Medicine. It is curiosity that drives him in the lab every day, working to unlock the secrets of small ribonucleic acids that affect the ability of blood vessels within the lungs to do their job.

Gerthoffer has two major research projects in progress. The first, focusing on pulmonary hypertension, is sponsored by a two-year, $275,000 National Institutes of Health grant to study the role that one micro RNA plays in the thickening and stiffening of blood vessel walls that can ultimately lead to heart failure. The second, sponsored by a five-year, $1 million NIH grant looks at the possible use of another micro RNA that could improve the effectiveness of anti-inflammatory drugs in treating asthma and chronic obstructive pulmonary disease (COPD).

The lungs can be damaged by toxins, smoking or even by ventilators used to sustain patients in hospital ICUs. Scientists in USA's Center for Lung Biology are working to understand how the lungs develop, adapt and respond to illness and injury.

Consider the lungs as two sets of intertwined tubes, one carrying air and the other carrying blood. Oxygen from the airways needs to move freely into the bloodstream for transport through the rest of the body. Likewise, carbon dioxide needs to move out of the bloodstream and out of the body through the airways. Each of the blood vessels and airways is encased in muscle cells that change their diameter to control the amount of flow. As long as those muscle cells are able to contract and relax as needed, the air and blood flow smoothly. In some cases, as with asthma and pulmonary hypertension, the muscles contract but don't relax properly, eventually leading to a stiffening of the walls.

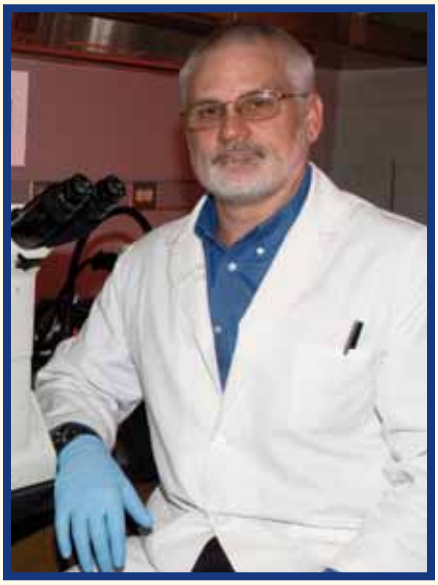
"Nobody knows what the very first event is that creates asthma," he explains, adding that it is probably some type of allergic reaction. "But why doesn't it stop? Why does that particular trigger cause this reaction?"

Gerthoffer is searching for answers at the molecular level. Working with micro RNAs, termed miRs in scientific shorthand, he hopes to reveal the epigenetic code that controls the proteins that cause asthma and pulmonary hypertension.

Molecular biologists have been describing RNA and DNA molecules since the 1950s, but the hundreds of micro RNAs are a relatively new discovery.

Gerthoffer's current research focuses on miR 16, which appears to reduce inflammation in asthma, and on miR 21, which promotes cell growth. He hopes that finding ways to block inflammation would prevent the overgrowth of muscle in pulmonary hypertension.

Working to solve the mysteries is exciting work for him. "There's a great deal that's unknown, so it takes imagination to guess what's important and technical skills to test it. And if it works and it's never been known before, that's intensely exciting," he adds. "If you find it and it's true, then it's true in every cell on Earth. That's pretty profound."



Working with micro RNAs, Dr. William Gerthoffer hopes to reveal the epigenetic code that controls the proteins that cause asthma and pulmonary hypertension.

Facing page: Dr. Gerthoffer uses a liquid chromatograph in the analysis and purification of recombinant protein.

For more information about the USA Center for Lung Biology go to: www.southalabama.edu/clb

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A Team Fight Against Deadly Disease

If the inner workings of human cells sound complex and esoteric, you've never overheard a brainstorming session among Drs. Tom Rich, Bing Zhu and Diego Alvarez.

The three members of the pharmacology faculty in the USA College of Medicine bounce ideas with an energy that reflects a sense of urgency.

That urgency is because their topic is a particularly deadly condition called acute respiratory distress syndrome (ARDS).

Fatal in about half of all victims, ARDS can occur in anybody with lung injury – whether caused by illness, trauma or by the mechanical ventilation that's keeping them alive in the face of other life-threatening problems. Those who survive ARDS frequently face a diminished quality of life.

ARDS is a key focus of USA's renowned Center for Lung Biology, and these three researchers are working on a particular element of that problem – how the location of proteins within cells might help.

Alvarez, an M.D./Ph.D., explains the medical problem: inflammation is the body's normal reaction to injury and illness. Inflammation can make blood vessels within the lung more permeable, allowing blood components to leak past the lining of endothelial cells. Ordinarily the body's lymphatic system drains away excess fluid, but if the fluid accumulates it can cause a condition called pulmonary edema. The fluid prevents the lungs from exchanging oxygen and carbon dioxide.

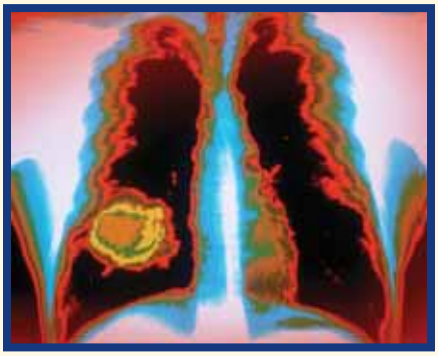
Their project, supported by a two-year, $840,000 National Institutes of Health grant, is looking for pharmacological approaches to plug or repair the leaks before too much fluid causes irreversible damage.

Research performed by Dr. Troy Stevens and his colleagues at USA's Center for Lung Biology has demonstrated that edema is prevented by an accumulation of cyclic AMP in one region of the cells, and *caused* by an accumulation of cyclic AMP in other regions of the cell. The body counteracts the deleterious effects of *bad* cyclic AMP by activating a protein called PDE that hydrolyzes, or breaks down, the cyclic AMP. PDE appears in two forms in endothelial cells, explains Zhu – PDE4 and PDE7. They hydrolyze the same amount of cyclic AMP but with differing sensitivities.

That discovery several years ago led Zhu to begin studying whether the two regulate different pools of cyclic AMP within endothelial cells. "We speculate that PDE7 hydrolyzes the good cyclic AMP, while PDE4 hydrolyzes the bad cyclic AMP," he explains.

According to Alvarez the new PDE4 inhibitors being touted as an asthma treatment may have both unexpected and deleterious effects on the pulmonary endothelium.

More practical, says Rich, would be a mechanism for blocking the signal that triggers the leaks while encouraging the signal that builds protective walls – "treating both ends of the problem."



Facing page: Drs. Tom Rich, Diego Alvarez and Bing Zhu share a brainstorming session about their research in respiratory distress syndrome.

For more information about the USA Center for Lung Biology go to: www.southalabama.edu/clb

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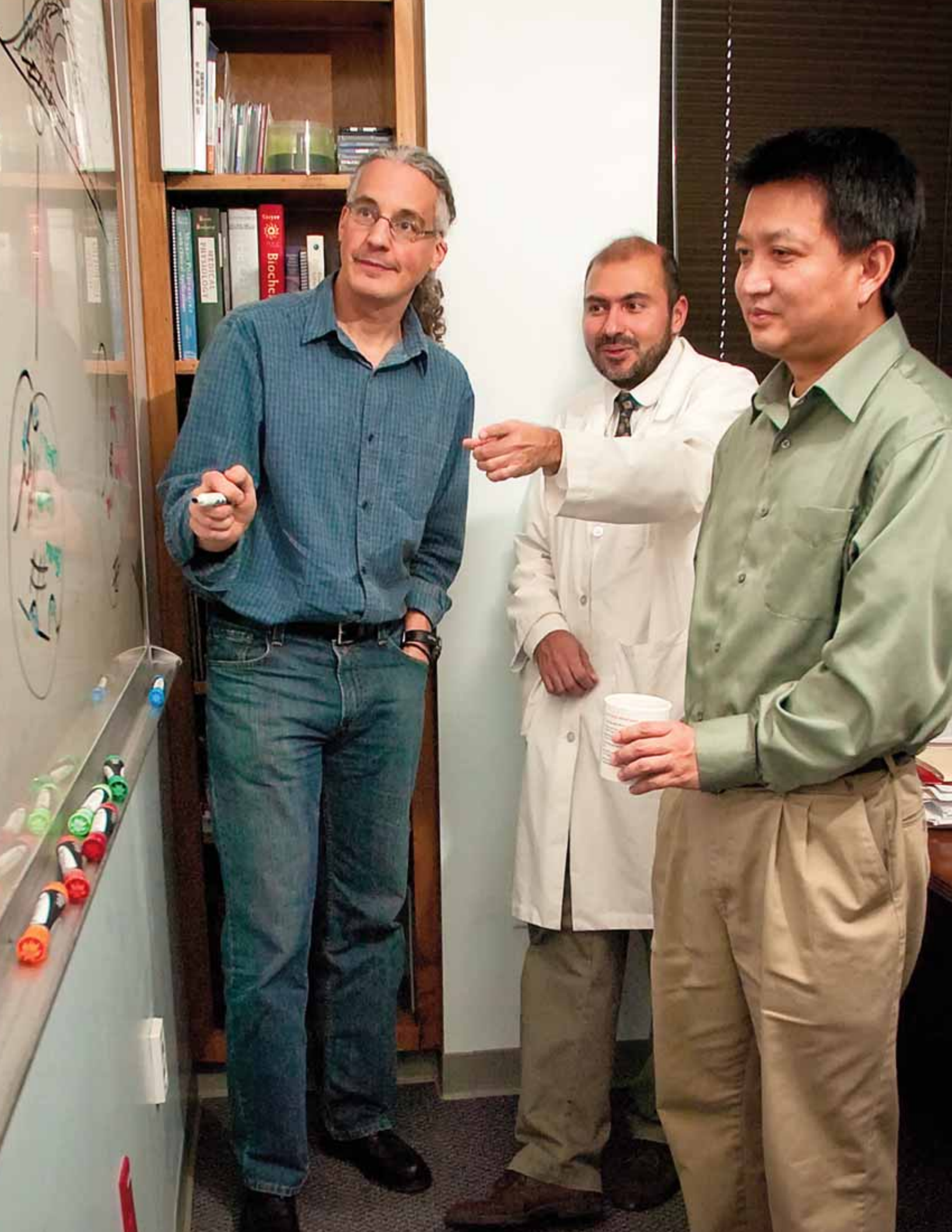

Improving Health Care and Saving Lives

Facing page: According to Dr. William Richards, chair of the department of surgery, assessing the quality of patient care is important in saving lives and saving money in health care.

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Patient A checks into Hospital A for bypass surgery, while Patient B checks into Hospital B for the same procedure. Patient A sails through the surgery, recovers quickly and returns home. Patient B suffers complications and dies.

So, Hospital A is better than Hospital B, right?

Maybe yes and maybe no, says Dr. William O. Richards, new chairman of surgery at the USA College of Medicine. You can't make any determination about the quality of care in the two hospitals without knowing something about the condition of the two patients when they checked in.

Even though the federal government has already sponsored a lengthy study to prove just that – that many factors go into any assessment of the quality of patient care – all the information from the study is being shelved during discussion of health care reform, Richards says.

He would like to bring that information back to the forefront. He worked to incorporate the lessons of that study in Tennessee when he was on the faculty at Vanderbilt. Now that he is at USA, he would like to see the program take root throughout Alabama and all around the nation.

The assessment program dates back to the 1980s, when Congress became alarmed at the high morbidity and mortality rates in Veterans Administration hospitals, Richards explains.

The study did not become a means of justifying poor results, Richards says. Instead, it was used to improve care. "Once you know you have a potential problem, you can start to deal with it. You can start doing things to mitigate the risk."

When results come in from multiple hospitals, everyone can learn from each others' examples, he explains. "If you know you have a great risk of infection in a colon surgery, you can find surgeons with a low rate of infection and adopt their practices."

The results of that study have been organized into the National Surgical Quality Improvement Program by the American College of Surgeons – a program that begins with extensive evaluation of incoming patients, carefully records results, shares data among participating hospitals, and helps hospitals learn from each other.

"If you have a reliable patient database, you can actually measure your quality of care and start to affect patient outcomes," Richards says.

The results are stunning, he notes — a 46 percent decrease in operative mortality and a 47 percent decrease in complications. Even more impressive is that everyone involved in the study improved. Hospitals and surgeons with poorer records improved greatly while those who were already doing well have done even better.

The problem with implementing an NSQIP-based program, says Richards, is that it is not cost free. Nurses need additional training and time with patients to gather all the relevant history. Inputting data takes more time.

But the cost of surgical complications is very high, he says.

"If every hospital had NSQIP, the estimate is that we could save $300 billion a year," he adds, and prevent up to 524 complications per hospital per year.


Huntington

Better Health Through Better Diagnostic Images

Whether it is as esoteric as finding ways to mark specific proteins in cells or as pragmatic as a means to quickly detect blood flow to skin damaged by burns or swelling, if it involves spectral imaging, then it is fascinating to Dr. Silas Leavesley, an assistant professor in USA's department of chemical and biomolecular engineering.

"Spectral imaging is a tool that lets us investigate each point in an image as if we were performing a spectroscopic assay," says Leavesley. "If a molecule is in this point, we can identify it based on the unique signature of the molecule. If many different molecules are in this point, then we can apply sophisticated mathematical analysis methods to calculate the amounts of each type of molecule. Because of this, spectral imaging gives us the ability to probe the molecular composition of cells and tissues, identifying unique or pathological regions based on their characteristic spectra."

Intrigued by development of biomedical tools since his undergraduate days at Florida State, he completed his Ph.D. at Purdue University to be part of the school's strong program in biomedical engineering.

His graduate research, funded as a joint project between university and industry, developed a means to eliminate background noise in a Kodak imaging machine. The machine could attach image fluorescent labels to cells in a mouse, but too much background fluorescence was visible from one cell to another. His project developed a method to eliminate much of the background, producing a more sensitive imaging machine that can capture more useful data.

Leavesley has three active projects at USA.

First, in collaboration with Dr. Tom Rich of the College of Medicine's department of pharmacology, Leavesley is working on a system to track signaling mechanisms in cells. Their team is developing methods for marking different proteins in a cell with different colors, then using spectral imaging to sort the information. The ability to mark individual proteins would help identify cells that are malfunctioning and target specific elements of the cells for intervention.

His second project, for which he is seeking funding, would identify problem cells without any artificial changes to allow tracking. Using the endogenous characteristics of the cells, he would vary the spectral composition of light used in endoscopy, for example, to help a physician differentiate between inflamed tissue and precancerous tissue. That project is a joint venture with Dr. Diego Alvarez in USA's Center for Lung Biology, and will also involve a clinical collaborator once the technology is sufficiently developed. They hope to add a clinician to their team when the project is further advanced.

Finally, he is working to develop a low-cost, portable device to measure blood oxygen in skin. When skin is damaged by burns or by swelling like that caused by a snake bite, it is often hard to tell visually what is actually damaged and what is simply distorted by damage to neighboring tissue.

With a grant from the USA Research Council, he has been able to purchase equipment to begin work on this project, and several of his students are conducting preliminary studies.

Research by Dr. Silas Leavesley, assistant professor of chemical and biomolecular engineering, is aimed at developing more effective medical diagnostic tools.

Facing page: Dr. Leavesley and engineering student John Boni test a prototype of a non-invasive spectral imaging device designed to measure blood oxygen levels in skin.

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Preventing Dropouts and Creating Better Teachers

If education is the key to success, then keeping kids from dropping out is an obvious must.

Dr. André Green, assistant professor of leadership and teacher education in the College of Education, has accepted that challenge as his personal mission.

First is a summer program for third- to fifth-graders at three urban schools in Mobile. Funded first by the Alabama Department of Education, the program is now sponsored by the J.L. Bedsole Foundation, the College of Education and 100 Black Men of Greater Mobile. It is designed to help "stop the summer slide" – the tendency to lose academic ground between the end of one school year and the start of the next, says Green.

The program includes reading, math, and science, with all the classes designed to be engaging and fun, plus a healthy dose of art, character education, and self-esteem builders. "You can't just educate with reading, science, and math," explains Green. "You have to address the needs of the entire child."

Mentoring by 100 Black Men of Greater Mobile plays a big role, too. One of Green's favorite examples is when the men teach the boys how to tie a necktie. The next day, without influence from the staff, some boys show up wearing ties, even if they're wearing T-shirts or polos.

The program is a great jumpstart for aspiring teachers, too, since it employs teachers-in-training from USA, many of whom have never experienced urban schools. Future teachers learn to relate to all students, regardless of background, and learn to teach in any environment.

"If we can train the teacher right, we will have 25 years of good teaching," says Green. "With an average of 25 kids per class, times 25 years of teaching, times 15 aspiring teachers – we have helped influence an entire generation of students."

A second program is aimed at more mature teachers. Green has partnered with colleagues Dr. Andrea Kent and Shelly Rider on a $280,000 state grant to train fellows in the Alabama Math, Science and Technology Initiative (AMSTI) program. The fellows are experienced teachers who can master the state's successful new hands-on math and science curriculum and then support other teachers as they begin to use the new curriculum.

Green, a specialist in science teaching methods, longs to see an upsurge in numbers of great secondary science teachers, so he's especially pleased about the third grant, a $900,000 National Science Foundation award to train new math and science graduates to become secondary teachers.

Under the new grant, written by Green, Dr. Justin Sanders, associate professor of physics, and Dr. Phillip Feldman, associate dean of education, recent science degree graduates will be selected to join a highly specialized master's in education program. The first semester will be spent in the secondary classroom, getting a jump-in-the-pool style introduction to teaching.

If they like it and the program leaders see great potential, they will be invited into the full, four-semester master's program, at no cost.

Dr. Phillip Feldman, associate dean of the USA College of Education; Doris Tillman, retired principal of Dodge Elementary School; and Shelly Rider, AMSTI project coordinator, watch as fourth graders Lisa Simms and Joseph Chavez conduct a science experiment.

Facing page: Dr. André Green holds the attention of a group of elementary school students at the Gulf Coast Exploreum Museum of Science.

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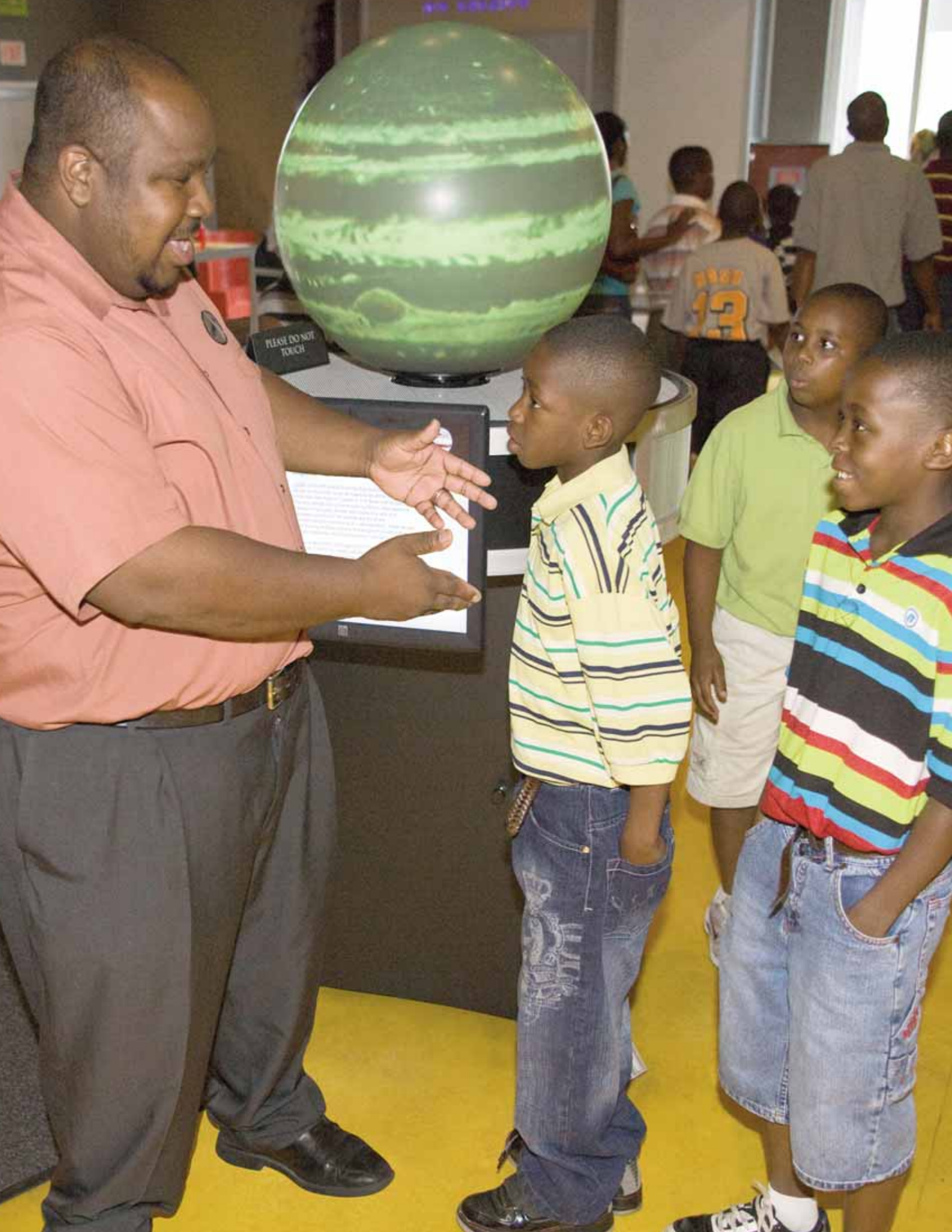
PLEASE DO NOT
TOUCH

Music Outreach Marches Forward

Ward Miller conducts USA's new marching band.

Facing page: The USA Marching Band takes the field by storm and makes a great impression on the crowd during halftime at USA's inaugural football game.

For more information about the USA Marching Band go to: www.southalabama.edu/music/marchingband

What's football without a band? And what's a band without a show?

While USA's new football team blazed through an undefeated season, the new marching band blazed to its own triumphs. Leading that band was new athletic bands director Ward Miller, who was determined to surprise the crowd – to startle them with the size, the quality and the versatility of the University's brand new band.

Building a new band was the lure that brought Miller to USA.

Music department chair Dr. Greg Gruner recruited Miller a full year before the band took the field. While Miller already had a reputation for arranging field shows, he needed time to recruit his team.

"We want an intelligent, good band," explains Miller. "We want the marching band to be like a little honors college and a crucial enhancement of university outreach to the community."

After all, he says, the band is one of the most visible groups on campus.

A band show is more than the music, it's a visual experience as well. To appeal to every audience, Miller wanted a mix of traditional patterns, like spelling out "USA," as well as the more modern flowing, curvilinear visual expressions performed with a soft sidestep, plus something unique for this band – a high knee lift with swaggering shoulders. With three half-time shows, three pre-game shows and specialty performances to boot – like a patriotic performance in honor of September 11 at nearby Theodore High School — he had more than 16 hours of drill to prepare. These drills included every step choreographed for each of the 150 marchers.

Miller is proud of the band and what they've achieved in just one year. He's looking forward to next year, when he'll have some veterans.

In the meantime, keep your eyes peeled – you never can tell where you might find them. They were the newest band on the Mobile Mardi Gras scene this year, and imagine the excitement of football season tailgaters when ensembles of band members stroll through the parking lot playing.

It's all part of Miller's plan to keep the band full of fun and full of surprises, and to keep the community looking toward USA.

"We want the marching band to be a crucial enhancement of university outreach to the community."

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Touching Lives by Creating Beauty

USA is dedicated to advancing the art of glassmaking.

Facing page: Jason Guynes, chair of visual arts, on the second floor balcony of USA's Health Sciences Building lobby, overlooking a large chandelier by glass artist Marty White Elk Holmes. The work was donated to USA by Jack and CoCo Hays.

Occasionally, a college art department ventures to do something with glass and tosses up a shed behind the main building, builds rudimentary equipment, and offers some glass-blowing classes as sort of a step child of the art department, says USA visual arts chair Jason Guynes.

Not so at USA. A complete glass program is being established, and a state-of-the-art glass studio is under construction. The new building, which is located behind the art complex, is designed to be the focal point for the north end of campus's new interior ellipse. Large garage-style doors will give passersby a view of artists at work.

"Walking through the campus should be a cultural experience," says Guynes. The new building will allow "a better understanding of the artist and the human experience in general."

When the new glass studio opens, USA will be the only public university in the South offering a program with both hot and cold facilities in a new climate-suitable building.

The $1 million, 5,000-square-foot building will include both a hot glass studio for the familiar process of blowing glass and a kiln-formed studio for cold glass, in which the artist arranges the components of a project while they are cold, then melts them in a kiln to create the piece, which may be manipulated again when it cools.

Glass programs are few and far between in the South, says Guynes, because it's just too hot. That's why the new climate-controlled facility will be such a plus. USA has been working with consultant David Keens from the University of Texas-Arlington to plan the facility. Now the national search is on for faculty.

Guynes foresees the program as a catalyst for even more interaction among the University, the community and the art community – with ties to the excellent art glass collection at the Mobile Museum of Art, and the opportunity for community classes, workshops, presentations and more. He hopes downtown Mobile's Space 301 contemporary art center, where he's a board member, will consider bringing in visiting glass artists to help promote the interconnections.

The glass facility will house an art program as well as a craft program, he emphasizes.

"What draws people is the beauty of the material," Guynes says. "People often overlook the message of the art. That's the conundrum of glass."

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Learning Through Serving

Dawn McKinney and Karen Peterson check in some of the volunteers for the MLK Day of Service.

Members of the USA basketball team give their time and a little help to a youngster at Dumas Wesley Community Center.

Facing Page: USA fraternity members volunteer to build a wheelchair ramp in the Creighton community of Mobile during the MLK Day of Service.

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What can you learn by serving others?

Thousands of University of South Alabama students have answered that question for themselves, at the same time improving and supporting the communities in which they live, work and play.

It is called service learning, and it is a passion for Karen Peterson of the USA English department and Dawn McKinney of the School of Computer and Information Sciences, organizers and leaders of USA's Center for Academic Service-Learning and Civic Engagement (CASLCE).

Their goal is simple: giving students opportunities for involvement in community service as a tool for personal and academic growth, resulting in better students, better citizens, and a better community.

Projects fall into two categories, McKinney explains. Civic engagement projects are big events, campus-wide, slated for days that inspire a focus on service such as the Martin Luther King Jr. Day in January, the 9-11 Day of Service in September, and Higher Education Day in March. The Center sponsors big projects around the community, whether building with Habitat or serving in a soup kitchen or building a garden at a nearby elementary school.

By contrast, service-learning projects encourage students to use what they're learning in class. For years, nursing students have been role models, setting up screening programs in malls or helping with vaccination drives on campus. CASLCE encourages other students to follow that example. It can be as simple as tutoring, says Peterson, or as complex as a class project.

McKinney mentors CIS senior project teams as they develop computer software for non-profit agencies throughout the community. She also includes a service-learning component in her freshman seminar course where students plan MLK Day of Service projects involving technology and help to recruit new CIS students from area high schools.

Projects are found throughout the university. Kristy Britt's Spanish students mix service and learning by delivering food to Hispanic families; students in Jeff Landry's information systems class help assess the technology needs of Mobile Fire Fighters, and beginning computer applications students help patrons with simple computer use at a local public library.

Students enjoy service, according to Peterson and McKinney. "They also are a very hands-on, interactive generation," Peterson continues. "Service-learning allows them to use their critical thinking skills to find community problems and address them with the skills that they are learning in the classroom. They can understand then how they can 'make a difference' in the world around them. CASLCE is here to show students how to learn while serving others and to make them aware of the impact they can have on their community for years to come."

For more information about the USA Center for Academic Service-Learning and Civic Engagement go to: www.southalabama.edu/academicaffairs/caslce


ΠΚΦ
DEWALT

Better Democracy Through Computing

"You have to get the election right or democracy doesn't work," explains Dr. Alec Yasinsac, dean of the School of Computer and Information Sciences at USA. "If someone can manipulate the vote, they have created a system that can take our country down the wrong road."

A faculty member at Florida State in 2000, he was close at hand when Florida's questionable election results kept the nation's presidential outcome in doubt for days. "Those problems had nothing to do with electronic voting," Yasinsac said. "They were all paper issues."

As a result of those paper problems, many communities moved to electronic voting — but electronic voting has issues of its own, says the retired Marine, whose research specializes in computer security.

"You can't see inside a computer. The risks and magnitude of undetectable errors or undetectable attacks are expanded when computers are involved."

In 2006 he was called in to help investigate voting problems, this time in Sarasota County, Fla., where computers indicated some 12 percent of voters failed to make a choice in a high-profile contest. Yasinsac's team conducted the first software security review of a contested federal election. They studied the voting machine software, exercised the machines, reviewed poll worker logs, and interviewed voting machine technicians before determining that the "under vote" problem was not software related.

"Though neither the 2000 nor 2006 Florida investigation revealed computer malfunction or tampering, electronic voting security is critical to the electoral process that is becoming increasingly digital," says Yasinsac, who today works with Alabama Secretary of State Beth Chapman and the U.S. Elections Assistance Commission to prevent election problems.

"There is clearly opportunity to improve voting access and accuracy through electronic voting. But to recognize those improvements, we must first ensure election integrity. When few people voted electronically, the threat wasn't great, but as electronic voting expands, the risk expands with it," Yasinsac explains.

"All significant electronic systems face substantial security challenges. Banks, for instance, routinely lose money through electronic transactions, but they have a profit margin that is sufficient to cover the losses. There's no comparable safety net for elections."

Moreover, while financial transactions are designed to be transparent and easily documented, elections are the opposite. They are designed to show proof that an individual voted without revealing which candidate was picked. These constraints make it harder to ensure the integrity of voting systems.

Despite the risks, he hasn't given up on electronic voting. Instead he's working to help develop well-engineered, auditable systems and to conduct threat analysis to help elections officials understand the risks so they can make informed decisions.

Dr. Yasinsac with Alabama Secretary of State Beth Chapman. Yasinsac is assisting the state to prevent problems in electronic voting.

Facing page: Dr. Alec Yasinsac, a leading authority on computer security, is working to prevent problems with electronic voting.

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Ensuring the Future of Our Precious Sea Life

USA graduate student Nate Geraldi inserting an electronic tracking tag into an eagle ray off the coast of Bermuda.

USA doctoral student Marcus Drymon capturing a large hammerhead shark off the Alabama coast during the monthly shark survey.

Facing Page: Dr. Sean Powers with a red drum collected for his research.

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For generations, information about fish populations came from fishermen, based on their landings, but that information could be skewed by any number of factors. If the oyster take dropped, it might mean that there weren't as many oysters, or it might just as well mean that the price of oysters had dropped and it wasn't worth the fishermen's time to gather them.

Dr. Sean Powers, USA associate professor of marine sciences, and his research group at the Dauphin Island Sea Lab are using the latest high-tech equipment such as acoustic, laser and sonar scanning systems, and a camera-equipped remotely operated vehicle (ROV) to study fish populations from the Gulf of Mexico to Alaska.

The work, funded by the National Marine Fisheries Service and the National Oceanic and Atmospheric Administration, is revolutionizing the science of assessing sea life populations and habitats.

Making sure there is habitat for fish is only one problem that must be overcome to ensure sustainable fisheries. Historic overharvesting of many species has left a legacy that may require long recovery times. For oysters, recovery may only take a few years, provided oyster habitat is available. Finfish like red snapper may require decades because they produce fewer eggs. Recovery times may take much longer for sharks because they have only one or two offspring a year. While the red snapper population could rebuild in about 10 years if harvests were stopped, it would take 40 for the shark population to regenerate, even with no harvest.

So who wants sharks? All of us should, Powers responds. "If you lose your great sharks - like hammerheads, tiger, and bull sharks - the number of stingrays and smaller sharks explodes," he says. And stingrays like to eat blue crab and oysters. That phenomenon has recently been seen on the East Coast, where a dwindling shark population led to an increase in stingrays, which have in turn walloped the clam and scallop population.

Powers has also worked with fisheries issues in other states – helping Alaska rebuild its herring from the long-term effects of the Exxon Valdez oil spill and monitoring salmon populations in the world-renowned Copper River salmon fishery.

In warmer waters, Powers is studying an influx of spotted eagle rays in Bermuda, where the government is trying to restore conch and scallops – two favorite foods of the rays. He's done a similar project in Mobile, tagging cownose rays to see whether they live in and near Mobile Bay year round or whether they migrate.

Powers' chief concern remains the Gulf of Mexico, where he has found disturbing trends confirming his fears about shark populations. For several generations, huge tiger and bull sharks were routinely caught; now the biggest generally only weigh 200 pounds. This is worrisome, since a tiger shark needs to weigh 300 pounds before it is mature enough to reproduce.

"We need to be more aggressive about shark management," Powers says. "Protecting fisheries is complex because it's impossible to manage just one aspect. You can't rebuild scallops, for instance, without managing the rays. And you can't manage the rays without managing the sharks."


SIMMS

Sharing Life's Secrets Through Genes

Every student planning a career in medicine, pharmacy or a host of other sciences needs a clear understanding of genetics. Realizing the importance of this topic, Dr. Ashley Morris, a plant geneticist in the USA biology department, has developed new methods of teaching the subject to make it not only palatable, but fascinating.

She has earned a National Science Foundation grant through the Course Curriculum and Lab Improvement Project, designed to improve science teaching for undergraduates. The grant helps pay for development of new courses and for the equipment needed to teach them as well.

Since the University has a strong curriculum in ecology and evolution, she is developing programs to incorporate genetics into these classes.

Even students who might otherwise turn up their noses at the study of genetics are attracted by the field research, she says – trips to the pitcher plant bog at a Nature Conservancy site in Baldwin County.

The bog includes six species of pitcher plants and many hybrids, influenced by plenty of variables – such as the rainwater that falls into the plants, the microorganisms in the rainwater, and the bugs that the plants eat. "It is so complicated and so interactive that it is perfect for understanding the role of genetics," she explains.

Understanding genetics is crucial for anyone planning a medical career, says Morris, who joined the faculty in 2007. Scientists around the globe are racing toward treatments that can be genetically modified to target the specific needs of each patient.

But genetics also has the potential to help unlock problems that could affect the human race in general, she said.

Her research targets one of those topics – the genetics of trees. Because trees live so much longer than humans, it is hard to witness the methods they use to adapt to a changing environment. "Genetics gives us a window to the past," Morris says.

Through genetic studies, she is working to determine how American beech and sweet gum trees survived the last Ice Age – how they adapted to climate changes and what that might mean if the Earth is facing another rapid climate change.

Working primarily in old-growth areas of state and national parks — to avoid trees that have been planted by humans — she captures DNA from bits of tree leaf to see how the species have distributed themselves naturally.

Working with a more immediate plant-to-human issue, Morris is also investigating genetics of the Illicium, also called star anise, a woody plant used in herbal medicines such as digestive teas. However, all but one species of the plant is poisonous to humans. For generations Southeast Asians picked the plant themselves. Now that its commercial value has increased, there have been increasing incidents of confusion between the helpful variety and its harmful cousins.

"The thing that I find most fascinating is that we can use genetics to reconstruct the past, which is pretty amazing when you think about it," says Morris.

Dr. Ashley Morris uses the carnivorous pitcher plant to teach genetics to her students.

Facing page: Dr. Morris takes water samples from inside a pitcher plant in her biology lab.

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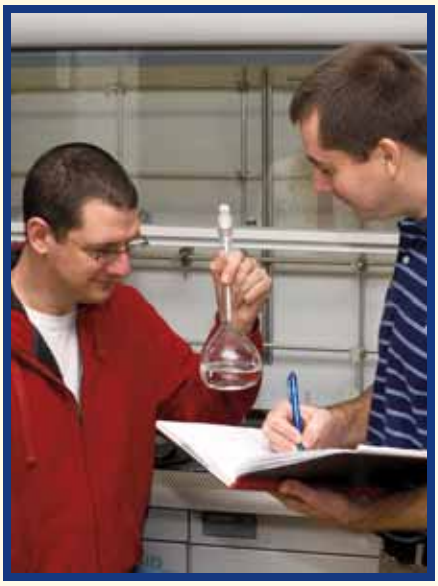
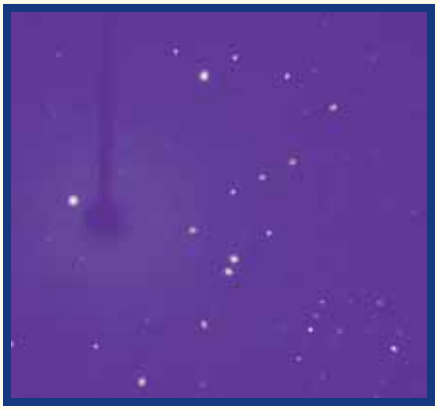
Discovering the Elements of Progress



Student researcher Nick Robinson and Dr. Richard Sykora record results from their research in lantanides.



A diffraction pattern from a single crystal.

Facing page: Dr. Richard Sykora prepares to examine a compound using a single crystal X-ray diffractometer, which is used to determine structures of compounds.

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Remember the layout of the Periodic Table of Elements? All of the common things like oxygen, hydrogen, helium, carbon, gold and silver are lined up near the top and the dangerous and exotic group — uranium, plutonium and so forth – are neatly lined up across the bottom.

Right above that bottom group of the actinides, many of them manmade, is the line of lanthanide elements that are at the heart of Dr. Richard Sykora's research in the USA chemistry department.

His is the basic research, the heart of science, that examines chemical reactions to see what he can see and find what he can find. Not the product-driven research of industry, his is the academic research that lays the groundwork for subsequent scientists. His work has earned a five-year, $625,000 National Science Foundation Early Career Development Award – a program aimed at young scientists just establishing their careers. It helps to support laboratory equipment, teaching and outreach, as well as the research itself.

A Baldwin County native, Sykora studied at Troy University and earned his Ph.D. at Auburn before doing postdoctoral work with actinides at Oak Ridge National Laboratory.

In research, lanthanides are commonly chosen as stand-ins for their heavier, more radioactive counterparts.

"We often use lanthanides as surrogates," Sykora says. "They're cheaper, easier to obtain and have many of the same properties."

While the term may be unfamiliar, the products that use lanthanides are commonplace – TV screens, magnets, sunglasses, lasers, and many optical products, he says.

Sykora's current research is devoted to two main projects. First is his work on the use of bimetallic compounds in catalytic fuel cells in collaboration with former colleagues at Oak Ridge. The work involves a process of combining lanthanides with gold, creating bimetallic combinations that can cut cost and increase efficiency in fuel cells.

His second project, working on the development of lanthanide emission phenomena, has potential future applications in chemical sensing. This project is in collaboration with a former Oak Ridge colleague who is now teaching at North Carolina A&T State University.

Whatever the particular project, Sykora loves working with lanthanides, which he terms "the cool thing" in inorganic chemistry.

"Lanthanides are unique," says Sykora. "For example, they can routinely bond with up to twelve other atoms simultaneously, while iron on the other hand normally only combines with six. This increased complexity creates many more possibilities for the production of novel alloys and compounds. And because the study of lanthanides is in its relative infancy, they offer a new frontier for inorganic chemistry. They are an important platform for scientific breakthroughs."


d diffraction

Better Living Through Space Age materials

Dr. Gail Jefferson's career has always been aimed at the heavens. An assistant professor in USA's department of mechanical engineering for two years, Jefferson's education — from high school summer institutes through postdoctoral work — has been supported by the nation's space program.

NASA Langley, NASA Lewis, the subcontractor National Institute of Aerospace – all are key elements of her curriculum vita.

Her current work at USA with nanotubes, which are manmade compounds known for their strength or other useful characteristics, builds on the structural work she did for the federal government — specifically, the characterization of advanced nanocomposite materials.

For example, a carbon nanotube measuring 0.1 nanometers in diameter and 100 nanometers long – too small to see without a high-power microscope – is very hard and very strong. But how can nanotubes be scaled up to be useful? Some researchers have attempted to accomplish this by spinning and aligning the tubes. Jefferson's work is to measure the electro-mechanical properties of the new product.

If her testing indicates that the resulting product is as strong as the original, or not as strong, she hypothesizes about the possible cause.

Space exploration demands new multifunctional materials and structures. As NASA scientists designed space modules, they kept adding layers of materials, each designed to accomplish a specific purpose – one to protect the astronauts from radiation, another to protect the module from space dust, others to handle other needs. Eventually, the shell can do everything it needs to do, but it is heavy. In space launches, saving weight saves money, so it is imperative to create multifunctional materials that will accomplish more than one of the needs. For instance, she ponders, can you combine aligned nanotubes to protect a part from lightning strikes and simultaneously strengthen it?

In addition to her research with agencies outside the University, she is also collaborating with her engineering colleagues at USA.

For example, with Dr. Kevin West, assistant professor of chemical and biomolecular engineering, she is researching the structure-mechanical property relationship in aerogels (see story on page 32). While he seeks ways to make the aerogels and add coatings that will make them absorb noxious chemicals, she studies the structure – how does his alteration of the chemical properties affect the structure of the feather-light gel?

And, in collaboration with mechanical engineering colleague Dr. Kung-Ting Hsiao, she is analyzing and characterizing composite structures, determining mechanical properties and relating these properties to the manufacturing process.

Though Jefferson enjoyed every minute of her NASA time and appreciates their support of her education, she's enjoying the new environment at USA.

"While I enjoy research, I also enjoy teaching," she says. "I wanted to work somewhere where both are important."

Dr. Gail Jefferson and mechanical engineering student Tim Morgan analyze fracture patterns of a composite material with an optical microscope.

Facing page: Dr. Jefferson sets up a compression test of a newly manufactured polymer composite.

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Improving Lives by Building a Better Gas Trap

Engineering student Aaron Lepre and Dr. Kevin West oversee the process of converting biofuel by-products into hydrogen for use in fuel cells.

Aerogels are made from the same material as glass, but have a density 100 times lower.

Facing page: Dr. Kevin West in the process of producing fragile aerogel for testing in the lab.

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Whatever noxious gas you need to capture – the carbon dioxide that threatens the health of Earth's atmosphere, the aldehydes circulating in the air of FEMA trailers, the leakage from anesthetics – chances are Dr. Kevin West has an idea about building a better gas trap.

Joining the department of chemical and biomolecular engineering at USA last year, West works with chemistry professor Dr. Jim Davis on several projects that aim to use ionic liquids to capture problem gases — projects that are funded by West's university start-up funds and Davis' research grant from Chevron.

Unlike normal liquids, ionic liquids don't evaporate, West explains. So if toxic emissions bind to them, they stay put rather than escaping into the atmosphere. And by working at the molecular level to alter the properties of the ionic liquid, it can be targeted to capture a specific gas.

Imagine, for example, an air filter that grabs carbon dioxide — what West terms the "800-pound gorilla of environmental issues" — out of the atmosphere. Davis' work in developing CO_2-absorbing liquids has already earned patents. Now the two are working to make the liquid less sticky to everything but carbon dioxide.

Remember the news about FEMA trailers contaminated by aldehydes circulating with the air? Davis and West are working on a spray-on coating for air filters that would trap aldehydes as the air circulates normally.

Another work in progress involves capture of gases used in anesthesia. The gases are recirculated during the course of a surgery since they remain viable as the patient breathes in and out. But still some 80 percent escapes into the atmosphere – a problem for the environment and also for the cost of health care, since the gases are expensive. West and Davis would like to develop a system to bubble the gases through an ionic liquid and capture them for reuse.

He enjoys the collaboration with Davis, and the two share that chance for collaboration with their students. West's students work in Davis' labs and vice versa. "We want students to speak both languages," West says.

Related to the filtering project with Davis, West is also working on creating aerogel-based filters. Made from the same components as glass, but engineered to have a density 100 times lower, the aerogels have an enormous amount of surface area. If that could be treated with a chemical absorbent, it would be remarkably useful for absorbing hazardous fluorocarbons from the environment, he hypothesizes. As a prelude to that work, part of his lab is devoted to the delicate process of making aerogels – because of their low density, they are very fragile, sometimes collapsing simply from the force of drying. But his student assistants are learning to create the aerogels so that they can begin the next steps in their research.

West is also working with Dr. Srinivas Palanki, professor and chair of chemical and biomolecular engineering, on processes to produce hydrogen for fuel cells from biowaste such as glycerol – creating a carbon neutral energy source.

"The research areas in which I work are inherently interdisciplinary, spanning engineering, chemistry, environmental science and materials science," says West. "The ability for us to work seamlessly across colleges is vital to our efforts and the environment at USA is strongly supportive of such collaborative efforts."

New Places for Teaching, Research,

The new Student Recreation Center will provide a state-of-the-art facility for recreation and to promote physical fitness.

Meisler Hall provides a central, convenient location for all student services.

The recently completed Football Field House provides training and fitness facilities for USA's new football program.

The new Moulton Tower and Alumni Plaza will be an important outreach tool of the University, providing a landmark and a gathering place for the community.

The USA Mitchell Cancer Institute was created to increase cancer survival rates through advanced treatment and research. It is the only cancer research institute in the upper Gulf Coast region and now provides 44,000 patient treatment encounters annually.

The Health Sciences Building, a new home for the colleges of Allied Health Professions and Nursing, provides a state-of-the-art facility to train future generations of health care professionals and conduct relevant research.

The USA Technology and Research Park fosters unique partnerships with industry that have created more than 600 local, private-sector jobs in computer science, information technology and biomedicine.

A new 20,000-square-foot dining facility is under construction near the student residence halls. It will provide students a more convenient facility in which to enjoy nutritious meals.

Shelby Hall, USA's new Engineering and Computing Sciences Building, will offer a new, high-tech home to the College of Engineering and the School of Computer and Information Sciences.

Major Grant Funds Research to Fight Threats to Human Health and Security

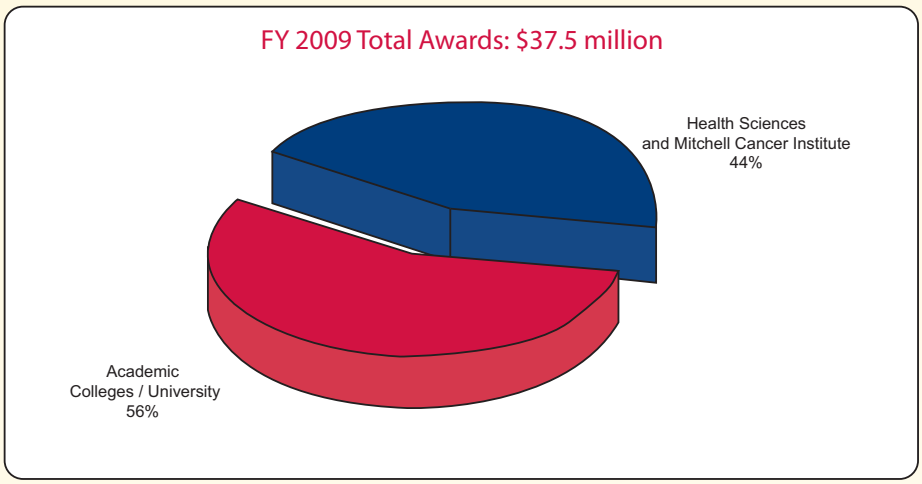
As this issue of Research, Innovation and Outreach was going to press, we learned that USA had received a $14.5 million grant from the National Institutes of Health to fund construction of a new state-of-the-art infectious disease research laboratory. This award is the largest competitive grant in the University's history.

Following a press event to announce the award are, from left: Dr. Ron Franks, vice president for health sciences, President Gordon Moulton; Dr. David Wood, Distinguished University Professor of Microbiology and Immunology; and Dr. Samuel Strada, dean of the College of Medicine.

For more information on this project, go to: www.southalabama.edu/publicrelations/pressrelease/2010pr/020510b.html

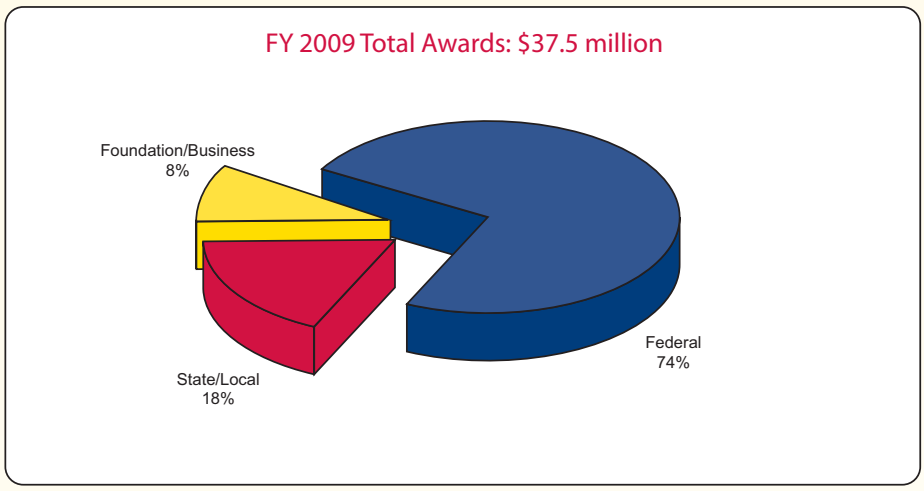
Research, Innovation and Outreach Productivity

AWARDS RECEIVED
October 1, 2008 - September 30, 2009



Academic Colleges/University	Health Sciences and Mitchell Cancer Institute	TOTAL
$21 million	$16.5 million	$37.5 million

AWARDS RECEIVED BY FUNDING SOURCE
October 1, 2008 - September 30, 2009



Federal	State/Local	Foundation/Business	TOTAL
$27.6 million	$6.7 million	$3.2 million	$37.5 million

Gross licensing revenue for USA patents and developments for FY 2009:

$2.6 million

The Chronicle of Higher Education* ranks USA 68th among U.S. universities in licensing proceeds.

*Chronicle of Higher Education, February 26, 2010

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- 600 High-Tech Jobs

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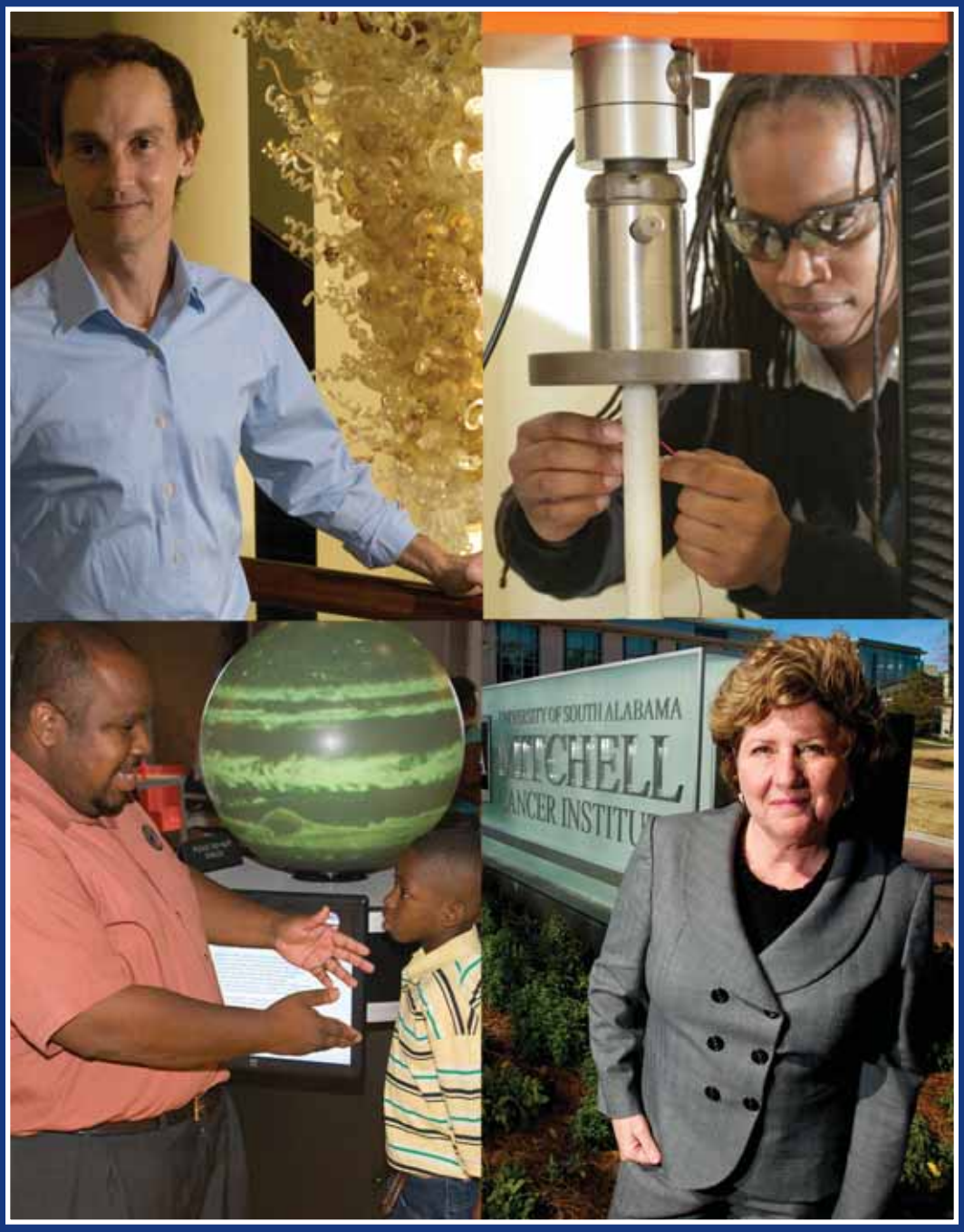

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