New to the OSU faculty in 2007, Artist Angela Piehl investigates the formation of identity as it relates to stereotypical gender roles with her wide variety of oil and acrylic paintings. A graduate of the University of Texas at Austin, Piehl says growing up in Texas helped shape the perspective from which she creates her works.

Her earlier paintings are somewhat autobiographical—telling stories of the frustration she felt growing up in a society with prescribed gender roles. Many were painted in a comic book style and included familiar icons from popular culture with which viewers could relate.

Her more recent work stems from a conceptual interest in Japanese “floating world” prints. These prints, which depict worlds filled with frivolity, novelty, superficiality, and artificiality, employ a range of mythology and symbolism.

Piehl’s recent works do the same. The paintings at times loosely emulate scientific illustration resembling various underwater creatures. Their scale in relation to the viewer’s size is unclear, and one cannot be sure if they are looking at a close-up view or a quick snapshot of something in the distance.

“I apply this concept of creating an alternate, ‘floating’ world and create my own fleeting space populated by the strange and taboo,” Piehl says. “My inhabitants are simultaneously beautiful and seductive, while repellent and abject. I enjoy playing with the notion of the authority of the image, and it is my hope that the viewer believes these creatures can exist simply because I have painted them believably.”

“Curiosities of the Floating World,” a solo exhibit at New York City’s chashama Gallery, displayed Piehl’s paintings during July and August 2008. Her work has also been displayed at the IAO Gallery in Oklahoma City, Okla. (as part of “Gendering America,” a regional invitational exhibit), Diaspora Gallery in Miami, Fla. (as part of “Women’s Work,” a four-person invitational exhibit) and Landmark Arts Gallery in Lubbock, Texas (as part of “Y QUE?” a regional, juried group exhibition).

Piehl is the recent recipient of the Oklahoma Visual Arts Council’s Creative Projects Grant and the OSU Dean’s Initiative Research Grant, which helped support her New York City solo exhibition. She was also a visiting artist at Clemson University during fall 2008 semester.

For more information on Piehl and her work, visit http://art.okstate.edu/faculty/piehl.html.

Angela Piehl pictured with a selection of her floating world paintings.
Dear Friends and Colleagues:

2008 was another record-breaking year for research at Oklahoma State University. Our total for sponsored programs was up more than $2.5 million to $270.8 million. The figure, which represents all money spent on OSU sponsored programs – including research – over the course of the 2007-2008 fiscal year, is a ten percent increase over the FY07 total and sets a new record for sponsored programs at OSU. The quality of OSU’s filed patents also continues to be high. By being selective in the patenting process we reduce costs and increase the success rate. You will note from the graphs on the inside back cover that the number of patents is down this year, but the license income continues to rise.

In this issue of Vanguard, we highlight some of the projects that account for these record increases. OSU President Burns Hargis tackles our Q&A section and addresses creativity and innovation. Hargis, a research structural engineer for the Oklahoma Creativity Project, has brought his passion for creativity to OSU. He discusses the impact of creativity on research, economic development and education. In a related story, Professor John Mowen presents the OSU Creativity Initiative, an effort to make OSU a leader in creativity and innovation.

For this year’s cover story, we showcase a unique collaboration between the physics department and the School of Mechanical and Aerospace Engineering. Led by Dres. Eric Benton and Andy Arena, the project allows students to build and launch cosmic radiation detectors into space.

Several of this year’s stories focus on health issues. Nutritional Sciences Associate Professor Edralin Lucas is studying the effects of common foods on cardiovascular health. A major breakthrough made recently by OSU structural biologists could be the first step towards a pharmaceutical for the dangerous smallpox virus. Clinical trials are underway at the OSU Center for Health Sciences to address children’s diseases, and at the Food and Agricultural Products Center, researchers are developing new methods for testing food for allergens.

The OSU Center for Veterinary Health Sciences will partner with the Oklahoma Medical Research Foundation on a combined residency-Ph.D. program in 2009. The program will equip veterinary graduates with training in comparative animal studies.

At OSU-Tulsa, Associate Professor Amanda Morris is working with families to evaluate the effects of a conflict resolution intervention program. Also in Tulsa, Dr. Diane Montgomery, professor in the College of Education’s School of Applied Health and Educational Psychology, led the research team that evaluated the benefits of Project CREATES, a program that seeks to infuse academics with art instruction at urban elementary schools.

OSU biofuels research is moving forward with an additional $20 million from the Experimental Program to Stimulate Competitive Research. Dr. Mostafa Elshahed, associate professor of microbiology, also received new funding this year. A $1.3 million grant from the National Science Foundation will enable Elshahed and partners from Oklahoma State University to discover new groups of unidentified microorganisms. In this issue we also highlight the work of Dr. Edward Jones, an OSU English professor and an authority on the poet John Milton. From the OSU-Stillwater campus, Jones works as editor of the Milton Quarterly, the first journal in the U.S. devoted to Milton. In our final feature, we feature OSU artist Angela Piel and her collection of “floating world” paintings.

We hope you see Vanguard 2009 you are introduced to the breadth and depth of research — and creativity — underway at OSU.

Dr. Stephen McKeeer
Vice President for Research and Technology Transfer

Vanguard 2009

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Research, scholarship and creative activity at Oklahoma State University

Q&A: Creating a culture where creativity thrives

OSU President Burns Hargis discusses how a focus on creativity will set OSU and Oklahoma apart from other universities and states. He also comments on the importance of creativity and innovation in making Oklahoma a national leader in research and economic development.

Creativity to be a cornerstone at OSU

John Mowen, Regents professor and Noble chair of marketing strategy in the Spears School of Business, is leading the OSU Creativity Initiative, an effort to weave creativity and innovation into the fabric of standard research at OSU.

The power of a peacemaker

Dr. Amanda Morris, associate professor of human development and family science at OSU-Tulsa, is giving youth the knowledge and skills they need to resolve conflicts in a nonviolent manner. Working with about 60 families from two Boys and Girls Clubs of Tulsa, Morris and her team are evaluating several factors before and after participation in a conflict resolution intervention program.

OSU professor discovers famous poet in unexpected places

Dr. Edward Jones has dedicated more than 25 years to working with Milton Quarterly, the first journal in the U.S. devoted exclusively to the life of English poet John Milton, author of the epic poem Paradise Lost. Jones’ knowledge about the famous poet has led to a celebrity status of a peculiar nature.

FAPC is improving food safety by detecting specific allergens

Researchers at the Robert M. Kerr Food & Agricultural Products Center have developed an improved method to detect the presence of soybean DNA in foods. Soybeans are one of eight allergenic ingredients that cause 90 percent of allergic reactions in the United States.

OSU professor discovers famous poet in unexpected places

Dr. Edward Jones has dedicated more than 25 years to working with Milton Quarterly, the first journal in the U.S. devoted exclusively to the life of English poet John Milton, author of the epic poem Paradise Lost. Jones’ knowledge about the famous poet has led to a celebrity status of a peculiar nature.

New funding sends OSU researchers fishing for scientific results

With a newly acquired $1.3 million grant from the National Science Foundation, researchers from Oklahoma State University’s College of Veterinary Medicine are working to detect, identify and isolate four groups of unique microorganisms and study them in the laboratory. The OSU group is led by Dr. Mostafa Elshahed, assistant professor of microbiology.

OSU researchers make breakthrough against poxviruses

A major breakthrough by Junpeng Deng, a structural biologist in the Division of Agricultural Sciences and Natural Resources, and his first-year Ph.D. student, Brian Krumm, may be the first step towards a pharmaceutical medication for smallpox and the emerging human monkeypox.

Back cover: Creating Floating Worlds

About the cover: Captured by a camera that was launched with the radiation detector built by OSU students, this photo provides an image of the earth from 104,000 in altitude.

For feature stories, see the beginning of each section.

2009
Q1 For some time now you have been the recognizable figurehead for the Oklahoma Creativity Project. What drew you to that role and why do you feel a focus on creativity is so important?

Creativity is important because Oklahoma can never spend its way to the front of the line. We have to promote, celebrate and support creative efforts in the state, which is a lot easier said than done because with creativity and innovation comes mistakes. We have to be tolerant of the process. We’ll move ahead as a state if we create a culture that not only tolerates mistakes but also promotes people taking risks. Thomas Edison said he knew a thousand ways not to make a light bulb. He didn’t say almost never. They stumble onto something else in the process. We must constantly be moving ahead as a state if we create a culture that not only tolerates mistakes but also promotes people taking risks.

Q2 In what ways will a focus on creativity benefit Oklahoma apart from other states?

There are infinite possibilities. On a non-scientific basis, the MAPS (Metropolitan Area Projects) program in Oklahoma City is a perfect example of creativity where people came together – none of whom would have classified themselves as creative – and came up with all these ideas, which they hoped would rejuvenate the spirit of Oklahoma City and enable it to develop more robustly. The result has been several positive, yet unintended, consequences. Once, for instance, has been the idea to put water in the river. I assure you nobody ever thought that river would become one of the major rowing venues in the United States. Here’s a river we used to wash our cows in now going to be hosting the Olympic trials. So, it’s a way it wouldn’t work. That kind of persistence is critical to creativity.

Q3 Comprehensive research universities like OSU conduct research and participate in scholarship and creative activities as part of their mission. Solutions to today’s complex problems, however, are often found at the interface between traditional disciplines. In what ways does interdisciplinary research encourage creativity?

I think that is exactly correct – most problems do not reside within one silo. There’s knowledge and developments in many disciplines that can come to bear on any issue. If you research certain issues within a very narrow field you can be encumbered by statements like, “we’ve tried that before,” and “that won’t work.” With interdisciplinary research, there is an openness to explore the problem much more broadly than you would if you stayed within one narrow discipline. Jordan Tang, who studied at OSU and was recently inducted into the Oklahoma Hall of Fame, is a good example of this. Throughout his career, he studied enzymes that cut proteins and was really interested in the digestive system. During his research, however, he discovered these enzymes were cutting proteins in brain tissue. What he may have stumbled onto is a link to the cause of Alzheimer’s disease. He wasn’t studying that.

As a member of the board of the Oklahoma Medical Research Foundation I’ve asked researchers, “How often do discoveries occur in the exact area you were pursuing?” They say almost never. They stumble onto something else in the process. That is a process that we need to catalyze throughout the university.

Q4 How do you feel creativity impacts economic development?

Virtual every new product and innovation is the result of creativity. Ditch Witch in Perry, Okla. is a perfect example – a discovery made by Ed Malzahn and his family in a machine shop trying to come up with something that could dig trenches and dig under roads without tearing them up. The process of developing the Ditch Witch machine was very creative – as creative as any work of art, any composition of music, and any scientific discovery. Economic development is, in fact, driven by creativity and innovation. Although ironically, some of the most creative and innovative entrepreneurs will say they’re not creative because they don’t think of it in that context. Most people think creativity only resides in the arts. It actually mostly resides in economic development matters.

Q5 Do you have a vision for creativity at OSU specifically?

Yes. The goal would be to first create a culture of creativity where all of our scholars, scientists and students are free to explore creative ideas, to collaborate, and to develop entrepreneurial programs that will involve many disciplines. To make that happen, we’re going to have to promote it, support it and celebrate it when it happens. I see OSU developing into a truly interactive venue of intellectual capital.

Q6 How do you see OSU developing as a truly interactive venue of intellectual capital?

The next fundraising focus is going to be two-fold. One focus will be in the area of scholarships; the other will be creating platforms for the further development of our research capabilities. Think one of the reasons states like Oklahoma don’t get their “fair share” of research dollars is that we often don’t have the infrastructure – not just with labs and facilities but with the scientists that are in those labs. Once we develop the resources to retain and attract the best scientists and provide the best facilities, I think the research dollars will follow. We also have to have ample scholarship money to attract students who are committed to this kind of creative endeavor. If we can put those two things together, I think it will march us forward significantly in our hope to be the example of a modern land-grant university.

Creating a Culture Where Creativity Thrives

As the 18th President of Oklahoma State University and the OSU System, Burns Hargis oversees one of the nation’s most comprehensive land-grant university systems with more than 32,000 students, 7,400 employees, and campuses located in Stillwater, Tulsa, Oklahoma City and Okmulgee.

A firm believer in the power of imagination and collaboration, Hargis was the first chair of the Oklahoma Creativity Project, a statewide initiative to establish Oklahoma as a world-renowned center of creativity and innovation in commerce, culture and education.

Hargis, who holds degrees in accounting from Oklahoma State University and in law from the University of Oklahoma, is the second OSU graduate to hold the presidency, following Dr. John E. Gifford. Dr. Gifford served as president from 1952 to 1966, graduating from then Oklahoma A&M in 1923.

Prior to coming to OSU, he was Vice Chairman of Bank of Oklahoma, N.A. Before joining Bank of Oklahoma in 1997, Hargis practiced law in Oklahoma City for 28 years, most recently with the firm of McAfee & Taft. He is a former president of the Oklahoma County Bar Association, former president of the Oklahoma Bar Foundation, and is a Fellow of the American Bar Foundation. Hargis served as vice-chairman of the then Oklahoma State Election Board, the Oklahoma Constitutional Revision Commission, and served as Chairman of the Oklahoma Commission for Human Services. He is a former member of the Commission of the North Central Association of Colleges and Schools. Hargis was a candidate for the Republican nomination for Governor of Oklahoma in 1990.

He has served and chaired many boards, including the Board of Regents for the Oklahoma Agricultural and Mechanical Colleges of Oklahoma State University.
Creativity to become cornerstone for Oklahoma State University

Oklahoma State University is rethinking and rebuilding the foundation on which research stands by officially adding creativity and innovation into the fabric of standard research.

Creative fields such as music, poetry, psychology, and other artistic endeavors are often overlooked by traditional research principles. John Mowen, Regents professor and Noble chair of marketing strategy in the Spears School of Business, wants to make sure creative endeavors get the recognition they deserve. “OSU has faculty who are writing books and poetry, composing music and performing theater,” Mowen said. “They are doing what is perhaps more appropriately called ‘scholarship,’ and research does not traditionally include every aspect of scholarship. These are the creative endeavors needing to be recognized.”

Mowen's commitment to recognizing and nurturing creativity at OSU began when he learned of OSU President Burns Hargis’ vision to make Oklahoma the “state of creativity.”

In the spring of 2008, Hargis spoke to Mowen and the Regents professors at their spring function about the Oklahoma Creativity Project, of which Hargis was the first chair. In this speech, Hargis indicated he would like to make OSU a leader in creativity and innovation. “Creativity and innovation are at the core of our vision to create a modern land-grant institution,” Hargis said. “There is no place better than a university campus to inspire creativity and discover innovative ways of problem solving and approaching global issues.”

Mowen explained that emphasizing these concepts fits nicely with OSU’s mission as a land-grant university. “OSU can claim leadership in creativity by taking the organizational steps necessary to maximize the role of creativity in five domains – scholarship on creativity, creative instruction, discovery, innovation, and community service,” he said. “Within these domains, one finds the three components of OSU’s mission—instruction, research, and outreach. By organizing OSU to focus on these arenas, our university can achieve the goal of becoming internationally recognized as one of the leading land-grant universities.”

Taking action

After learning about Hargis’ desire to make OSU a creativity leader, Mowen created a steering committee that will spearhead the effort to make OSU a leader in creativity and innovation. This goal has become known as OSU Creativity Initiative.

As part of a comprehensive plan to make OSU a leader in creativity and innovation, the team decided to hold a Creativity Festival. The festival will recognize creative endeavors from students and faculty, and will communicate these endeavors to those outside OSU. The Creativity Festival will be held during Research Week 2009, which is titled “Celebrating Creativity and Innovation.”

Research Week is a perfect outlet to carry out the goal of recognizing creativity and innovation in scholarship and research, said Stephen McKeever, OSU vice president for research and technology transfer. “Research, by its very nature, is creative and innovative,” McKeever said. “It is our obligation to push the boundaries of our understanding and to think about the world around us in new and different ways.”

Mowen said the goal of the Creativity Festival during Research Week is to showcase all aspects of creativity and innovation at OSU – in both scholarship and research.

“The festival will have presentations and booths in which different groups from across campus can illustrate the importance of creativity and how they have used it to promote the arts and their own activities,” McKeever said. “An artist may cause us to pause and view the world in a way we haven’t seen it before, and this goes hand in hand with research. It needs to be a part of the festival.”

The Right Leader

Mowen has become a champion of this creativity initiative because of his love for the arts. “I have a strong interest in all phases of creativity, from the arts to science,” Mowen said. “I love new ideas, I love new things, and making creativity and innovation part of OSU’s brand will energize the campus, attract students and increase research.”

Beyond Mowen’s academic work, he is a semi-professional artist. He creates images from photographs, and his original digital designs can be seen in galleries in Texas, Arizona, Colorado and Oklahoma. Mowen also plays the piano and conducts psychological research. “John is the perfect person to lead this initiative,” McKeever said. “When he suggested highlighting creativity for Research Week, I immediately said ‘yes.’”

In order for OSU to become outstanding, Mowen thinks the university must find a niche. “We can become outstanding and unique, and it will differentiate us from other universities,” he said. “This initiative is academically sound and is important for the community because of our focus on outreach and community service.”

Through Mowen’s creativity research, he found environment is key to creativity. “To support creativity, the environment must be willing to accept diverse ideas and encourage people to challenge ideas,” Mowen said. “Right now OSU is famous for its sports and its friendliness. We need to add an outstanding academic element to this, and creativity will become a cornerstone in setting OSU’s reputation as a leading university.”

The creative process will spawn more opportunities for faculty and better prepare students for a new and constantly evolving world. “I appreciate John’s leadership on this initiative,” Hargis said. “It has the potential to transform learning at OSU.”

Emily Kilian

Let’s Get Creative!

On Feb. 16-17, 2009, Oklahoma State University will host the OSU Creativity Festival, which is being held in conjunction with OSU Research Week. The Festival will feature a wide variety of activities aimed at sparking creativity and innovation throughout the OSU system.

- Panel discussions about the role of creativity and innovation at OSU and in the workplace
- A plenary talk by Chic Thompson, creativity consultant to Fortune 500 companies, on “The Power of Possibilities: Unlocking Creativity and Innovation at OSU”
- Presentations of scholarship on creativity and innovation by OSU faculty and graduate students
- A keynote presentation by Bob Mankoff, cartoon editor for the New Yorker magazine
- A creativity challenge contest where students, faculty and staff submit proposals on ways OSU can be more creative and innovative. Winners will receive cash prizes.

For more information on these and other events taking place during the festival, visit http://researchweek.okstate.edu.

John Mowen is spearheading the OSU Creativity Initiative, which seeks to make OSU a leader in creativity and innovation. Mowen has become a champion of this creativity initiative because of his love for the arts and endeavors as a semi-professional artist.
The Power of a Peacemaker

OSU-Tulsa Researcher Explores Conflict Resolution in Tulsa's Youth

Through her research, OSU-Tulsa professor Dr. Amanda Morris is helping about 60 families from two Boys and Girls Clubs of Tulsa learn how to manage emotions and resolve conflicts in a nonviolent manner.

Whether it’s bullying, teasing, jealousy, sibling disputes or playground fights, many young people are caught up in conflicts every day and they don’t know how to handle them.

Dr. Amanda Morris, associate professor of human development and family science at OSU-Tulsa, is working to provide youth with the knowledge and skills they need to resolve conflicts in a nonviolent manner.

With funding to support the study from the Oklahoma Agricultural Experiment Station, Morris and her team of trained OSU researchers, graduate assistants and students from Tulsa and Stillwater are trying to make a difference by promoting resilient and healthy family behaviors.

“One of my passions is to help at-risk youth and families through my research projects and related outreach,” Morris said. “Helping early adolescents learn how to manage emotions and handle conflict is one of the best ways to reach this goal and we are seeing a lot of success.”

Morris said the objective of her research is to assist Tulsa-area parents and youth (ages eight to 12) who are at an increased risk for community violence, economic distress and difficulties in effective parenting and family interaction. Learning how they cope with emotions and conflict can give parents, teachers and other community members the insight they need to promote and encourage peaceful conflict resolution and improve conditions in their homes, schools and community.

The Facts

According to the Office of Juvenile Justice and Delinquency Prevention in the U.S. Department of Justice, conflict resolution education can help bring about significant reductions in suspensions, disciplinary referrals, academic disruptions, school fights and family and sibling disputes. By providing young people with the knowledge and skills needed to settle disputes peacefully, they can successfully prevent conflicts from escalating into violent acts.

Working with about 60 families from two Boys and Girls Clubs of Tulsa, Morris and her team are evaluating several factors before and after participation in a conflict resolution intervention program. The program, “I Can Problem Solve,” was developed by Dr. Myrna Shure, a developmental psychologist and professor of psychology at Drexel University. The adapted 10-week intervention program aims to strengthen parent-child communication and conflict-resolution skills by teaching perspective-taking, effective communication, problem-solving and means-end thinking.

“Many young people turn to gangs, drugs and violence to make them feel better about themselves,” Morris said. “We want to teach kids positive ways to handle emotions and related stress. We want to reach youth early in adolescence before negative influences and destructive coping patterns set in.”

Morris’ research findings during an earlier study at the same Boys and Girls Clubs of Tulsa in 2006 suggested the need for conflict-resolution programs. The results indicated that those children were being exposed to moderate to high levels of violence in their neighborhood. Sixty-two percent of the children reported hearing gun shots; 48 percent reported seeing drug deals: 74 percent reported seeing someone being beaten up; 16 percent reported seeing someone get stabbed; and 23 percent reported seeing someone get shot.

“Violence in communities is a pervasive contextual factor in child and adolescent development,” Morris said. “Youth exposed to high family and peer conflict may see this type of family interaction as an appropriate way to deal with conflict, increasing the risk for destructive interaction within families and communities.”

Promising Results

The 2006 research study was Morris’ first as a professor at OSU-Tulsa. Since her initial findings, she has worked continuously to get funding and the appropriate approvals to put the “I Can Problem Solve” intervention program in place.

Though Morris is still collecting data for her current study, she is already seeing promising results.

“What we’re finding so far is that their responses to conflict are becoming much more positive after the intervention,” Morris said. “The program really seems to be making a difference.”

OSU-Tulsa President Gary Trenepohl said Morris’ research and work with Tulsa’s youth are great examples of the many OSU professors and students who are impacting communities through their academic efforts and research expertise.

“University-community partnerships are exciting and beneficial for everyone involved. Our faculty and students have the opportunity to apply their research skills and knowledge to a real-world problem and assist local organizations with their goal of improving the quality of life for individuals and families in the community,” Trenepohl said. “OSU-Tulsa will continue to focus on conducting research that is relevant and beneficial to the needs of our community.”

Morris hopes to broaden her research intervention project across Oklahoma, as well as collect similar data in other parts of the world. She is conducting related research in Kenya that involves families who live in extreme poverty, high-risk environments with no running water or electricity.

The Center will partner OSU researchers with local social service agencies to tackle problems and find solutions for issues in the community.

Morris admits that although the focus of her research is difficult at times, she loves working with young people and looks forward to a career of seeing them succeed.

“I’ve always wanted to do this. I’ve just always wanted to help families,” Morris said.

Trish McBeath
Food allergies are an important health concern in developed countries. According to several European and American studies, food allergies affect about 2 percent of the adult population and 8 percent of children. In addition, it has been estimated that more than 20 percent of all allergic reactions are caused by foods.

Because of these data, researchers at the Robert M. Kerr Food & Agricultural Products Center on the Oklahoma State University campus are currently evaluating methods to rapidly detect specific allergens in foods.

The idea for this project developed from a brainstorming session by a food science research initiative team in OSU’s College of Agricultural Sciences and Natural Resources. Christina DeWitt, FAPC food chemist, and a team of food science researchers decided to tackle the issue and help to improve consumer food safety.

“When reviewing possible allergens, it was brought to our attention by someone in the food industry, a former OSU graduate, that allergen detection kits for soy proteins were not reliable,” DeWitt said.

Tackling the Problem
To help solve this problem, Tyler Tate, OSU food science graduate student, conducted the study for his master’s program. Tyler currently works in research and development for the Advance Food Co. in Enid, Okla.

“This study was designed to use real-time PCR as a method to detect soy DNA as an indicator of the presence of soy in foods,” Tate said. “These results can be used to help design an assay to detect the presence of soybean DNA fragments in food samples.”

PCR, or polymerase chain reaction, is a method to amplify short DNA sequences within a long DNA chain. Real-time PCR results are measured by fluorescence spectroscopy, which can be used to determine the presence of soy in a food.

Problems with Allergen Detection
Allergen detection kits are based on an antigen-antibody interaction. The antigen is the allergen, which in foods is typically a protein. In fact, the majority of allergens are proteins. The Enzyme Linked Immuno Assay, or ELISA, is the common antigen-antibody method used to detect proteins in a sample.

The antibody used by the kit binds specifically to the protein of interest. However, proteins are often altered during the processing of foods causing problems with antibody detection. Changes in protein shape and size make it difficult for the antibody to detect the protein, and the result is often a false negative.

“Since soy products are commonly highly processed, the soy protein’s shape and size can be altered not allowing ELISA to detect it,” Tate said.

The approach for this project was to attack the problem of allergen contamination from a food labeling perspective.

“Food labeling laws require that you identify whether or not a food is a source of the allergen in the product,” DeWitt said. “So, you aren’t really saying yes, there is an allergen or no, there is not an allergen. You are saying either there is an allergen-containing food or no there is not an allergen-containing food in the product.”

Instead of developing a method to test the presence of allergens, DeWitt, Tate and other researchers developed a method to test the presence or absence of the allergen-containing food.

“The best way to do this is through DNA detection,” DeWitt said. “DNA detection does not rely on the ‘shape’ of the DNA; it relies on identifying a sequence of nucleic acid in the DNA that is unique to the product or food in question. In soy, this comes from a specific region of the DNA that is unique to soy called the soy lectin gene.”

Detecting Soybean DNA
A variety of different soy products where obtained from commercial food ingredient suppliers to evaluate the rigor and specificity of soybean DNA detection using real-time PCR.

“Soy protein concentrates, soy protein isolates, soy flour and soy protein-fiber-lecithin are all highly processed products,” DeWitt said. “This means the DNA will likely be degraded to varying degrees in each type of product.”

DNA was extracted from each soy product, and real-time PCR was used to detect the soy lectin gene. The results demonstrated that processing did cause significant degradation of the DNA, however, this did not prevent real-time PCR from detecting the presence of soy.

“Neither processing conditions nor the amount of DNA degradation affected the detection of soybean DNA,” Tate said. “This method is another approach to attacking the problem of food allergens, specifically soy products, being present in foods.”

The Big 8
In August 2004, President George W. Bush signed the Food Allergen Labeling and Consumer Protection Act, or FALCPA, which required labeling on food that contains certain allergenic ingredients known as the “Big 8.”

The purpose of FALCPA is to ensure that foods containing the “Big 8” allergens, which include cow’s milk, eggs, crustaceans, fish, peanuts, wheat, soybeans and tree nuts, or a derivative of these allergens, give sufficient information on the presence of the allergen in the food. The “Big 8” accounts for about 90 percent of food allergies in the United States.

The only effective treatment to prevent possible life-threatening reactions to food allergies is to strictly avoid consuming these allergenic foods; which makes it necessary to provide sufficient information about potentially allergenic ingredients on food labels.

According to a Japanese study, soybean labeling is particularly important, citing the almost unlimited uses of soybean and the number of people with soybean allergies. It has been reported that 16 allergenic proteins have been found in soybean seeds.

“These statistics show just how important our research is in detecting allergens in soy-containing foods,” DeWitt said. “Detection of allergen-containing foods, like soy, is possible with real-time PCR without having to worry about false positives or negatives caused by food processing conditions or interference by the food substance itself.”

Mandy Gross and Stacy Patton
Edward Jones has dedicated more than 25 years to working on the Milton Quarterly, the first journal in the U.S. devoted exclusively to the life of English poet John Milton who composed the epic poem Paradise Lost.

Every time OSU professor Edward Jones starts to grasp the life and writings of poet John Milton, he reminds himself his research has been shaped by luminaries such as T.S. Eliot and C.S. Lewis.

“To go into this field and think you are an expert, to think you know everything, that is a terrible mistake,” Jones says. “I am helping fill in the blanks.”

The gaps are aplenty. How many residences did Milton have? At least 10 are known, Jones says. Are there others? Where are Milton’s first wife and only son buried? What are the birth and death dates of Milton’s sister? When did Milton go blind?

“I continue to search for these documents,” Jones says. “It’s all very strange. Milton’s life is so well documented and yet so many essential facts remain unknown.”

Jones senses that family skeletons may account for missing records. He gives examples:

Filling in the Blanks

Locating manuscripts in remote and ancient places is like researching your family tree, Jones says. “There are enormous records relating to Milton’s life, yet huge gaps remain in his biography. I am helping fill in the blanks.”

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The gaps are aplenty. How many residences did Milton have? At least 10 are known, Jones says. Are there others? Where are Milton’s first wife and only son buried? What are the birth and death dates of Milton’s sister? When did Milton go blind?

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With a newly acquired $1.3 million grant from the National Science Foundation, researchers from Oklahoma State University and the University of Oklahoma are on the hunt for new microorganisms. The five-year award enables the scientists to detect, identify and isolate four groups of unique microorganisms and study them in the laboratory.

“Our goal is to bring these microorganisms to light so that other scientists that have more applied ideas – like looking for new antibiotics or new enzymes for bioethanol production – will have these new microorganisms in their arsenal,” said Dr. Mostafa Elshahed, assistant professor of microbiology and the lead OSU researcher on the project. “We know for sure there are thousands of new microorganisms in nature, we are focusing on the ones that are present in the highest numbers at our study site.”

Researchers collect the microorganisms from the sulfur-rich Zodletone Spring in southwestern Oklahoma. The Zodletone spring is ideal for this research, Elshahed says, because it has abundant sunshine, a lack of oxygen and a high concentration of hydrocarbons. “That spring has a combination of things that are common by themselves but rarely come together,” Elshahed said. “It appears when all these environmental factors come together they select for these novel microorganisms.”

OSU received $800,000 of the total award, which Elshahed, post doctoral student Noha Youssef and graduate student Jim Davis will use to accomplish two of the project’s three main goals. First, they will identify and analyze the genome, or DNA, of the microorganisms. Second, the team will attempt to tame the microorganisms by growing them in the laboratory.

Since the microorganisms are anaerobic (i.e. die in the presence of oxygen), keeping them alive to monitor their behavior and evaluate their characteristics will be key to the success of the project. For that reason, Elshahed said much of the work will be conducted in an anaerobic glove bag, a plastic, dome-like chamber that seals out oxygen and can be filled with gases similar to those present in the spring.

OU received $500,000 of the total award, which will be used to evaluate the way the microorganisms behave in the spring. “If we know how they behave in the spring it will give us a better indication of where else they could be,” Elshahed said. “If you know how they behave in the spring it also helps you tame them in the lab.”

An educational outreach component of the grant will allow high school students to be involved as well. Led by Dr. Caroline Beller, assistant professor in the OSU College of Education, the award will fund several high school students who will participate in the research process and then present their results at the Junior Science and Humanities Symposium, a regional competition that takes place each year on the OSU campus.

“It gives these students the opportunity to do university-level research that they normally wouldn’t be able to do at a high school,” Beller said. “It’s a great learning experience.”

Work with a similar philosophy has been going on for the last 20 years and has resulted in many useful products such as antibiotics and commercially useful enzymes, Elshahed said. With today’s more sophisticated techniques and equipment, this team is hoping for similar or even better results.

Kelly Green
Students from Oklahoma State University’s Radiation Physics Laboratory are taking research to a whole new level – literally. With simple materials and a lot of ingenuity, the students have constructed and successfully launched two cosmic radiation detectors that reached the edge of outer space.
Funded by a three-year NASA EPSCoR grant, the program, which is a collaboration with the OSU School of Mechanical and Aerospace Engineering (MAE), seeks to uncover information about radiation levels at varying altitudes – information that will be used by NASA to develop instrumentation for space flight.

“Our project is unique because we are not only developing and fabricating new radiation detection instrumentation for use in space, we are field testing the instrumentation ourselves by launching it on high-altitude balloons,” said Dr. Eric Benton, assistant professor of physics and co-principal investigator on the grant. “The use of high-altitude balloons provides the students with hands-on experience in carrying out research in physics and in engineering, as well as providing us with a practical means of achieving the research objectives of the project.”

**Starting the process**

Benton, who has flown detectors on long-duration, high-altitude balloons with NASA for years, said he was unaware until about three years ago that college students could conduct these types of experiments and get results in a matter of hours.

When he arrived at OSU, he heard about Dr. Andy Arena’s Atmospheric and Space Threshold Research Oklahoma (ASTRO) program. Sponsored by the NASA Oklahoma Space Grant Consortium and OSU, ASTRO provides low-cost access to the space environment by launching payloads on weather balloons.

“We’ve used it to give students an introduction to aerospace engineering,” Arena said. “They get hands-on experience building satellites, taking data and other things of that sort.”

But Benton was curious about the other possibilities. “We got together for lunch, tossed around ideas and said one of these days we should collaborate,” Benton said. “When the NASA EPSCoR opportunity came up, I knew this had to be a major component of it.”

The team received the grant in September 2007 and launched the first detector on July 10, 2008. “Our first attempt was really a proof of concept,” Benton said. “It’s a very conservative design. We wanted to keep it really simple so if something went wrong we’d know what it was.”

Much to their delight, however, the flight was flawless. The detector, as well as a high-resolution camera, sensors for temperature, pressure and humidity, and a GPS module to determine altitude and geographic position, launched from the OSU-Stillwater campus at 9:18 am. A helium-filled balloon spanning 12 feet in diameter carried the payloads to 104,000 feet in altitude – an area known as the Pfotzer Maximum.

“Cosmic radiation present in the atmosphere is composed almost entirely of secondary particles, which are emitted through a series of nuclear reactions as primary cosmic rays penetrate into the atmosphere,” Benton said. “The Pfotzer Maximum is the region where the density of secondary particles is the greatest.”

Above the Pfotzer region, Benton said secondary particle production via nuclear interactions is greater than particle losses through ionization. Below the region, ionization dominates secondary particle production and the number of secondary particles slowly decreases with altitude.

“It’s really great to see that the Astro program has been useful for a research mission,” Arena said. “I’m just thrilled that we could put their payload on our balloon and they could get useful scientific data.”

For the third flight, Johnson plans to revamp the detector to include much more sophisticated electronics, including a change from through-hole to surface-mount electronic components.

“The jump to surface-mount basically allows you to increase the density of components on the circuit board space,” Johnson said. “The third version will be about one-fifth the size of the first, be much lighter weight, and still possess the same capability.”

**Sharing their success**

In addition to the development of instrumentation for use in space flight, educational outreach is a component of this NASA EPSCoR award.

Although future detectors designed by Johnson and the team for NASA will likely be too sophisticated, Benton said the first detector will serve as a prototype for radiation detectors included in the Near Space Standard Science Platform, an experiment platform he hopes will be used by science students at high schools and colleges around the country conducting research with high-altitude balloons.

Using PVC pipe, simple electronics and other items readily available at local hardware stores, students will be able to build the detector for their own flights. Benton and the team intentionally kept the cost to build the detector low. The total for the first version was about $150.

“Another goal of the project is to promote student interest in science and engineering through experiments with high-altitude balloons,” Benton said. “There will be a range of possibilities. Some students could do the actual building of the instrumentation; some could just fly pre-made instruments to obtain useful data.”

The team plans to launch eight different detectors over the course of the project. The final detector will be sent on a long-duration NASA balloon launched from the Antarctic. Ultimately, Benton hopes similar detectors will be worn by astronauts. If outfitted with an alarm, he said the detector could warn astronauts about increasingly dangerous levels of radiation, especially when they are outside the space craft.

“This is an inexpensive way to test our detectors,” Benton said. “If they won’t work on one of these balloons, they won’t work in space; many of the environmental constraints are very similar.”

How the detectors will be implemented by NASA – either in space flight or for educational outreach purposes – is yet to be determined. What is certain, however, is that these OSU researchers will continue to reach beyond the limits.

Kelly Grace

A group photo after a successful first flight. Pictured left to right are: Joe Conner, Ladd Rupp, Dr. Eric Benton, Ryan Paul, Dr. Art Lucas, Xander Busk, and Carl Johnson.
For Health’s Sake

Nutritional Sciences Associate Professor Edralin Lucas would like to help reduce and perhaps prevent health problems with the naturally occurring compounds found in food. Her goal is to promote healthy foods that would prevent the development of chronic diseases and decrease the use of pharmaceuticals due to their side effects. She is particularly interested in compounds that affect cardiovascular disease, osteoporosis, and cancer.

Lucas, who holds a doctorate in analytical chemistry, and her research team have investigated the effect of flaxseed on lipid and glucose metabolism. She has also participated in research showing dried plums can help prevent and reverse osteoporosis. Her current projects measure the effects mangos, bitter melons and grapes have on cardiovascular health.

The National Mango Board is backing her investigation into the use of mangos to modulate glucose and prevent osteoporosis. While studies on mangos’ antioxidant, antiviral and anticancer properties have been conducted, research to determine mango effects on cardiovascular health was not available. Preliminary reports from animal studies conducted by Lucas and her team found that mangos show promise as a food that could help lower the risk of cardiovascular disease.

Using the flesh from whole Tommy Atkins mangos, the researchers discovered the fruit is as effective as the glucose lowering drug rosiglitazone and lipid lowering drug fenofibrate in reducing fat mass in mice. Lucas says the findings showed that mango can help prevent metabolic syndrome—a cluster of conditions like obesity, insulin resistance, high cholesterol and high blood pressure, which can increase the risk of cardiovascular disease.

The study also showed that the positive effect of mangos on glucose and lipid parameters is not accompanied by a negative effect on bone as seen with rosiglitazone. Whole body bone mineral density and bone mineral content were highest for mice fed mangos for two months and were better than those of mice fed rosiglitazone.

“We were pleased to find the mangos did not play a role in bone loss, and may actually improve bone density,” Lucas said.

Lucas is also researching the efficacy of bitter melon for diabetes, funded by the U.S. Department of Agriculture. The widely consumed Asian vegetable has hypoglycemic properties.

The study compared the effects of freeze-dried bitter melon with rosiglitazone and fenofibrate on body weight and glucose. Significant differences in body weight were observed within one week of beginning the study, Lucas said. “Body weights in groups fed bitter melon were reduced and blood glucose was normalized.”

But it’s yet another study that has grabbed the attention of Oklahoma’s grape growers and wine makers. Lucas is researching the anti-inflammatory properties of the grape varietes grown in Oklahoma. Her findings could boost sales for Oklahoma’s grape industry.

“Oklahoma had 49 wineries in 2005, and each worked with a different variety of grape. Since most grow their grapes, they could then look into producing the healthiest variety for their wine,” she says.

“Our findings will help Oklahoma grape growers market their products by promoting them as potentially beneficial to the prevention of inflammation related diseases,” Lucas says.

“The health benefits will not only be a strong promotional tool to market wine but could encourage some growers to expand their businesses to produce a ‘healthier’ grape juice as well.”

While everyone knows fruits and vegetables have long been recommended by the medical community as the foundation for health, Ed Lucas is proving why consuming them can reduce the dependence on chemicals to manage a variety of diseases and prevent others from occurring.

Edralin Lucas

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“We’re testing 33 varieties of Oklahoma grapes. We first determined each variety’s phenolic content – the compounds that we think provide health benefits. Now we’re using grape juice extract to test the anti-inflammatory benefits at the cellular level. The next step is to see how the compounds work in humans,” she says.

Lucas believes it would benefit growers and wineries to determine which variety of grapes offers the most health benefits. “Oklahoma had 49 wineries in 2005, and each worked with a different variety of grape. Since most grow their grapes, they could then look into producing the healthiest variety for their wine,” she says.

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Edralin Lucas
Using Innovative Ways to Train Graduate Researchers

Oklahoma State University’s Center for Veterinary Health Sciences and the Oklahoma Medical Research Foundation have partnered to address the growing shortage of veterinary scientists available to deliver modern science and medicine.

There is a nationally recognized need for increased numbers of veterinary graduates trained in comparative animal systems able to conduct advanced research in the health sciences. The National Research Council in a recent study, “Critical Needs for Research in Veterinary Science” (Committee on the National Needs for Research in Veterinary Science), warns that we are not training enough veterinary researchers to take advantage of scientific opportunities.

The CVHS is addressing the current shortage by proposing a combined Residency-Ph.D. training program at OSU’s CVHS and the OMRF. The program is set to begin in summer 2009.

“The training of veterinarians for academic careers is extremely critical due to the national shortage of veterinarians entering academic careers,” explains Dr. Michael Lorenz, dean of the CVHS. “Training residents to conduct biomedical research is an important preparation for faculty careers. This program is designed to prepare clinical scientists for productive academic careers.”

“This innovative collaboration will utilize the depth and breadth of our faculty expertise to train clinician-scientists for future clinical research careers,” he continues. “The OMRF faculty conducts cutting-edge research in biomedical science using a cross-disciplinary approach to medical research focusing on such critical research areas as heart disease, cancer, lupus, and Alzheimer’s disease.”

The areas of complementary and overlapping interest between the two institutions provide a good foundation to establish a unique and successful program with opportunity to expand over time based on the acquisition of extramural training grants.

Among the major areas for research activities are application and/or development of animal models of diseases of human or veterinary importance and new application of technologies, particularly bio-imaging, across these models. There are other areas of need such as diagnostic and pathology services, specialized animal housing, and other infrastructure that closer interaction might address to the benefit of both institutions.

“One of the greatest challenges we face as veterinary educators is recruitment of veterinary clinical specialists to pursue the advanced training and interest to fill open faculty positions,” says Dr. Charles MacAllister, department head of Veterinary Clinical Sciences. “This proposed combined program will allow us to train additional clinical specialists that will have not only clinical specialty training, but also the research training that will enhance their careers as faculty members.”

The research conducted by these future scientists would be directly applicable to advancing human and/or animal health and welfare. The first promising scientist would be trained in pathology. In subsequent years, a scientist could alternately receive training in radiology.

An interdisciplinary committee will mentor and advise each trainee. Outcomes of the program will be measured primarily by the number of successful scientists produced and transitioned into clinical (translational) research careers.

Eligible candidates must have a genuine intent to pursue an academic/clinical career and understand that this is an integrated program that leads to both board eligibility and the Ph.D. degree.”

A program advisory committee will advise and mentor students regarding career goals, plan of study, selection of funding, and clinical progress. This committee will include members of the Veterinary Biomedical Sciences graduate faculty, OMRF faculty appointed to adjunct positions, and clinical faculty in the specialty areas for residency training. Written evaluation reports will be submitted annually to the program advisory committee, the coordinator of the VBS Graduate Program, the dean of the CVHS, and president of OMRF.

Research training for the Ph.D. will occur concurrently over a six-year program. Throughout the program, students will be expected to maintain activity and presence in both residency and research environments, attending appropriate conferences, meetings, special training sessions and engaging in regular meetings with mentors across the range of activities.

The budget includes salary and benefits, and tuition support for one trainee for six years. Sufficient funds will also be available to mentors to supplement research activities and other training-related expenses, including nominal support for participation of the trainee in regional and national meetings. It is the long-term goal for this program to secure National Institutes of Health (NIH) funding. Until that occurs, the CVHS and OMRF will split the cost.

The Oklahoma State University Center for Veterinary Health Sciences is one of 28 veterinary colleges in the United States and is fully accredited by the Council on Education of the American Veterinary Medical Association. The Center’s Veterinary Medical Teaching Hospital is open to the public and provides routine and specialized care for small and large animals. It also offers 24 hour emergency care and is certified by the American Animal Hospital Association.
Creating an atmosphere for learning

Project CREATES is having a lasting impact on school children by changing the work of teachers in the Tulsa Public Schools.

Connecting Community Resources Encouraging All Teachers to Educate with Spirit (CREATES) was born in 2000 and Dr. Diane Montgomery, professor in the College of Education’s School of Applied Health and Educational Psychology, was there at the beginning. Montgomery served as the principal investigator for the project's research component.

The mission of Project CREATES was “to develop and deliver high-quality academic instruction infused with high-quality arts instruction for students attending urban elementary schools of need in the Tulsa community.”

After two years of the pilot work, the Barthelmes Foundation gave OSU a $250,000 contract in 2002-2003. At the end of that year, the foundation saw a major return on its investment and awarded another $1 million and a four-year contract (2003-2007) for research on cultural changes, equity, and sustainability of the activities.

“We looked at a culture of change connected to our conception of co-creation. Our goal was equity combined with excellence.”

Examples included a lesson titled “Stomp!” which taught students rhythm and patterns through composing and performing music using common objects; and “What a Wonderful World,” a lesson in which students created a painting or drawing and learned history by analyzing lyrics for the song.

“It was so successful that teachers became overwhelmed with how motivating it was to collaborate,” said Montgomery, who received the OSU-Tulsa President’s Excellence in Teaching Award in 2008.

Montgomery and her team employed a unique and innovative research model that used mixed methods. The research team did not serve to externally evaluate how the lessons were received by the children; they co-planned and implemented the project using immediate research feedback to change it. They were able to make adjustments to what was happening and then continue to document the culture.

“One of the innovations, we felt, was that the people providing services in the schools – the arts educators and our teachers – became researchers,” Montgomery noted. “They assisted in making observations and providing data to graduate students who were researchers in the schools.”

Another unique aspect of the program was that it focused only on teachers who responded to the invitation to participate. Total school commitment was not required. Teachers chose to participate at the level they felt comfortable in terms of their time commitments, interests, and strengths.

Project CREATES extended beyond the classroom and into the community in the form of visual art displays at libraries, student coffee houses, poetry readings, musical performances and plays. The events were attended by parents and families and supported by community agencies.

From the observations they made and the data collected, Montgomery and her team learned a number of things about the educators and children involved.

“They found that involvement in the arts did not take away from student achievement. Also, children who participated in music talent development were found to be better readers and were also better in science and social studies. Creativity scores increased.”

It was reported that children had a sense of accomplishment and were better with their self-governing behaviors – concentrating, intensity of thought and engagement with the task.

The research component continues, initial findings demonstrate the need for teachers to gain comfort in using the arts in their classrooms.

“We're proud to see the schools continue with combining equity and excellence in arts infusion and talent development,” Montgomery said.

Project CREATES research resulted in more than 30 publications and presentations at the regional, national and international level.

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Project CREATES set out to develop rich and challenging curricula for all students while identifying and supporting talent development with under-identified and under-served populations of students. Music and visual arts were the vehicles used. The project's focus included arts infusion, professional development for teachers and artists, talent development for students with interest or potential in the arts, and especially research on the outcomes.

The project aimed to expand on the traditional artists-in-residence model, which may be stand alone programs separate from other curricula. Arts Resource Coaches (ARCs) worked with teachers and artists daily in Project CREATES.

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Consider it the basis of the coming bio-based economy: Build a better plant and strengthen local communities, thereby improving the quality of life for residents.

The ultimate goal is to create renewable energy from high-yield, high-quality plants that can help meet the world’s needs in economically viable and environmentally sound ways, said Yanqi Wu, a plant breeder with Oklahoma State University’s Division of Agricultural Sciences and Natural Resources.

“It’s a simple concept, but the science needed to realize the goal can be quite involved,” said Wu, a faculty member in the department of plant and soil sciences, whose biofuels research got a boost in November thanks to new funding provided through the Oklahoma Experimental Program to Stimulate Competitive Research.

EPSCoR is on tap to receive $20 million from the National Science Foundation and Oklahoma State Regents for Higher Education at a rate of $4 million annually, renewable for the next five years.

The EPSCoR funding supports a collaborative project led by OSU’s Ray Huhnke, director of the division’s Biobased Products and Energy Center; Lance Lobban, director of the University of Oklahoma’s School of Chemical, Biological and Materials Engineering; and Kirankumar Mysore, a professor at the Samuel Roberts Noble Foundation.

“A high percentage of our OSU involvement will be Dr. Wu and his group,” Huhnke said. “Yanqi will be working with scientists across the university community to enhance development in both yield and quality of switchgrass.”

**Science at the Molecular Level**

Wu and his fellow collaborating scientists will be studying DNA to identify genomic regions responsible for the major components of biomass switchgrass. They will also examine the gene expression profiles associated with switchgrass development and the makeup of plant structure as it relates to biomass yield. A third major factor will focus on plant stress resistance, a key to protecting biomass yield potential.
“Dr. Ranmanjalu Sunkar’s work with small RNA’s is extremely exciting and cutting edge,” Wu said. “Small RNA’s are important because they regulate plant gene expression. The ability to effectively utilize small RNA activities is a relatively new field of research, and is the foundation of enhancing scientific understanding necessary to ultimately produce improved varieties of plants.”

Wu, Sunkar and Ramamurthy Mahalingam, who like Sunkar is a member of the OSU department of biochemistry and molecular biology, will be creating cost-effective feedstocks that can then be converted by microbial and chemical processes to produce desired products such as biofuels.

Huhnke will be working closely with the University of Oklahoma to make use of the scientific and technical advances discovered and developed by the research teams led by Wu, Sunkar and Mahalingam.

Growing Intellectual Capacity

As part of its research focus, the EPSCoR funding will provide the division and OSU with opportunities to hire new faculty, post-doctoral scientists, research engineers and graduate and undergraduate students.

“Think of the EPSCoR funding as growing Oklahoma’s intellectual capacity in the field of plant development and conversion technologies,” Huhnke said. “This is an important component of attracting industry to the state. Our cellulosic ethanol research is already well known throughout the nation. This will solidify Oklahoma’s status as a leader in the use of state resources to develop liquid fuels and other forms of energy.”

Oklahoma is one of only four states that have 10 or more distinct eco-systems. This has helped foster the division’s vision about what it will truly take to create a sustainable, renewable energy system.

Plants that might work best in one part of the state will not necessarily be the best choice for biofuels feedstock in another part of Oklahoma; the same holds true on the national scale, where it might make more economic and environmental sense for states or regions to favor certain feedstocks over others, said Clarence Watson, associate director of the division’s statewide Oklahoma Agricultural Experiment Station system.

“Our vision of a decentralized system has received a great deal of interest from U.S. government officials as they look at developing a national renewable energy policy,” he said. (see sidebar) “Key elements of the science that will help create a viable biobased economy are going on right now, right here in Oklahoma, and the EPSCoR funding is playing a vital role.”

Improving Quality of Life

The division is comprised of the OSU College of Agricultural Sciences and two state agencies: the Oklahoma Agricultural Experiment Station, with 17 research stations situated across the state, and Oklahoma Cooperative Extension Service, working side-by-side with local residents through county, area, district and state offices serving all 77 counties in Oklahoma.

“Our land-grant mission is to tackle issues and concerns of importance to Oklahoma, and the activities associated with the EPSCoR grant are a good example of some of the ways in which we take science-based discoveries and turn them into practical programs that benefit the public,” Watson said.

The grant allows for summer technology academies, mobile science vehicles and teacher-training workshops aimed at exposing students and teachers from kindergarten classes through high school to cutting-edge science related to bioenergy.

At the collegiate level, the funds support undergraduate student research experiences in academia and industry that will promote increased awareness about bioenergy and stimulate the recruitment of talented next-generation problem-solvers into graduate-level programs.

“A statewide cyber-infrastructure consortium will be established,” Huhnke said. “Conferences to encourage multi-disciplinary, multi-campus collaborations will be supported, which should also enhance faculty competitiveness in securing future grants.”

An entrepreneurial workshop, a business plan competition for students and vouchers to assess the commercial potential of researchers’ inventions also are on tap, each of which will help foster the spirit of creativity and entrepreneurship vital to creating a sustainable biobased economy.

Huhnke said the educational initiatives not only strengthen Oklahoma’s business capacity, they also promote the inclusion of historically underrepresented groups through collaboration with 890 land grant institutions and tribal colleges.

“The EPSCoR funds will enhance our ability to facilitate the transition of students from high school to college, provide culture-armed counseling support and promote programs aimed at retaining students pursuing science, technology, engineering and math disciplines,” he said.

Other initiatives will promote the effective communication of biofuels-related advances in order to enhance public awareness about the value of science.

Watson adds it is important to remember that science moves at its own pace; researchers do not just snap their fingers and immediately come up with the solution to a concern or issue.

“It’s only because visionary scientists, engineers and agricultural economists at OSU and some of our peer institutions began studying biomass-based energy and the economic, environmental and social implications of a biobased economy back in the early 1990s that the United States today is close as it is to a sustainable biobased energy system,” he said.
Smallpox has a nasty history throughout the world. Caused by poxviruses, smallpox is one of the few disease-causing agents against which the human body’s immune system is ineffective in its defense.

A major breakthrough by Junpeng Deng, a structural biologist in the Division of Agricultural Sciences and Natural Resources (DASNR) at Oklahoma State University, and his first-year Ph.D. student, Brian Krumm, may be the first step towards a pharmaceutical medication for smallpox and the emerging human monkeypox.

The human immune system is rendered helpless against poxviruses partly because the viruses block a human immune molecule, interleukin-18 (IL-18), from sending out a signal to the immune system. The body acts as if everything is fine and the deadly disease takes over.

Deng and Krumm joined an ongoing project midway through 2007 and Krumm found what he was looking for in December 2008. They solved a three-dimensional crystal structure of a poxvirus protein in the act of disarming the IL-18.

“We capped a lot of others’ research. This is additional information provided,” said Krumm, who is credited as the major contributor to the research. “We also show many things through the structure that can’t be revealed through traditional molecular biology and immunology.”

The study is published in the Dec. 22 early online edition of the Proceedings of the National Academy of Sciences of the United States of America.

“We know now how the proteins communicate with each other,” Deng said. “In the future, we can design a drug to stop the poxvirus from blocking the IL-18 protein.”

As there is currently no medication for poxvirus-caused diseases, this research could aid national and international security efforts against potential poxvirus use as bioterrorism.

Deng called the finding an example of “killing two birds with one stone.”

“At this time we only have very limited medication to treat autoimmune diseases,” he said.

For example, rheumatoid arthritis is one of the most prevalent autoimmune diseases in which IL-18 is too active, leading to the body attacking its own cells. Deng said seeing how IL-18 interacts with the poxviruses will help with the development of effective inhibitors against overreaction.

“There are still a lot of questions to be answered. This is just the beginning,” Deng said.

“This opened up a new area to explore: How we design medication for autoimmune diseases. We want to provide more and more structural insights.”

Deng and Krumm will continue to do research in the lab created two years ago in November 2006, when Deng joined OSU with funding provided by a start-up fund from DASNR.

“Junpeng is a relatively new assistant professor at OSU and has already demonstrated some excellent work,” said Gary Thompson, head of the department of biochemistry and molecular biology. “I’m really impressed with not only Junpeng, but also the quality of work from his Ph.D. students.”

Deng and Krumm did their research in the lab at OSU, but recognize the help they had from other researchers.

“Credit also goes to Yan Xiang and Xiangzhi Meng, our collaborators at the University of Texas Health Science Center at San Antonio,” Deng said of the multi-institutional effort. “I believe our excellent collaboration will bring more success in the future.”

Sean Hubbard