

Department of Biological and Agricultural Engineering  
 Dale Bumpers College of Agricultural, Food and Life Sciences  
 and the College of Engineering



From  
 the  
**Department  
 Head**  
 Dr. Lalit R. Verma

## Biological & Agricultural Engineering Experiencing Changes Across the Nation

*By Fred Miller*

One of the top 20 advances in the industrial revolution in the first half of the 20th century — the mechanization of agriculture — involved agricultural engineers, including those in the Department of Agricultural Engineering at the University of Arkansas.

The discipline now is focused on much smaller machines, some of them the size of a cell or molecule, in addition to the large mechanical systems involved in producing and processing crops and food products, said Dr. Lalit Verma, head of the UA department that changed its name in 1988 to Biological and Agricultural Engineering.

Verma was one of five members of a task force that proposed a recent change in the name of the American Society of Agricultural Engineers to the American Society of Agricultural and Biological Engineers.

The change reflects a movement on university campuses to change departmental names and the name of the major, which became biological engineering in 2001 at the U of A. Undergraduate student numbers have increased from about 20 before the name and focus of the major were changed to about 100 now, Verma said.

The department is in both the College of Engineering and Dale Bumpers College of Agricultural, Food and Life Sciences. Most faculty members also have research or extension appointments in the UA System's statewide Division of Agriculture.

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*“We are the only discipline that integrates engineering with living systems”*  
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“We are the only discipline that integrates engineering with living systems,” Verma said.

“The discipline has grown from agricultural production technology, which is still important, to include food processing and storage, the environment, health and nutrition,” Verma said. “We have always worked with biological systems, which is what agriculture is, but we have expanded into areas such as health and nutrition and ecological sustainability.”

“Major advances in the life sciences and biotechnology have provided new ways to combine biological sciences and engineering in areas such as nanotechnology.”

The Department is pleased to announce Dr. Brian Haggard as the newest member of our faculty. Dr. Haggard has worked for the USDA-ARS and served previously as adjunct assistant professor in the department. He will serve as an associate professor in ecological engineering.

◆ ◆  
 In April, the department will host the annual Arkansas Academy of Biological & Agricultural Engineering Banquet. The banquet will be at the Clarion Inn in Fayetteville. The Academy will recognize the 2005-2006 scholarship recipients and have a silent auction. We look forward to celebrating another class of inductees.

◆ ◆  
 Dr. Otto Loewer was named the 2005-2006 president of ASABE. For more information please see page 5.

◆ ◆  
 Dr. Indrajeet Chaubey was awarded a grant from the USDA in the amount of \$650,000. The proposal was ranked No. 1 by the peer review panel.

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## Grants

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G. Huitink and S. Bajwa. Cotton Foundation. Precision farming technology for developing subsoiling guidelines in Arkansas. \$3,000.

T. Costello. NASA. GSRP: Heat transfer within a hypobaric plant growth chamber. \$24,000.

I. Chaubey and J. Popp. USDA CSREES. IREECGP (406). Effectiveness and optimization of BMPs in improving water quality from an agriculturally dominated watershed. \$650,000.

I. Chaubey and M. Matlock. Arkansas Soil and Water Conservation Commission. Watershed response modeling in 11-digit priority watersheds in Arkansas. \$76,104.

M. Matlock. Arkansas Soil and Water Commission. Adaptive management approach for review of the Arkansas NPS management plan. Demonstration of low-impact development best management practices. \$292,879.

I. Chaubey, M. Matlock and S. Bajwa. US EPA. Environmental resource management to develop watershed technologies and management tools. \$148,800.

B. Haggard. USDA ARS. Research support. \$11,000.

J.W. Kim, R. Deaton and S. Tung. USDA CSREES. NRICGP. Engineering ultrasensitive, electrically addressable nanotube-wire through controlled DNA-nanotube interfacing. \$157,000.

M. Matlock. City of Fayetteville. Analysis of land use impact on stream ecological services in Fayetteville, AR. \$119,477.

B. Haggard. USDAARS. FY2006 Task order #1 and #2—Research support. \$162,011.

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## New Projects

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J.W. Kim. Engineering Ultrasensitive, Electrically-Addressable Nanotube-Wire Nanosensors through Controlled DNA-Nanotube Interfacing.

I. Chaubey and J. Popp. Effectiveness and Optimization of BMP's in Improving Water Quality from an Agricultural Watershed.

M. Matlock. Impact of Rural and Urban Land Use Change Processes on Ecological Services.

P.G. Crandall and C.L. Griffis. Validation of Acceptable Log Reductions of Pathogenic Bacteria Using Thermal and Nonthermal Processes.

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## How Does Engineering Work?

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Students in Dr. Julie Carrier's Biological Engineering Design Studio I class prepare hands-on research to see how engineering works in biological systems. Design Studio meets twice a week at the Biological & Agricultural Engineering Research Center located off campus. The course is designed to create projects that explore the unique problems associated with engineering applied to biological systems. Group

activities are used to teach teamwork skills in the context of engineering practice, including reporting, project management, time management, communication and balancing individual and team accountability.



*Above: Biological & Agricultural Engineering Research Center is located off campus at 1180 W. Cassatt in Fayetteville.*

*Right: Dr. Julie Carrier, right, instructs students on how to develop a biological battery.*



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## Awards and Recognition

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Leverett Elementary School dedicated the outdoor learning environment designed by Kyle Kruger, Katie Merriman, and Amanda McAlister.

Seniors Adam Jokerst, Leslie Bartsch, Jennifer Riable, and Britt Hill are working with the Community Design Center at the University of Arkansas to design ecological services and create Habitat Trails, a Habitat for Humanity Green Community. Habitat Trails will include 12 homes, a common courtyard, and a meadow/trail complex in Rogers. The first of the 12 homes was fully funded on Oct. 14; construction will be complete on the final home in 2007.

Marty Matlock, Bob Morgan, and Brian Schaffer received an Acknowledgement Award in the 2005 Holcim International Sustainable Design competition for the Warren, Arkansas stream restoration and greenways design. The design team was lead by Steve Luoni, director of the UA Community Design Center.

Abani Pradhan, a PhD student working with Yanbin Li, won the \$250 first prize in the Graduate Students Poster Contest during the Food Safety Consortium 2005 Annual Meeting, Oct. 2-4 in Manhattan, Kansas. The title of Abani's poster was "Interactive predictive modeling of pathogen kinetics, heat and mass transfer for thermal inactivation of *Listeria* in ready-to-eat poultry products." In addition, four other posters were presented: Xiaoli Su, Qian Sun, Byungchul Kim and Dr. Li presented a poster titled "Microfluidic filter chip based chemiluminescence biosensor for detection of *E. coli* O157:H7;" Madhukar Varshney, Dr. Li, Balaji Srinivasan and Steve Tung presented a poster titled "Microfluidic filter chip based chemiluminescence biosensor for detection of *E. coli* O157:H7"; Hong Wang, Dr. Li and Michael Slavik presented a poster titled "PCR-based fluorescent method for rapid detection of *Campylobacter jejuni*, *Salmonella Typhimurium*, *Escherichia coli* O157:H7 and *Listeria monocytogenes* in poultry samples"; and Liju Yang, Dr. Su and Dr. Li presented a poster titled "Quantum dot bioconjugates for simultaneous detection of *Salmonella Typhimurium* and *Escherichia coli* O157:H7". Dr. Li also gave a presentation on "Impedance biosensor for detection of multiple foodborne pathogens" at the meeting.

Yanbin Li gave an invited presentation on "Biosensors for rapid detection of foodborne pathogens" at the Workshop on Food Quality and Safety, sponsored by the USDA and China's Ministry of Science and Technology in Beijing, Sept. 20-24. He also gave an invited presentation on "Biosensors and their applications in agriculture and food" at the World Agriculture Congress 2005: Agricultural Information Forum, also in Beijing, Sept. 15-17.

While in Beijing, Li visited China Agricultural University and met Professor Maohua Wang of the College of Information and Electrical Engineering and Prof. Changxin Wu of the College of Animal Science and Technology to discuss the research collaboration on biosensors for screening of avian flu viruses, Sept. 19-20. He also visited Zhejiang University in Hangzhou to conduct research on biosensors for detection of pesticide residues in foods in collaboration with Prof. Yibin Ying and Prof. Jiangping Wang of the College of Biosystems Engineering and Food Science, Sept. 25-27. Earlier, Aug. 28-Sept. 22, Prof. Wang of Zhejiang University, then visited the Department of Biological and Agricultural Engineering here in Fayetteville to conduct the research on biosensors for detection of foodborne pathogens in the Biosensors and Bioinstrumentation Laboratory. This research was funded by the USDA/FAS and Zhejiang University.

Mahendra Kavdia and P. Deonikar gave the presentation, "Biochemical interactions of nitric oxide and red blood cell-effects of oxygenation and hematocrit" at the Biomedical Engineering Society (BMES) meeting in Baltimore, MD in October. Kavdia and S.S. Potdar also gave two more presentations at the meeting: "High glucose effect on nitric oxide and superoxide release from HUVECs under shear stress;" and "Nicotine induced alterations in endothelial cell release of nitric oxide and free radicals." Dr. Kavdia also visited the Society for Free Radical Biology and Medicine in Austin, TX in November to present "Model to Evaluate Oxidative Stress Effect on Nitric Oxide Transport in an Arteriole."

Brian Haggard was chosen as a 2005 ARS Scientist of the Year for "outstanding research evaluating nutrient sources and transport from the landscape through aquatic ecosystems." The purpose of this awards program is to annually recognize the creative efforts, scientific leadership and the major research accomplishments of ARS research scientists. Sixteen scientists are selected and rewarded annually for this program. All award winners receive cash awards and additional research support funding. Dr. Haggard and the other winners will be formally recognized with an award plaque at the ARS Annual Recognition Program to be held February 7 in Washington, D.C.

The paper, "Water Quality at the Buffalo National River, Arkansas, 1991-2001," received a 2005 ASABE Honorable Mention Paper Award. The paper was coauthored by K.L. White, B.E. Haggard and I. Chaubey. The ASABE Paper Awards are selected annually from papers of engineering merit published the prior year in ASABE publications.

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## Awards and Recognition (continued)

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Jin-Woo Kim was awarded the “Imhoff Outstanding Researcher Award” by the College of Engineering. Dr. Kim also acted as a member of the program organizing committee for the 2005 IEEE International Conference on Robotics and Biomimetics (ROBIO 2005), held June 29-July 3, in Hong Kong, and as an editorial board member for “Nanomedicine: Nanotechnology, Biology and Medicine,” published by Elsevier Science. In addition, Dr. Kim presented refereed papers at the International Conference on Bio-Nano-Informatics (BNI) Fusion in Marina del Rey, CA.; DNA 11: 11th International Meeting on DNA Computing in London, Ontario; the 5th IEEE Conference on Nanotechnology (IEEE-Nano 2005) in Nagoya, Japan; and the IEEE International Conference on Robotics and Biomimetics (ROBIO) in Hong Kong. Dr. Kim also coauthored papers presented at the Institute of Biological Engineering (IBE) Annual Meeting in Athens, GA.; the 229th American Chemical Society (ACS) National Meeting (Sessions: Biosensors and Sensors III: Bacteria-Based and Cell-Based Sensors and Biosensors and Sensors II: Nanosturctures) in San Diego; the AIChE Annual Meeting (Sessions: Nanoscale Science and Engineering, Extremophile Bioprocessing) in Austin, TX; and the ASME International Mechanical Engineering Congress and R&D Expo (IMECE) in Anaheim, CA.

Indrajeet Chaubey gave an invited presentation titled “Identifying runoff source areas in a pasture dominated watershed” at the Annual International Conference of the Soil and Water Conservation Society in Rochester, N.Y., August 2.

Sreekala Bajwa coauthored 3 papers presented at the ASAE Annual Meeting & Conference in St. Joseph, MI.: “Hydrologic modeling of L’Anguille watershed using soil and water assessment tool,” coauthored by V. Vibhava and Indrajeet Chaubey; “Modeling spectral indices of cotton canopy with soil compaction, soil electrical conductivity and yield,” coauthored by Subodh Kulkarni; and “Effect of near-infrared scanning angle in prediction of tenderness and sensory attributed of Longissimus Thoracis steaks,” coauthored by Kandaswamy, J., J.K. Apple, and J. T. Sawyer.

Yanbin Li presented a paper titled, “Nanoparticles based QCM immunosensor for detection of foodborne pathogens” at the IAFP (International Association for Food Protection) 2005 92nd Annual Meeting Aug. 13-17 in Baltimore, MD.

Karl VanDevender participated in the Joint Foreign Animal Disease meeting sponsored by The National Pork Board Swine Health Committee, the National Pork Producers Council and the AASV Foreign Animal Disease committee held a meeting on Aug. 16, 2005 at the National Pork Board headquarters in Des Moines, IA. The meeting goal was to initiate development of educational materials on disaster preparedness as the result of a foreign animal disease outbreak.

Dennis Gardisser is the joint developer of training for PAASS (Professional Aerial Applicator Support System) during 2005-06. The topic will be “Ag Aviation System Maintenance.”

Gary Huitink attended the National Institute of Farm Safety Annual Conference near Charlottesville, VA, June 26-29, 2005. He presented a paper titled, “Alerting Management to Vital Aspects of Preventing Agricultural Tragedies.”

Rachel Lipsey attended the Emerging Energy Technologies Conference in Norman, Okla., Sept. 27. She also presented a poster at the Southern Region Water Quality Extension Conference in Lexington, Ky., Oct. 23-26.

A Poultry Air Quality Working Meeting was held September 28 at the Pauline Whitaker Arena Center in Fayetteville. Sreekala Bajwa, Gary Huitink, Rachel Lipsey, Karl Vandevender and Lalit Verma from BAEG, and Tom Tabler and Susan Watkins of the Poultry Center of Excellence participated. This is an initial effort to spur a multi-discipline approach to solving air quality issues that are related to poultry confinement.

Gary Huitink was a speaker at the annual Cotton Ginners School at the USDA Laboratory at Stoneville, MS., June 13-16. They provided comprehensive training on safety, gin management, current technology and cotton gin operation to about 100 ginners from the US cotton production region. He also presented a technical paper during the June 26-30 National Institute of Farm Safety meeting at Wintergreen, VA.

Yanbin Li visited the USDA ERRC (Eastern Regional Research Center) at Wyndmoor, PA., Nov. 3-4 for future research collaboration in biosensors and gave an invited presentation on nanoparticles-based optical biosensor for detection of multiple pathogens in foods. Dr. Li also visited two universities in China: Zhejiang University in Hangzhou and China Agricultural University in Beijing, Nov. 6-15. He met his coinvestigators in animal science, medical science and biological engineering for their joint research projects on biosensors for rapid detection of foodborne pathogens and avian influenza viruses. These research projects are funded by USDA/FAS, China MOE and Zhejiang Province DOST.

Dennis Gardisser attended the Aviation Association annual convention in Reno, NV. Dr. Gardisser received the William O. Marsh Safety Award, given for significant achievements in safety, safety education, or an outstanding operational safety program. Dr. Gardisser received both the state and regional FAA Aviation Safety Counselor of the Year awards during 2005.



## NAME CHANGE RECOGNIZES LINK BETWEEN AGRICULTURE, BIOLOGY



The American Society of Agricultural Engineers has announced that it has changed its name to the American Society of Agricultural and Biological Engineers.

The name change provides formal acknowledgment of the close integration and shared history of agricultural and biological engineering.

Melissa Moore, ASABE executive vice president, explained that the change more clearly represents the breadth and depth of the profession.

“Biology has always been at the core of the profession,” said Moore, “and the profession has taken the lead in developing the engineering, the educational curriculum, and the applied research for systems dealing with plants, animals, humans, and the environment.”

The action also follows the lead of university departments in the United States which, one by one, have adopted names that reflect the unique and broad educational experience they provide. Once known simply as *agricultural engineering*, these departments now include *biological* in their names or such variations as *biosystems* and *bioresources*. Accordingly, graduates of these programs possess the engineering skills that deal with all agricultural and biological systems, including the entire food and fiber chain.

The name change was approved earlier this year by membership vote and formally adopted July 19 at the Society’s annual business meeting.

The American Society of Agricultural and Biological Engineers is a scientific and educational organization dedicated to the advancement of engineering applicable to agricultural, food, and biological systems. Founded in 1907 and headquartered in St. Joseph, Michigan, ASABE comprises 9,000 members representing more than 100 countries. For further information, contact ASABE, 2950 Niles Rd, St. Joseph, Michigan, 49085; 269-429-0300; [hq@asabe.org](mailto:hq@asabe.org); [www.asabe.org](http://www.asabe.org).

## OTTO LOEWER NEW PRESIDENT OF ASABE



Otto Loewer, director of the UA Economic Development Institute and former dean of the UA College of Engineering, has been installed as president of the American Society of Agricultural and Biological Engineers (ASABE) for 2005-2006.

Dr. Loewer’s leadership will help guide the ASABE through a historic period—not only did the Society undergo a recent name change from the American Society of Agricultural Engineers—it is also preparing to celebrate a centennial that will kick off in the summer of 2006.

Dr. Loewer served as UA dean of Engineering from 1996 to 2002. Immediately prior to that, he was department head of agricultural and biological engineering at the University of Florida. He also has served as head of the UA Department of Agricultural Engineering.

## Meet our Faculty....

### Department Head and Professor

Dr. Lalit Verma  
[lverma@uark.edu](mailto:lverma@uark.edu)

### Professors

Dr. Dennis Gardisser  
[dgardisser@uaex.edu](mailto:dgardisser@uaex.edu)

Dr. Carl Griffis  
[clg@uark.edu](mailto:clg@uark.edu)

Dr. Yanbin Li  
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Dr. Otto Loewer  
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Dr. Karl VanDevender  
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### Associate Professors

Dr. Julie Carrier  
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Dr. Indrajeet Chaubey  
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Dr. Tom Costello  
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Dr. Brian Haggard  
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Dr. Marty Matlock  
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### Assistant Professors

Dr. Sreekala Bajwa  
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Dr. Mahendra Kavdia  
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Dr. Jin-Woo Kim  
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Dr. Scott Osborn  
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Dr. Kaiming Ye  
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## Biological & Agricultural Engineering

### Experiencing Changes Across the Nation (continued)

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A master of science degree curriculum in biomedical engineering is the department's newest program. Drs. Mahendra Kavdia and Kaiming Ye are the first two faculty members. "We have a lot of pre-med students in this program," Verma says.

Research by Kavdia and Ye includes bio-nanotechnology projects to develop models and microsensors for medical applications. Drs. Jin-Woo Kim and Yanbin Li also work in the bio-nanotechnology area.

Kavdia's research includes developing new ways to explore underlying mechanisms of disease. A project funded by the American Heart Association is to develop a better method to measure the effects of nitric oxide in the blood on heart disease and other health problems.

Ye is developing a microsensor system that can be implanted under the skin to detect and signal low glucose levels. This would allow diabetics to manage blood glucose levels more effectively and with no pinpricks. The research is supported by a grant from the Juvenile Diabetes Research Foundation.

Other faculty members specialize in three other academic, research and extension programs.

Bioresource engineering includes agricultural production technology and by-product utilization in agriculture and food processing.

Ecological engineering focuses on sustainable solutions to environmental problems.

Food and bioprocess engineering involves designing equipment and processes — including biological processes — to enhance the quality and safety of food products.

Verma says the curriculum includes courses in a variety of engineering disciplines and classes in biological and agricultural sciences. Students typically choose one of the four specialty areas for advanced level courses.

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### New Faculty and Staff

Dr. Margaret Gitau joined the department in December 2005 as a research associate working with Dr. Indrajeet Chaubey. Dr. Gitau will be conducting watershed and water quality modeling, and management practice impact assessments in priority watersheds in Arkansas.



*Gitau*



*Haggard*

Dr. Brian Haggard joined the Department in January 2006 as an associate professor. Dr. Haggard had previously worked with the USDA-ARS and served as adjunct assistant professor in the Department. His research will continue to focus on ecological engineering.

#### **Distinguished Doctoral Fellowships and Doctoral Academy Fellowships**

The Department of Biological and Agricultural Engineering at the University of Arkansas has two Distinguished Doctoral Fellowships, and four Doctoral Academy Fellowships as well as graduate research assistantships available in several research areas in biological engineering.

#### **FELLOWSHIPS:**

*Distinguished Doctoral Fellowships* offer a stipend of \$30,000 per year plus tuition for up to four years.

*Doctoral Academy Fellowships* offer a stipend of \$23,700 per year plus tuition for up to four years.

#### **REQUIREMENTS:**

*Distinguished Doctoral Fellows* should have a master's GPA of 3.85 or B.S. GPA 3.65 or higher, a GRE verbal plus quantitative score at least 1300 and a GRE writing score of 5.5 or higher.

*Doctoral Academy Fellows* should have a master's GPA of 3.65 or B.S. GPA 3.5 or higher, a GRE verbal plus quantitative score of at least 1200 and a GRE writing score of 5.0 or higher.

#### **TO APPLY:**

Send a letter of application, a resume, transcripts of all college work, and three reference letters to:

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## Publications

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- Haggard, B.E., P.A. Vadas, D.R. Smith, P.B. DeLaune and P.A. Moore Jr. 2005. Effect of Poultry Litter to Water Ratios on Extractable Phosphorus Content and its Relation to Runoff Phosphorus Concentrations. *Biosystems Eng.* 92(3):409-417.
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- Galloway, J.M., B.E. Haggard, M.T. Meyers and W.R. Green. 2005. Occurrence of Pharmaceuticals and Other Organic Wastewater Constituents in Selected Streams in Northern Arkansas. U.S. Geological Survey: Scientific Investigations Report 2005-5140.
- Vadas, P.A., B.E. Haggard and W.J. Gburek. 2005. Predicting Dissolved Phosphorus in Runoff from Manured Field Plots. *J. Environ. Qual.* 34:1347-1353.
- Warner, K.A., J.-C.J. Bonzongo, E.E. Roden, G.M. Ward, A.C. Green, I. Chaubey, W.B. Lyons and D.A. Arrington. 2005. Effect of Watershed Parameters on Mercury Distribution in Different Environmental Compartments in the Mobile Alabama River Basin, USA. *Sci. of the Total Environ.* 347:187-207.
- Ying, Y.B., Y.D. Liu, J.P. Wang, X.P. Fu and Y. Li. 2005. Fourier Transform Near-Infrared Determination of Total Soluble Solids and Available Acid in Intact Peaches. *Trans. ASAE* 48(1):229-234.
- Kim, J.-W., D.P. Carpenter and R. Deaton. 2005. Estimating the Sequence Complexity of a Random Oligonucleotide Population by Using *in vitro* Thermal Melting and Cot Analyses. *Nanomedicine: Nanotechnology, Biology, and Medicine* 1:220-230.
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- Yang, L., and Y. Li. 2006. Detection of Viable *Salmonella* Using Microelectrode-Based Capacitance Measurement Coupled with Immunomagnetic Separation. *J. Microbio. Methods* 64:9-16.
- Zharov, V.P., J.-W. Kim, D.T. Curiel and M. Everts. 2005. Self-Assembling Nanoclusters in Living Systems: Application for Integrated Photothermal Nanodiagnosics and Nanotherapy. *Nanomedicine: Nanotechnology, Biology, and Medicine* 1:326-345.

## *Educational Objectives: To produce graduates who:*

1. Effectively apply engineering to biological systems and phenomena (plants, animals, humans, microbes, and the environment) with demonstrated proficiency in basic engineering skills, technical knowledge, and professional and personal skills.
2. Are well prepared for diverse careers in biological engineering, life-long learning, and professional and ethical contributions to society through sustained accomplishments in biomedical engineering, ecological engineering and biotechnology.

## **Calendar of Events**

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### **March**

20-24 Spring Break  
24 University Holiday- Campus Closed

### **April**

17-21 Academic Festival Week

### **May**

4 Last Day of Spring 06 Classes  
5 Dead Day  
6-12 Finals Begin  
13 Commencement  
22 Summer Session I Classes Begin  
29 Memorial Day Holiday - Campus Closed

### **June**

30 Summer Session I Classes End

The University of Arkansas is an equal opportunity/affirmative action institution.

## **BAE Lifeline**

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~ and ~

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