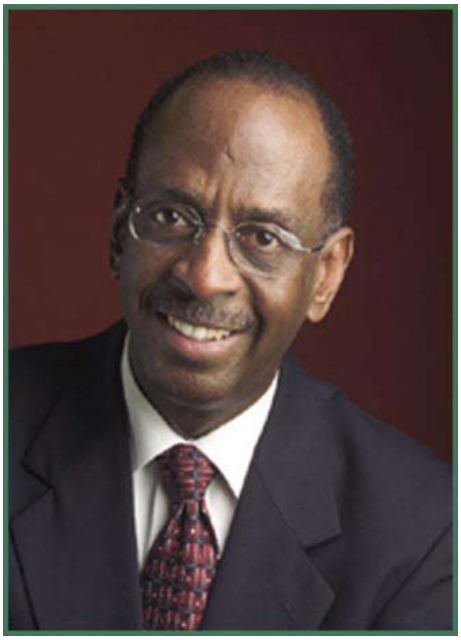
MICHIGAN STATE UNIVERSITY

BAE Bulletin

Newsletter of the Department of Biosystems and Agricultural Engineering Fall '08

BAE Launches the George and Betty Merva Distinguished Lecture Series

Dr. Larry P. Walker delivers inaugural lecture on the future of Biobased Renewable Fuels



On October 7, 2007, Dr. Larry P. Walker, a 1978 graduate of BAE, delivered the inaugural *George and Betty Merva Distinguished Lecture in Biological Engineering*. His topic, *The Evolving Paradigm of Agriculture and Forestry as a Supplier of Energy and Industrial Raw Materials* was provocative and timely, particularly because it was delivered by such a respected leader in the field. Dr. Walker is a sought after expert in a movement that has a gold rush-like momentum and at times, a gold rush-like mentality. He acts as a guide, helping anxious travelers navigate an unmapped journey from dependence on fossil fuel-based energy to a sustainable, environmentally safe and economically sound renewable energy future.

Dr. Walker has been passionate about converting biomass into renewable energy since the first energy crisis in the 1970s. This passion led him to pursue his graduate studies in BAE, a department at the leading edge of converting agricultural and forestry materials into sustainable energy. Today, this lauded BAE and CANR alumnus is a Professor in the Department of Biological and Environmental Engineering at Cornell University, the Director of the Northeast Sun Grant Initiative, and member of the Presidential Forum on Renewable Energy. He is also the principal investigator for Cornell's Biofuels Research Laboratory, a $6 million lab funded by the Empire State Development Corporation.

The message Dr. Walker delivered to his MSU audience was clear: "Biomass is the only renewable that directly reduces our dependency on liquid fuels." But in order to successfully change the way that energy is produced, we need new tools and methods to process organic material more efficiently and on a massive scale. The corn-to-ethanol conversion process has been the most successful effort to date, but corn requires major inputs of water for irrigation, fertilizers, pesticides, and ironically, oil-based energy to produce it. There is the additional challenge of assuring an adequate corn supply for ethanol (Continued on page 2)

BAE Students Win National Awards

Gail Bornhorst is a recipient of a **National Science Foundation Graduate Fellowship**. (continued on page. 9)

Jacquelyn McNett is the winner of an **Outstanding Biosystems Engineering Award sponsored by Schlumberger.**

Michael Wiederoder has received a prestigious **Department of Homeland Security Undergraduate Fellowship.**

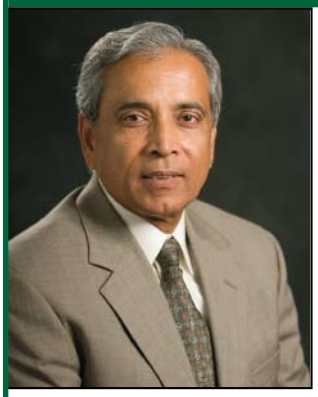
Michelle Packard and **Shannon McGraw** each received **SMART (Science, Mathematics, and Research for Transformation) fellowships from the Department of Defense** to pursue Ph.D. degrees in Biosystems Engineering at MSU.

Faculty Honors

Dr. Truman Surbrook, Ph.D., P.E., a 38 year teaching veteran of the Department of Biosystems and Agricultural Engineering was the recipient of the **2007-2008 Withrow Teaching Excellence Award**. He is praised by his students for his ability to make difficult concepts easy. He is a singularly dedicated professor with a desire for students to succeed.

Jon Althouse, Instructor and coordinator for the Electrical Technology certificate program was awarded the **2008 Outstanding Faculty/ Staff Award** during Spring Commencement of the Institute of Agricultural Technology on March 16. The award reflects John's dedication to the Electrical Technology Program.

FROM THE CHAIR



Dear Alumni,

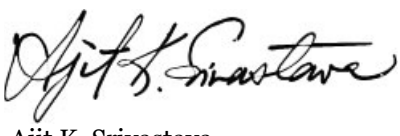
It has been a busy and exciting year for all of us at BAE. Student enrollment in Biosystems Engineering (BE) was at an all time high of 101. Enrollment in Technology Systems Management (TSM) has steadily increased since its inception in 2005. The certificate program in Electrical Technology (ET) continues to fill to capacity as we graduate about 24 students every year. Our BE undergraduates have a nearly a 100% placement rate and earn highly competitive salaries. Our first two graduates from the TSM program were immediately placed in the job market.

In response to the Biological Engineering accreditation criteria, we have revamped the BE undergraduate program by incorporating more biology into our curriculum. We have also added new concentrations on bioenergy and biomedical engineering. We have hired several additional faculty members to strengthen our focus on bioenergy and ecosystems engineering. Our alumni and our students have received national honors. This year, senior Gail Bornhorst was the fourth BAE student in the past five years to be awarded a National Science Foundation (NSF) Fellowship – an impressive number for our department. The next year promises even more growth.

We sincerely appreciate the investment that our alumni and friends have made in BAE's future. We in turn, have invested in our most valuable assets — our students, our faculty and our facilities. Because of our work together, we have survived, thrived and will remain at the forefront of innovation for many years to come.

Please keep in touch. We want to hear from you. As always, if you are traveling in this direction, please stop by and say hello.

Sincerely



Ajit K. Srivastava

(Walker con't)

conversion, for feed, and for human consumption. There are, however, other potential plants that are more sustainable in different ecosystems. Plants are also effective in sequestering and recycling carbon, and are renewable. They are also genetically and chemically diverse.

Dr. Walker is working to perfect a process in which certain enzymes in perennial grasses convert the cellulose into sugars that can be transformed into ethanol fuel. Before the fermentable sugars can be converted to ethanol, they must first be extracted. A key component of this step is chemical and physical pretreatment, which involves size reduction of the biomass and subsequent treatment using acids or alkalis at various concentrations, temperatures, and pressures.

One approach is to use molecular biology to engineer microorganisms that can achieve both cellulose hydrolysis and fermentation of carbon sugars that are derived from plant carbohydrates. Another approach is to prospect for new industrial microorganisms. However, more research is needed to determine the best species for biomass production and pretreatment enzyme activity to convert cellulose into sugars. Indeed, researchers have an ambitious "to-do" list in order to meet the Department of Energy's (DOE) goals. The agency would like a sustainable biomass harvest and collection technology capable of supporting an industry of up to 1 billion dry metric tons per year by 2050. The DOE has a near-term objective of supporting an industry of up to 150 million dry metric tons per year by 2010. In order to accomplish the DOE's objectives, Dr. Walker suggests researchers examine the following directions:

- Expand breeding program to improve biomass and plant quality for biofuel production.
- Develop a response to potential disease problems on perennial grasses such as smuts, rusts and virus diseases, all of which may be intensified in a monocultural production system.
- Explore using manure to meet nutrient requirements for crops that could be suitable for biofuel.

At the conclusion of the lecture, Dr. Walker acknowledged the disruptive nature of this evolving paradigm shift. He asked his audience to join him to find a way for industry, government and universities to work together to exploit opportunities and address challenges.

"Biomass is the only renewable that directly reduces our dependency on liquid fuels."

New Faculty


Dawn Reinhold


Christopher Saffron


Wei Liao


Yan (Susie) Liu


Pouyan Nejadhashemi

Dawn Reinhold, assistant professor (Jan. 2008) received her doctorate in Civil and Environmental Engineering from the Georgia Institute of Technology in 2007. Her research focuses on understanding the removal processes in plant-based systems, particularly with regards to trace organic pollutants like personal care products, pharmaceuticals, and pesticides.

Christopher Saffron, assistant professor (Aug. 2007), received his Ph.D. in Chemical Engineering in 2005 from MSU. He has a joint appointment with BAE and the Department of Forestry. Previously, Dr. Saffron was an engineer and project manager with Michigan Biotechnology Institute (MBI) in Lansing. His research interest is the thermochemical conversion of biomass to fuels and chemicals and economic model development for combined thermochemical and biochemical refineries.

Wei Liao, assistant professor (Aug. 2007), received his Ph.D. in Biological Systems Engineering from Washington State University. His research interests are biological pretreatment of lignocellulosic materials such as straws, corn stover, wood residues etc. to produce mono-sugars and high density enzymatic hydrolysis of lignocellulosic materials to enhance sugar yield and sugar concentration.

Yan (Susie) Liu, assistant professor (Aug. 2007), received her Ph.D. in Biological Systems Engineering from Washington State University. Her research interests are integrated agricultural waste management, anaerobic digestion systems to convert animal and food wastes to renewable energy and other value-added products. She was a research associate in the Department of Biological Systems Engineering at Washington State University.

Pouyan Nejadhashemi, assistant professor (Aug. 2008), received his Ph.D. from the University of Maryland. Before joining BAE, Dr. Nejadhashemi was a core member of the Kansas State University interdepartmental–interagency watershed management team providing technical support and overseeing execution of various modeling tools to track pollutant load reduction activities. His research interests are focused on the description, analysis and prevention of non-point source pollution at laboratory, field, watershed and regional scales.

Faculty News

Renfu Lu, Ph.D., an adjunct professor in BAE, has been named research leader for the Sugar Beet and Bean Research Unit (SBRU) of the U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) in East Lansing. As SBRU research leader, Lu will manage all aspects of the unit, including interpretation and reporting of research results. As lead scientist, he will conduct a research program that applies and develops engineering methods and techniques to assess, grade, and assure postharvest quality and condition of specialty crops.

Retirements

Left to right: Richard Ledebuhr, Bill Bickert, and Gary Van Ee at their retirement party December 6, 2007, at the University Club.

Bill Bickert, Ph.D., professor, retired from BAE in June 2007 after a distinguished career in extension and research. Bill was a pioneer of integrated manure management. His work has emphasized livestock facilities, including designs related to transition housing for dairy calves, full wall ventilation for barns, improved freestalls, equipment for separating sand from sand-laden manure, and other innovations in facilities.

Gary Van Ee, Ph.D., P.E., professor, retired after 27 years. Gary was a prolific inventor of fruit and vegetables mechanization, and agricultural chemical applications. Together with Richard Ledebuhr, he developed the patented "Air Curtain" spraying concept for orchards to minimize spray materials needed to produce high quality, abundant, and safe food. He taught the capstone senior design courses and was a recipient of two Withrow Teaching Awards.

Richard Ledebuhr, specialist, retired after over 38 years with the Department. He was involved in research and extension for fruit and vegetable mechanization and chemical application equipment. He helped develop the original double bar sickle adopted for trimming fruit trees. He helped perfect the first mechanical strawberry harvester and the modification of strawberry processing equipment, before he turned his attention to improve sprayers to effectively deliver pesticides to their target.

Priscilla Gardner, administrative assistant, retired in December 2007 after 12 years with the department. She had been employed at MSU for 28 years. She played a key role in helping the department celebrate its centennial in 2006.

Bill Bickert

Gary Van Ee

Richard Ledebuhr

Priscilla Gardner

Research

MSU CENTER FOR BIOBASED RENEWABLE ENERGY

The MSU Center for Biobased Renewable Energy is a multidisciplinary center established in 2006 to promote renewable, biobased energy through teaching, research and outreach. BAE will collaborate with the MSU Department of Chemical Engineering and Materials Science, and the MSU Department of Forestry in this venture. The Center is funded by the Michigan State University Quality Fund. Currently, the Center is in a start-up phase, hiring faculty to augment existing faculty who are active in this area. The program is expected to be fully functional in 2009.

Core courses are in the planning phase as part of an undergraduate option in renewable energy, as well as an integrated curriculum option for several engineering, and agriculture and natural resources majors, at undergraduate and graduate levels.

Bioenergy research faculty are conducting biomass production research in the following areas:

- genetically modified energy crops
- thermal, chemical and biological processes to convert agricultural and forestry biomass and waste materials
- reforming processes to convert biofuels and biogas into fuel grade hydrogen

The Center also plans to publish materials to promote energy conservation and bioenergy utilization.

ECOSEAM (EDUCATIONAL COLLABORATIVE ON SUSTAINABLE ENVIRONMENTAL AND AGRICULTURAL MANAGEMENT)

ECOSEAM is a collaborative, multi-state team that will develop unique self-study web-based and experiential multidisciplinary design courses on sustainable approaches to high priority agricultural and watershed management needs, notably at rural/suburban interfaces. Four unified classes will be developed and widely distributed on:

- agricultural air emissions and air/water interface science
- animal manure management and technology
- decentralized wastewater technology and cluster system management
- suburban/rural watershed interface modeling

BAE RESEARCHERS DESIGN PROTOTYPE MACHINE TO HARVEST CHESTNUTS

Edible chestnuts may be a profitable commodity, but harvesting the sweet nuts by hand is backbreaking work. Dan Guyer, a professor in BAE, is collaborating with Whoa Seug Kang, a South Korean professor of agricultural engineering on sabbatical from Kangwon National University, to design a prototype of a harvesting unit to simplify and expedite the harvesting process.

The design concept for the harvesting machine came from Prof. Kang. He concluded that, for the burgeoning fresh chestnut industry to thrive, growers needed an affordable small-to medium-sized harvesting machine that could easily maneuver around and between trees. The prototype designed by Prof. Kang and his colleagues is partially modeled after larger, more expensive machines found in Europe. *(Adapted from ANR Communications News Release, Sara Long 12/12/07.)*

BAE Alumni News

Dr. Robert Gustafson (Ph.D., P.E. '74) has been named as the director of the Engineering Education Innovation Center and the Honda Professorship for Engineering Education at The Ohio State University, College of Engineering. The Engineering Education Innovation Center serves as a hub for programs to enrich student experience and strengthen the academic credentials of the college's undergraduate students. In 2006, Dr. Gustafson was the recipient of the MSU College of Engineering's Distinguished Alumni Award.

Dr. Larry Walker (Ph.D. '78) was awarded the MSU 2008 Outstanding ANR Alumnus Award. He is a professor in the Department of Biological and Environmental Engineering at Cornell, Director of the Walker Lab, and member of the Presidential Forum on Renewable Energy. Currently, he is the director of the Northeast Sun Grant Institute of Excellence, a fourteen-state regional research and economic development program focused on biofuels and bioproducts.

Mr. Gary Schluckbier (B.S. '72), vice president of Technical Services, Global Engineering at Kellogg Company, was awarded the College of Engineering BAE Distinguished Alumni Award for 2008. Mr. Schluckbier joined the Kellogg Company in 1983 as a process engineer. He has served the company in several engineering positions, in research and technology, and has been responsible for product, process and packaging development. Mr. Schluckbier and his team have delivered many key innovation advancements for the organization.

Dr. John Larkin (Ph.D. '84) was the BAE 2008 Distinguished Alumnus Award winner. For the past sixteen years, he has worked as the branch chief of the Process Engineering Branch of the Food Processing Science and Technology Division of the Food and Drug Administration. He evaluates regulatory issues to extend the shelf life of food. His research pertaining to thermal processing and food production has played a significant role in the regulatory review of low-acid food processing systems.

Dr. Stephen Radke (B.S. '00, Ph.D. '04) was the recipient of the BAE 2008 Outstanding Alumnus Award. This award is given to alumni who have graduated less than 10 years ago from the department. Dr. Radke is an account manager in the processed foods industry with FMC Food Tech in Philadelphia, Pennsylvania. He works with clients such as Campbell's Soup, Pepperidge Farms, Unilever, and Cargill to develop food processing solutions for everyday brands and store brand consumer food products.

BE Senior Design Showcase '08

BE 487 - Biosystems Engineering Design Project Class of 2008

Every year, teams of Biosystems Engineering students, enrolled in the two-semester senior design capstone experience, BE 485/487, develop, evaluate, and select design alternatives in order to solve real world problems. The projects are diverse, but each reflects systems thinking by integrating interconnected issues impacting the problem, including critical biological constraints. The engineering design process is documented in a detailed technical report. The project designs are then presented to engineering faculty and a review panel of licensed professional engineers for evaluation.

This year's showcase was held on April 17, at Kellogg Center. Six teams presented the following projects:

- Water Minimization and Wastewater Disposal at Leelanau Fruit Company
- Extruder Modeling: The Kellogg Company
- Rapid Detection of *E.coli* in Recreational Waters
- Nutrient Separating Baffle Box for Agricultural Runoff Treatment
- Biodiesel Production in Malawi
- Swine Facility Waste Management Model

Spotlight On

The senior design team sponsored by Dr. Alocilja won first place at the MSU Undergraduate Research and Arts Forum (UURAF) for their oral presentation under the Food, Agriculture, and Environmental Science category. The project was called the ***Rapid Detection of E.coli in Recreational Waters.***

Rapid Detection of E.coli in Recreational Waters Team members (left to right): Michelle Slavin, Rebecca Busk, Ashley Varga, and Aubrey Higginbotham.

Academic Excellence

Sudeshna Pal, doctoral candidate in BAE was the recipient of the **Outstanding Graduate Student Award** in the College of Engineering, and third place winner of the **Fitch H. Beach Award for Outstanding Graduate Research.** Her research focuses on the development of an electrically active magnetic biosensor targeting *Bacillus anthracis* spores. This work is critical to current needs in homeland security (biodefense) and improved public health. She has already authored or co-authored five peer-reviewed journal papers and has made several research presentations at professional meetings.

Left to Right: Satish Udpa, dean of the College of Engineering, Sudeshna Pal, Evangelyn Alocilja, and Ronald Rosenberg, College of Engineering associate dean of research and graduate studies.

Awards and Scholarships

BAE Undergraduate Scholarship Winners

F . W. Bakker-Arkema Minority Endowed Scholarship Fund in Biosystems Engineering
Hanna Miller

Arthur W. Farrall Endowed Scholarship Fund
Natalie Bouchard
Rebecca Busk
Louis Faivor
Jacqueline Palmer
Heather Stewart

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Christopher Gancsos
Thomas Skrocki

George E. & Betty L. Merva Endowed Scholarship Fund
Alyse Egner

BAE Graduate Scholarship Winners

Agricultural Engineering Endowed Fellowship Fund
Dharmendra Kumar Mishra

Katherine and Merle L. Esmay Endowed Fellowship Fund
Edith Torres-Chavolla

Bill & Rita Stout Expendable Scholarship Fund
Rabiha Sulaiman

College of Engineering Undergraduate Academic Award Winners

Catherine Louise Dudgeon
Tara Lee Franey
Bradley Jacob Wardynski
Tyler Scott Wright

College of Engineering Service Award Recipients

Bradley Jacob Wardynski
Michael Sean Wiederoder

Outstanding Graduate Student Award

Sudeshna Pal

Academic Excellence

TECHNOLOGY SYSTEMS MANAGEMENT (TSM) HAS ITS FIRST GRADUATES

TSM, a new BAE B.S. degree program focusing on the application and management of technologies, has had its first graduates.

Darby Elliott graduated in Fall of '07 and is employed with Northstar Fire Protection in Chicago as a Fire Systems Design Engineer.

Daniel Knorp who also graduated in Fall '07 is employed with Modcomp Systems and Solutions, Inc.

TSM graduates apply new technologies in the areas of food production, processing and safety; environmental monitoring and measurement, and homeland security applications. They lead in transferring new technologies to business and society while responding to changes in technology. They manage/apply technologies such as:

- Automation and Controls
- Data Acquisition and Management
- Geographic Information Systems (GIS)
- Global Position Systems (GPS)
- Information Technology
- Remote Sensing

BAE Student Awarded National Science Foundation Fellowship

Biosystems Engineering senior Gail Bornhorst (above) is the recipient of a National Science Foundation (NSF) Graduate Fellowship. Her award was announced in March, 2008. This is the 4th prestigious NSF fellowship that Biosystems Engineering majors have received in the past 5 years. A total of fifteen NSF Graduate Fellowships have been awarded to MSU College of Engineering graduates during that period. This translates into BE students receiving 27% of the NSF Fellowships awarded to MSU College of Engineering graduates since 2003. Approximately 1,100 awards are granted annually. The award carries a $30,000/year stipend plus a cost of education allowance of $10,500 per tenure year.

Romali Ranasinghe (left) and **Brian Castro** (right), undergraduate professorial assistants in the Biosensor Lab, both received a second place award for their posters at UURAF in the Engineering category. Romali's poster was titled *Biosynthesis of Gold Nanoparticles*. Brian's poster was titled *Aptamer Selection for Microorganism Detection Preliminary Assays*.

Events and Happenings

1 Thelma Hansen (left), Professors Emeriti Clarence Hansen (center) and Fred Bakker-Arkema (right) visit during the November '07 Donor Appreciation luncheon.

2 Alfred Murray (B.S. '57) (center) and Steve DeBoer (M.S. '73) (right) catch up on news at the November '07 Donor Appreciation luncheon.

3 BAE chair Ajit Srivastava (left) presents Matt Klein (right) with his ASABE Foundation Engineering Scholarship in October '07.

4 Marthena (Baker) Harms (B.S. '97) enjoys Homecoming in the Department with one of her sons in October '07.

Events and Happenings

5 BAE chair Ajit Srivastava (left) presents Deborah Spehar (right) with the Jonathan L. Snyder plaque recognizing the Deborah and Timothy Spehar Endowment. The Jonathan L. Snyder Society recognizes individuals who make a commitment between $100,000 and $249,000 to MSU.

5

6 Jeffrey Armstrong (left), dean of the College of Agriculture and Natural Resources (CANR), and MSU President Lou Anna Simon (right) present Dr. Larry Walker (Ph.D. '78) (center) with the CANR's Outstanding Alumnus Award.

6

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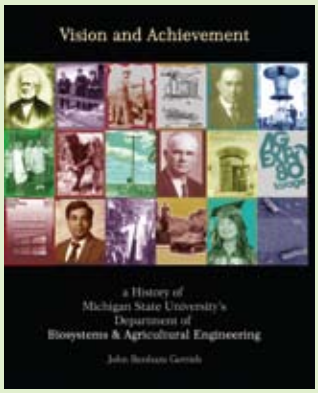
Order your copy of John Gerrishs' lively account of the evolution of the Department of Biosystems and Agricultural Engineering



"Anyone who has ever known 'Ag Engineering' at Michigan State University will relish this well-researched history."
Ajit K. Srivastava

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