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American Society of  
Agricultural and Biological Engineers

## Hot Topics

*Agricultural and biological engineers dedicate their careers to providing people throughout the world with food, clean water, bio-fuel and energy sources, cures and treatments for diseases and healthy and sustainable environments in which to live. These men and women apply engineering principles to any process associated with creating, developing and producing agriculturally based goods and management of our natural resources.*

*Agricultural and biological engineers embrace a variety of specialty areas. Below you will find links to 11 areas with descriptions, a list of hot topics and ASABE experts that you may contact for timely news and developments. With more than 9,000 members worldwide, our knowledge resources run broad and deep. If you would like more information about these specialty areas or for additional experts, please contact:*

[Dolores Landeck](#)

Director of Public Affairs

ASABE

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[Aquacultural Engineering](#)

[Biological Engineering](#)

[Energy](#)

[Food & Bioprocess Engineering](#)

[Forest Engineering](#)

[Information & Electrical Technologies](#)

[Natural Resources](#)

[Nursery & Greenhouse Engineering](#)

[Power Systems & Machinery Design](#)

[Safety & Health](#)

[Structures & Environment](#)

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## *Hot Topics*

### **AQUACULTURAL ENGINEERING**

The demand for aquacultural engineering solutions is increasing as pollution, diseases and over-harvesting threaten natural fish supplies. Biological and agricultural engineers help design farm systems for raising fish and shellfish, as well as ornamental and bait fish. They specialize in water quality, biotechnology, machinery, natural resources, feeding systems, ventilation systems and sanitation. Our members seek ways to reduce pollution from aquacultural discharges, to reduce excess water use and to improve farming efficiency and profitability. They also work with aquatic animal harvesting, sorting and processing.

#### Hot Issues

- Animal and fish waste management
- Habitat improvement and restoration of rivers and inland lakes
- Aquaculture in developing countries
- Rising water temperature issues and strategies for protecting fishery resources  
(industrial water discharges, global warming, land use changes, water withdrawal/flow regulation impact water temperatures and quality)

#### ASABE Expert

**Fred Wheaton, Ph.D.**

Executive Director

[Northeastern Regional Aquaculture Center](#)

University of Maryland

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Dr. Wheaton's research focuses on re-circulating aquatic production systems, off-bottom shellfish culture, processing of aquatic products and the environmental requirements of fish, shellfish, and aquatic plants.

## *Hot Topics*

### **BIOLOGICAL ENGINEERING**

This is one of the most rapidly growing specialty areas. It applies engineering principles to problems and opportunities presented by living things and the natural environment. Biological engineers are involved in a variety of exciting and emerging developments ranging from environmental protection and remediation, to food and feed production, to medicine and plant-based pharmaceuticals, to biodegradable packaging materials. Some ASABE biological engineers design bioinstrumentation and imaging products. Others develop strategies for natural pest control, treatment of hazardous wastes for composting and for enzyme processing of biomass, food, feed and water.

#### Hot Issues

- Social and ethical implications of biological engineering
- Biological engineering career opportunities

#### ASABE Experts

##### **Donald C. Erbach**

ASABE President, ASABE Fellow

Phone: 703-960-2874

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Recently retired after 40-year career with the USDA, Agricultural Research Service. ASABE President Erbach serves on the USDA Biobased Products and Bioenergy Coordination Council and the White House Office of Science Technology Policy Hydrogen Task Force.

#### **NANOTECHNOLOGY**

##### **Michael Ladisch, Ph.D.**

[Director, Laboratory of Renewable Resources Engineering](#)

Purdue University

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Dr. Ladisch is a Distinguished Professor of Agricultural and Biological Engineering with a joint appointment in Biomedical Engineering at Purdue University, West Lafayette, Ind. His research addresses fundamental topics in bioprocess engineering as it applies to bioproducts, biorecovery and bionanotechnology. He previously chaired the National Research Council Committee on Bioprocess Engineering as well as the Committee on Opportunities in Biotechnology for Future Army Applications. He was elected to the National Academy of Engineering in 1999.

#### **AGRICULTURAL WASTE MANAGEMENT**

##### **Richard K. Koelsch, Ph.D.**

[Associate Professor](#)

Biological Systems Engineering and Animal Science

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Dr. Koelsch dedicates most of his time to extension services, providing him with invaluable insights in day-to-day agricultural needs. His work focuses on livestock nutrient management planning, livestock odor management and the development and design of facilities and equipment for managing livestock manure.

**Russell A. Persyn, P.E., Ph.D.**

KS Persyn

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Dr. Persyn's areas of expertise include evaluating composted organics from various sources for use in storm water and erosion control on construction projects. He's also a resource for solutions to waste management issues caused by movement of sediment, nutrient and heavy metal transport. Dr. Persyn has experience designing and evaluating treatment technologies such as constructed wetlands, sand filters, trickling filters, and aerobic treatment units. He is also a resource for information about land application technologies including, spray distribution, drip distribution, and subsurface treatment.

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## *Hot Topics*

### **ENERGY**

Our high standard of living and comfort could not be maintained without energy to power the machines, devices and systems in our homes and workplaces. Many of our energy sources, however, are nonrenewable and create undesirable byproducts. Biological and agricultural engineers are at the forefront of the effort to identify and develop viable energy sources — biomass, ethanol, methane and vegetable oil, to name a few — and to make these and other systems cleaner, more efficient and profitable for companies to produce. These specialists develop energy conservation strategies to reduce costs and protect the environment. And they design traditional and innovative energy systems to meet the needs of agricultural operations throughout the world.

#### Hot Issues

- Emerging biofuel energy solutions
- Wind and solar energy
- Energy and climate change

#### ASABE Experts

##### BIOFUELS

##### **Donald C. Erbach**

ASABE President, ASABE Fellow

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Recently retired after 40-year career with the USDA, Agricultural Research Service. ASABE President Erbach serves on the USDA Biobased Products and Bioenergy Coordination Council and the White House Office of Science Technology Policy Hydrogen Task Force.

##### **Ray Huhnke, Ph.D.**

##### Professor

Biosystems & Agricultural Engineering Department

Oklahoma State University

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Dr. Huhnke and his OSU research team are collaborating with several other universities to convert low-cost and underutilized biomass into ethanol and other value-added products. Their grass-to-gas conversion uses total biomass, such as perennial grasses and crop residues instead of grains. The goal is to create efficient, small-to-moderately-large ethanol plants.

##### **Shahab Sokhansanj, Ph.D. and M. Sc.**

##### Adjunct Professor

Department of Chemical & Biological Engineering

The University of British Columbia

[shahabs@chml.ubc.ca](mailto:shahabs@chml.ubc.ca)

Dr. Sokhansanj specializes in thermal processing and densification of bio-based materials. He and his colleagues focus on the development of feedstock handling and supply logistics for the emerging bio- refineries in the U.S. Their emphasis is on minimizing costs without compromising quality, safety and environmental sustainability.

#### ENERGY CONSERVATION

**Ron MacDonald. P.Eng., Agricultural Engineering**

[President, Agviro, Inc., Guelph, Ont., Canada](#)

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[rmacdonald@agviro.com](mailto:rmacdonald@agviro.com)

Ron MacDonald established AGVIRO, Inc., in 1992. He has researched and produced over 40 scientific, technical and information papers on agriculture and energy efficiency. His areas of expertise include energy efficient ventilation, heating, refrigeration and lighting systems for agricultural operations.

#### SOLAR & WIND ENERGY

**Nolan Clark**

[Laboratory Director and Research Leader](#)

Conservation and Production Research Laboratory

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Clark specializes in using renewable energies (wind and solar pumping systems) to provide water for livestock and for supplemental irrigation of crops. He also has worked with developing hybrid wind/diesel electric generation systems to generate electricity for remote and rural areas.

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## *Hot Topics*

### **FOOD & BIOPROCESS ENGINEERING**

Biological and agricultural engineers understand microbiological processes. They develop useful products and equipment to treat and reduce municipal, industrial and agricultural wastes. They champion food safety and are experts in pasteurization, sterilization and irradiation. These engineers develop solutions for packaging, transportation and storage of perishable products. Food and process engineers combine design expertise and manufacturing methods to develop economical and responsible processing solutions for industry.

#### Hot Issues

- Population and food production in Asia
- Food allergies
- Foodborne illnesses
- Drought resistant crops
- Terrorist germ or contamination attacks

#### ASABE Experts

##### **Mary Maley**

Project Manager, Kellogg Company

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Maley has more than 20 years experience in food processing. As project manager for a world-leading producer of ready-to-eat cereals, meat alternatives and convenience foods, she brings a global perspective to food processing issues.

##### **R. Paul Singh, Ph.D.**

[Professor](#)

Department of Biological and Agricultural Engineering

University of California, Davis

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[rpsingh@ucdavis.edu](mailto:rpsingh@ucdavis.edu)

<http://www.rpaulsingh.com>

Dr. Singh and his students have focused their studies on heat and mass transfer in food processing. They have studied the impact of frying food in oil and how to prevent degradation. Their work in food safety issues has centered on preventing E-Coli O157:H7 from surviving in hamburger patties during the cooking process. They have also done studies on the safe freezing and thawing of foods. Most recently, through funding from NASA, Singh and his team are developing a multi-purpose fruit and vegetable-processing system for future manned missions to Mars.

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## *Hot Topics*

### **FOREST ENGINEERING**

Biological and agricultural engineers apply engineering to solve natural resource and environment problems in forest production systems and related manufacturing industries. Engineering skills and expertise are needed to address equipment design and manufacturing, forest access systems design and construction, machine-soil interactions and erosion control, forest operation analysis and improvement, decision modeling and wood product design and manufacturing.

#### Hot Issues

- Sustainable forestry
- Fire management

#### ASABE Expert

**Bruce Hartsough, Ph.D.**

[Professor](#)

Department of Biological and Agricultural Engineering

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[brhartsough@ucdavis.edu](mailto:brhartsough@ucdavis.edu)

Professor Hartsough's research sheds light on partial/selective harvesting of native forest stands, and on short-rotation plantation forestry. His work includes projects in California and elsewhere to develop methods that will improve the health of naturally regenerated stands that are overstocked and prone to wildfires.

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## *Hot Topics*

### **INFORMATION & ELECTRICAL TECHNOLOGIES**

This is one of the most versatile of the agricultural and biological engineering specialty areas. Its developments and knowledge are applied to virtually all other specialty areas from machinery design, to soil testing, to food safety and quality control, to geographic information systems and global positioning, to machine instrumentation and controls, to bioinformatics such as biorobotics, machine vision, sensors and spectroscopy.

#### Hot Issues

- Biorobotics
- Precision agriculture

#### ASABE Experts

**Michael Delwiche, Ph. D., P.E.**

[Professor and Chair](#)

Department of Biological and Agricultural Engineering

University of California, Davis

Phone: 530-752-0102

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Professor Delwiche is a leading resource for information on electronic instrumentation and control strategies for biological production systems. His recent research areas include post-harvest engineering, biosensors, biological control of insect pests and the effects of environmental toxicants on birds. Among his accomplishments is the development of a machine vision system that allows companies to sort harvested fruit by color and defects.

**Tim Stombaugh, Ph.D., P.E.**

[Associate Professor, Biosystems and Agricultural Engineering Department](#)

University of Kentucky

Phone: 859-257-3000 ext: 214; Fax: 859-257-5671

[tstomb@bae.uky.edu](mailto:tstomb@bae.uky.edu)

Dr. Stombaugh's research teams are currently conducting GPS (global positioning system) testing for agricultural applications. They are developing autonomous agricultural vehicles to lessen equipment downtime in the field. His teams are also developing remote sensing tools to take affordable, clearer aerial images of farmland for more accurate crop management.

**Marvin Stone, Ph.D.**

[Regents Professor, Emeritus and ASAE Fellow](#)

Oklahoma State University

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[mstone@ceat.okstate.edu](mailto:mstone@ceat.okstate.edu)

Dr. Stone conducts research in the areas of sensor systems, electronic communication systems and control systems. Stone and colleague John Solie developed the acclaimed "Greenseeker" technology for precision application of fertilizers. He is one of a select group of ASABE members to earn election to the grade of Fellow and is one of a very few in the world to receive

the prestigious Rosentreter Standards Award (2004) for his exemplary leadership and service in the establishment of ASABE standards.

**K.C. Ting, Ph.D., P.E.**

[Professor and Head, Department of Agricultural and Biological Engineering](#)

University of Illinois

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Editors interested in the latest information on automation of agricultural equipment, systems analysis and alternative energy and thermal control will find Dr. Ting a valuable resource. He is also an expert in computerized simulation, optimization and decision support for bio-production and bio-processing systems including phytomation, phytoremediation and advanced life support. Recent projects include concurrent science and engineering, systems studies and modeling of advanced life support systems for human long-duration space exploration, robotics for plant and food production and phytoremediation engineering design.

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## *Hot Topics*

### **NATURAL RESOURCES**

Our environment is fragile. Our soil and water are vulnerable to degradation by both man-made and natural forces. Biological and agricultural engineers with environmental expertise work to better understand how to use our natural resources efficiently and without degradation. These engineers determine crop water requirements and design irrigation systems. They are experts in agricultural hydrology principles, such as controlling drainage, and they design ways to control soil erosion. They study the environmental effects of sediment on stream quality. Natural resource engineers design, build, operate and maintain water control structures for reservoirs, floodways and channels. They also work on water treatment systems, wetlands protection and other water and soil issues.

#### Hot Issues

- Global water shortages
- Flood and coastal erosion risk management
- Soil stabilization

#### ASABE Experts

##### **Terry Howell, Sr., P.E., Ph.D.**

##### Research Leader

USDA Conservation and Production Research Laboratory

Bushland, TX

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Dr. Powell's research interests center on the efficient use of water in irrigated agriculture: sprinkler irrigation, microirrigation, evapotranspiration, lysimeters; irrigation scheduling, crop growth models, micrometeorology, weather networks and water quality.

##### **Russell A. Persyn, P.E., Ph.D.**

KS Persyn

Castroville, Texas

Phone: 830-931-2679/ Fax: 830-538-9005

[rpersyn@hotmail.com](mailto:rpersyn@hotmail.com)

Dr. Persyn's areas of expertise include evaluating composted organics from various sources for use in storm water and erosion control on construction projects. He's also a resource for solutions to waste management issues caused by movement of sediment, nutrient and heavy metal transport. Dr. Persyn has experience designing and evaluating treatment technologies such as constructed wetlands, sand filters, trickling filters, and aerobic treatment units. He is also a resource for current advances in land application technologies including, spray distribution, drip distribution, and subsurface treatment.

##### **Tom Spofford**

USDA-NRCS, retired

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Spofford is a retired USDA Natural Resources Conservation Service national water management engineer. He has been a very active member of ASABE and served on the United States Committee on Irrigation and Drainage, and the Irrigation Association (from which he received the 2001 *Person of the Year*.) His work to standardize evapotranspiration calculations and the installation of thermoplastic irrigation pipe has advanced engineering best practices and water resource management.

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## *Hot Topics*

### **NURSERY & GREENHOUSE ENGINEERING**

Nurseries and greenhouses have very similar needs to large-scale agricultural systems: irrigation, mechanization, disease and pest control and nutrient application. However, there are specific engineering needs, too: equipment for transplantation, control systems for temperature, humidity and ventilation, and plant biology issues such as hydroponics, tissue culture and seedling propagation methods. There's also work underway to design greenhouse systems to support space exploration.

#### Hot Issues

- Organic pest control
- Soiless vegetable production
- Plant cloning

#### ASABE Experts

##### **R. Paul Singh, Ph.D.**

##### Professor

Department of Biological and Agricultural Engineering

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<http://www.rpaulsingh.com>

Dr. Singh and his students have focused their studies on heat and mass transfer in food processing. They have studied the impact of frying food in oil and how to prevent degradation. Their work in food safety issues has centered on preventing E-Coli O157:H7 from surviving in hamburger patties during the cooking process. They have also done studies on the safe freezing and thawing of foods. Most recently, through funding from NASA, Singh and his team are developing a multi-purpose fruit and vegetable-processing system for future manned missions to Mars.

##### **K.C. Ting, Ph.D.**

##### Professor and Head, Department of Agricultural and Biological Engineering

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Editors interested in the latest information on automation of agricultural equipment, systems analysis and alternative energy and thermal control will find Dr. Ting a valuable resource. He is also an expert in computerized simulation, optimization and decision support for bio-production and bio-processing systems including phytomation, phytoremediation and advanced life support. Recent projects include concurrent science and engineering, systems studies and modeling of advanced life support systems for human long-duration space exploration, robotics for plant and food production and phytoremediation engineering design.

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## *Hot Topics*

### **POWER SYSTEMS & MACHINERY DESIGN**

Biological and agricultural engineers focus on making equipment more efficient and less demanding on our natural resources. They develop equipment for food processing, highly precise crop spraying, agricultural commodity and waste transport, turf and landscape maintenance and specialty areas such as removing seaweed from beaches. But they also develop tractors, tillage equipment, irrigation equipment and harvesting equipment that are used by small to mega-farms around the world.

#### Hot Issues

- Tractor innovations
- Robotic harvesting
- High-speed tractors

#### ASABE Experts

**Thomas F. Burks, Ph.D.**

[Associate Professor](#)

Department of Agricultural & Biological Engineering

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Dr. Burks specializes in the design and development of agricultural machinery systems, robotics, machine vision, neural networks, precision agriculture and instrumentation. He has particularly looked into the urgent need for finding robotic harvesting solutions for fresh fruits such as late-season Valencia oranges.

**Donald C. Erbach**

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Recently retired after 40-year career with the USDA, Agricultural Research Service. ASABE President-elect Erbach serves on the USDA Biobased Products and Bioenergy Coordination Council and the White House Office of Science Technology Policy Hydrogen Task Force.

**Roger M. Hoy, Ph.D.**

[Professor, Biological Systems Engineering](#)

Director, Nebraska Test Laboratory

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Dr. Hoy's research focuses on tractor and machinery test technology. He's also a key resource for emerging trends in off-road vehicle design and tractor performance.

**John B. Solie, Ph.D.**

[Professor, ASABE Fellow](#)

Oklahoma State University

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Dr. Solie conducts research on the design of production and bioharvesting machines that use sensor-based, precision application and management of production systems. Along with Marvin Stone, Solie was key in developing the much-acclaimed "Greenseeker" technology for precision application of fertilizers. He is also a patent attorney for OSU's Biosystems and Agricultural Engineering department.

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## *Hot Topics*

### **SAFETY & HEALTH**

Farming is one of the few industries in which entire families are vested and are at risk for injuries, illness and death. Agricultural and biological engineers analyze health and injury data, the use and possible misuse of machines and equipment compliance with standards and regulations. They constantly look for ways to improve safety and health in farming operations.

#### Hot Issues

- Musculoskeletal Disorder (MSD) prevention
- Hazardous waste
- Farm safety training for non-English speaking workers
- Web-based safety training

#### ASABE Experts

##### **Malcolm “Mac” Legault, Ph.D.**

##### Assistant Professor

Department of Health, Safety and Environmental Health Sciences

Indiana State University

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Dr. Legault is a prolific writer and presenter on agricultural hazards and safety issues. He is a resource for information about legislation for improved industrial and farm safety, fire protection systems and technology, biostatistics and hazardous substances and waste materials.

##### **Dennis J. Murphy, Ph.D.**

##### Professor

The Pennsylvania State University

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Dr. Murphy specializes in agricultural safety and health issues. Areas benefiting from his research include tractor and machinery safety; youth safety; classification of agricultural deaths and injuries; methods of modifying farm worker safety behavior; evaluating safety interventions and responding to farm injury emergencies.

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## *Hot Topics*

### **STRUCTURES & ENVIRONMENT**

Agricultural and biological engineers understand the importance of creating and maintaining a healthy environment for growing agricultural commodities and for the laborers who produce them. They also understand the importance of not diminishing the quality or availability of natural resources. These engineers design animal housing, storage structures and greenhouses with ventilation systems, temperature and humidity control. They build structures appropriate for their climate and purpose. And they continually seek ways to improve the storing, recovering, reusing and transporting of waste products.

#### Hot Issues

- Animal housing emission controls
- Bio-terrorist threat to agriculture
- Impact of poverty on the agricultural environment

#### ASABE Expert

**Greg Williams, Ph.D., P.E., S.E.**

Tyson Foods

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Dr. Williams has developed novel and sophisticated solutions for the design of safe, functional food, agriculture and bioprocess processing facilities, including those inspected by the USDA and FDA, using all major materials for construction. He is a leading authority in the design of concrete and steel bulk storage. Dr. Williams has extensive experience using the design-build project delivery method. He has also worked as a consulting engineer and for Fortune 50 food processors.