

NABC

news

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*Providing an open forum
for exploring issues in
agricultural biotechnology*



NABC'S PRINCIPAL OBJECTIVES ARE TO:

- ◆ provide an open forum for persons with different interests and concerns to come together to speak, to listen, to learn, and to participate in meaningful dialogue and evaluation of the potential impacts of agricultural biotechnology
- ◆ define issues and public policy options related to biotechnology in the food, agricultural, biobased industrial product, and environmental areas
- ◆ promote increased understanding of the scientific, economic, legislative, and social issues associated with agricultural biotechnology by compiling and disseminating information to interested people
- ◆ facilitate active communication among researchers, administrators, policymakers, practitioners, and other concerned people to ensure that all viewpoints contribute to the safe, efficacious and equitable development of biotechnology for the benefit of society
- ◆ sponsor meetings and workshops and publish and distribute reports that provide a foundation for addressing issues.

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Letter from the Chair....

Agricultural biotechnology is now being looked to as a key contributor to society's needs for renewable energy and industrial feedstocks, in addition to enabling cost-competitive food production. NABC-member institutions share a commitment to the vision that agricultural systems can meet these expectations. What they also share is a recognition that training of future scientists is going to be critically important.

Agricultural innovation has been closely tied to research and knowledge-creation for over a hundred years. The fundamental disciplines of botany, physiology, microbiology, genetics, agronomy and ecology—as well as animal science, biochemistry, chemistry and physics—remain the “ABCs” upon which this innovation has occurred. As agricultural biotechnology gradually morphs into industrial biotechnology, we must not lose sight of this.

Throughout the 1990s and the early part of this decade, enrolment in agricultural programs at universities declined at a rate of several percentage points per year. In recent years, a number of universities have initiated programs in an effort to reverse this trend—focusing on areas such as resource management and environmental studies—which have helped to halt the decline. Nevertheless, it is important to recognize that some disciplines of study should not be compromised.

There will be significant challenges to agriculture and, therefore, to agricultural biotechnology that relate to fundamental matters of botany and plant physiology. Nitrogen utilization, drought tolerance, cell-wall structure, seed germination and storage are disciplines that reach back hundreds of years and the need to reach forward will



ALAN WILDEMAN
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continue in the era of industrial uses of crops.

NABC-member institutions comprise many of the research leaders in the agricultural and life sciences, and this past year we have introduced programs to encourage our graduate students to become more engaged in our annual meeting. By hearing the kinds of issues and opportunities discussed, such as biofuels, health and food production, the importance of a strong scientific knowledge-base might be recognized as being at the core of new progress. The *Student Voice at NABC* is an initiative that provides assistance to graduate students to attend the annual meetings and to comment on current and emerging issues (see page 5).

With respect to agricultural biotechnology, a disconnect persists between science, public policy and public opinion. All three of these carry significant weight. We often talk about need for science-based policy, and we live in a world in which scientific credibility is not always recognized within the choir of commentary. It is

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NABC 20—Mark Your Calendars

Columbus, OH, June 2–5, 2008

Reshaping American Agriculture to Meet Its Biofuels and Biomaterials Roles*

STEVEN A. SLACK

NABC's twentieth annual meeting will be hosted by the Ohio State University in downtown Columbus, June 2–5, 2008. Representing the eastern edge of the corn belt, Ohio is home to >11 million people and several major metropolitan areas, including Cleveland and Cincinnati. Agriculture still ranks as the #1 industry with an annual economic value of \$93 billion, contributing to one in seven jobs in the state. As opportunities for agricultural crops expand beyond food and fiber, there is increasing interest in building on the synergism between the agricultural sector and Ohio's \$50 billion polymer industry—which is linked to a diverse supply chain of manufacturing industries including national leadership positions in paints, adhesives, rubber and detergents. Polymer Ohio, Inc., an organization representing the polymer industry, will hold its biennial Polymer Summit at the same time and location as NABC 20, enabling leverage of overlapping themes.

NABC 20 will broaden the “agricultural biofuels” theme of NABC 19 in Brookings, South Dakota, with examination of trends and policies; impact of using crops as renewable energy resources; and how to derive value from generated co-products. Keynote speakers will address four sessions followed by response panels presenting contrasting view-

points. In the tradition of NABC, there will be opportunities for discussion of the themes at Q&A sessions and in breakout workshops.

- *Megatrends Reshaping American Agriculture.* Speakers will share their views on major trends shaping the breadth and scope of US agriculture. This module will frame important questions and issues on the horizon, to stimulate discussion.
- *Enhancing Bioenergy Productivity of Crops.* Speakers will address the multiple factors—including feedstock selection and management as well as effective and efficient bioconversion of complex carbohydrates into building blocks—needed for the biofuel and polymer industries. These issues must be managed in the context of using crops for food and feed as well as fuel.
- *Optimizing the Value of Co-Products/By-Products.* This area of endeavor is receiving increased attention nationally. Building on the theme of food, feed and fuels, speakers will examine co-product utilization as a critical factor in balancing and maximizing the utilization of crops and crop components.
- *Policy Issues Impacting Agriculture and Bioenergy.* In this, the capstone session for the conference,

speakers will look at issues impacting the utilization of crops for bioenergy and bioproducts and how they will operate within a policy framework.

Registration, travel and lodging information will be circulated in the coming months and will be included in the spring 2008 *NABC News*. The NABC website (<http://nabc.cals.cornell.edu/>) will post details as they become available. Flyers will also be developed and circulated.

Columbus is the capital city of Ohio and the conference will be held in the vibrant downtown area where a wide range of dining and entertainment opportunities exist within walking distance. The Short North Arts District is just north of the conference area, while the German Village and the Brewery District are just to the south. More information can be found at: www.experiencecolumbus.com/ .

Please direct questions, comments and suggestions to

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* Conference and session titles are tentative.

Overview of NABC 19

Agricultural Biofuels: Technology, Sustainability and Profitability

NABC's nineteenth annual meeting—hosted by South Dakota State University—convened in Brookings, SD, May 22–24, 2007. Delegates were welcomed by Kevin Kephart (vice president for research and dean of the Graduate School, SDSU), Gary Lemme (dean of the College of Agriculture and Biological Sciences, SDSU), Tony Shelton (NABC chair, 2006–2007) and Ralph Hardy (NABC president). The conference attracted 108 delegates from twenty-two US states, two Canadian provinces, and Egypt, Niger and Taiwan. Plenary sessions were held on the afternoon of May 22 and the mornings of May 23 and 24. Excursions—laid on for the afternoon of May 23 to a biodigester at Milbank, to the VeraSun ethanol plant at Aurora, and to the USDA National Resources Conservation Service Laboratory at Brookings—were informative and much enjoyed, and provided practical backdrops to the discussions. As well as an excellent banquet on May 22, attendees savoured prime South Dakota beef at a barbecue at the State Agricultural Heritage Museum, Brookings, on the evening of May 23.

Ex-Senate majority leader Tom Daschle was the banquet speaker (*Breaking America's Addiction to Oil through Agriculture*) and luncheon addresses were delivered by SD Governor Mike Rounds and Jim Fischer (James R. Fischer and Associates).

Session #1—*Sustainability: Impacts and Issues*—comprised presentations by Suzanne Hunt (Worldwatch Institute, Washington, DC, *Biofuels For Transportation Sustainability*);

Steve Bantz (Union of Concerned Scientists, Washington, DC, *Biofuels: An Important Part of a Low-Carb Diet*); William Richards (25×'25 National Steering Committee, *Food, Feed, Fiber and Fuel: A New World for American Agriculture and Environmental Sustainability*) and Brendan Jordan (Great Plains Institute, Minneapolis, MN, *Ushering in a Sustainable Bio-Economy*).

In session #2—*Technology, Biomass, Fuels and Co-Products*—presentations were made by Larry Smart (SUNY College of Environmental Science & Forestry, Syracuse, NY, *Development of High-Yielding Varieties of Shrub Willow as a Dedicated Energy Crop*); William Gibbons, (South Dakota State University, Brookings, SD, *Challenges on the Road to Biofuels*); Mark Bricka (Mississippi State University, Mississippi State, MS, *Energy Crop Gasification and Gasification Issues*); Kurt Rosentrater (USDA/ARS North Central Agricultural Research Laboratory, Brookings, SD, *Ethanol Processing Co-Products: Economics, Impacts, Sustainability*); David Ramey (ButylFuel LLC, Gahanna, OH, *Butanol*) and Richard Flavell (Ceres, Inc., Thousand Oaks, CA; *Turning Biomass Crops For Biofuels Into Commercial Reality*).

The speakers in session #3—*Economics and Sustainability*—were Wallace Tyner (Purdue University, West Lafayette, IN, *Biofuels, Energy-Security and Global-Warming Policy Interactions*); Roger Wyse (Burrill & Company, San Francisco, CA, *Economics and Sustainability*); Mark Kraeger (Prime BioSolutions, Omaha,

NE, *Energy: Agriculture's Call to Action*); Danny Le Roy (University of Lethbridge, Lethbridge, AB, *Development and Sustainability of the Biofuel Industry in Canada*) and Maria Wellisch (Natural Resources Canada, Ottawa, ON, *Biofuels and Biorefinery Development in Canada: The Question of Sustainability*).

The conference theme—agricultural biofuels—was comprehensively covered, with high-quality presentations that stimulated lively Q&A sessions with the audience and active discussions within three breakout workshops. Points of interest made by speakers include:

- The United States must find ways to reduce dependence on its enemies for energy.
- The United States uses 21 million barrels of oil a day, *i.e.* a twentieth of the world's population uses a quarter of its oil. It is expected that US consumption will grow to 40% by 2025.
- Increasing demand from China and other countries has stretched production capacity and played a significant role in higher oil prices. With little spare capacity, supply disruptions could have more dramatic effects, and the risk of oil-price volatility is greater than ever.
- As we burn oil, we burn up our planet. If global warming continues unchecked, it will push wheat cultivation deep into Canada and Alaska by 2050.
- The United States is borrowing money from its economic competitors in order to burn up the planet and indirectly subsidizing people

- whom we are asking our soldiers to fight.
- South Dakota has led the country in reaping the economic benefits that can come from growing fuel. Ethanol plants in South Dakota have produced returns of 33% for their investors and have drawn \$400 million in new capital investment into the state.
 - South Dakota generates more transportation bio-fuel than it consumes.
 - Due to the large demand for transportation fuels and the fact that corn-based ethanol can, at most, account for 15—20% of this need nationally, there is widespread interest in producing ethanol from lignocellulosic biomass.
 - The use of biomass to produce renewable power will reduce reliance on petroleum-based transportation fuels when plug-in hybrid and electric cars become widely commercially available.
 - Perennial energy crops will be a major component of overall biomass resources, but there has been little breeding to improve their bioenergy traits.
 - One of the major bottlenecks to widespread commercial deployment of new perennial energy crops is the scale-up of high-quality planting stock, *i.e.* seed lots of switchgrass, rhizomes of *Miscanthus x giganteus* and whips of shrub willow.
 - Biochemical conversion processes use pre-treatment processes and enzymatic hydrolysis to break down biomass into sugars that are subsequently fermented to ethanol by microbes (typically yeast). Alternatively, thermochemical conversion processes use gasification or liquefaction to degrade biomass into one- and two-carbon molecules that are catalytically converted into more complex products.
 - At the beginning of 2007, 110 plants manufacturing corn-starch ethanol in the United States had an aggregate production capacity of 5.5 billion gallons per year. Seventy-six plants are under construction or expansion, and upon completion will contribute an additional 5.6 billion gallons per year. As the ethanol market segment continues to grow, so do the quantities of processing residues, or co-products, that are generated.
 - Opportunities to increase economic returns from ethanol production from corn starch include processing distillers' dry grains into high-value animal feeds, human foods and industrial composites.
 - For utilization as feed, distillers' dry grains are being transported greater distances via truck and rail, and stored in bins, silos, *etc.*, until final use. Unfortunately, discharge flow is often problematic, due to caking and bridging between particles. In order to induce flow, workers often have to hammer railcars and hoppers, causing severe damage. No formal scientific studies have investigated handling or flow properties of distillers' grains.
 - Because distillers' grains are high in fiber and low in starch, they have potential as a food ingredient for diabetics.
 - The anaerobic production of butanol and hydrogen was reported to provide about 42% more energy from corn starch than does the production of ethanol.
 - Butanol can be used as an automobile fuel without engine-retrofitting and with mileage better than from gasoline.
 - Although the economics of production of ethanol from switchgrass and miscanthus critically depend on biomass yield and efficiency of conversion of cell-wall materials to biofuels, these factors need more breeding, optimized for large-scale agriculture.
 - Ethanol has been produced for fuel in the United States for almost 30 years. The industry launch was initiated by a subsidy of 40 cents per gallon provided in the Energy Policy Act of 1978. Between 1978 and today, the ethanol subsidy has ranged between 40 and 60 cents per gallon and is now 51 cents, paid to the blender.
 - During the period 1984–2003, crude-oil prices ranged between \$10 and \$30 per barrel, with only one very short-term peak above \$30. In that range, the fixed federal subsidy did not put significant pressure on corn prices. However, with crude oil recently at \$80/barrel and major expansion of starch-ethanol production plants, corn prices have increased.
 - Ethanol development in Canada has been much slower than in the United States for reasons of grain supply and government policy. However, in December 2006, the Canadian government announced C\$345 million in taxpayer transfers for two agriculture programs to subsidize the development of a biofuels industry. To encourage more farmer participation, C\$200 million is to be made available through the EcoAgriculture Biofuels Capital Initiative.
- At the breakout workshops, which convened at the conclusion of each session, delegates in small groups had further opportunity to discuss issues raised in the presentations and Q&A sessions, to voice other related matters and to make recommendations to share with policymakers. A summary of the workshops is provided on page 6 of this newsletter.
- And a fuller summary of the presentations will be provided in *NABC Report 19* (projected publication date December 31, 2007) with manuscripts by the speakers. ■

Student Voice at NABC Inauguration at NABC 19

To increase graduate-student participation at NABC conferences, the *Student Voice at NABC* initiative was launched in Brookings (page 3). NABC offered \$500 grants to one graduate student delegate (GSD) from each member institution to assist with travel and lodging expenses, with the registration fee waived. The GSDs were expected to attend all NABC-19 sessions and workshops and were requested to meet as a group on the evening of May 23 and identify current and emerging issues in agricultural biotechnology including biofuels.

The GSDs were as follows:

Clarimont Clementson	Purdue University	Arijit Mukherjee	Clemson University
Sarah Collier	Boyce Thompson Institute	Tom Niehaus	University of Kentucky
Haluk Gedikoglu	University of Missouri	Kari Perez	Cornell University
Alissa Meyer	Pennsylvania State University	Buck Wilson	Oregon State University
	Chinnadurai Karunanithy		South Dakota State University

Ms. Perez and Mr. Karunanithy reported briefly on the *Student Voice* discussions at the conclusion of NABC 19 and provided the following in writing:

Agricultural Biofuels

- Public awareness/education is needed on biofuels, emphasizing potential environmental benefits, effects on greenhouse gas emissions and global warming, and possible effects on crude-oil imports and the Kyoto protocol.
- A comprehensive approach is needed, involving plant breeders, agronomists, bioprocess engineers, biotechnologists and microbiologists. New varieties of energy crops/trees/shrubs have to be developed with higher productivity, greater bulk density and less lignin content with low inputs of water and fertilizers.
- Pretreatment and enzymes are the most costly components of ethanol production. Many groups are working on these aspects, but effort should be intensified to reduce ethanol cost so that it can compete with fossil fuels.
- Develop micro-organisms for simultaneous fermentation of pentoses and hexoses in biomass.
- Introduce flexible fuel vehicles with higher mileage.
- In order to meet the US-government goal by 2025, at least 2 billion gallons of biodiesel should be produced. The transesterification process produces biodiesel and glycerol; disposal of the latter must be addressed.
- Butanol is an alternative to ethanol/gasoline owing to its higher energy content as well as direct use in existing cars.
- Economic and social implications: Once mature cellulosic ethanol technology is available, there will be competition between food and fuel. Farmers will decide on crops/land-use patterns based on income. This will lead to land scarcity, therefore, there is need to develop marginal lands for energy crops.
- If all agricultural residues are harvested as biomass, the issue of soil-fertility maintenance must be addressed
- Like starch ethanol, there should be long-term incentives/tax benefits for cellulosic ethanol.

Key Future Directions for Agricultural Biotechnology

- Increase K–12 outreach activities; identify what is biotechnology and what are the risks and non-risks
- Intellectual property
 - Address patenting issues (public sector vs. private ownership)
 - Address issues of biopiracy
- Develop GMO regulations and policy that are uniform and reconcile public and scientific concerns and promote application.
 - Stress importance of separate policies for edible food crops vs. non-edible GMO applications
 - Emphasize research for the genetic control of transgenes
- *Student Voice* grants should be continued. ■

NABC-19 Workshops Summary

KENTON E. DASHIELL & VAN C. KELLEY¹

Three breakout workshops were held during NABC 19, with the following topics:

- Sustainability: Impacts and Issues
- Technology: Biomass, Fuels, and Co-Products
- Economics and Sustainability.

Eight groups, each with a facilitator and recorder², met for 1-hour periods to discuss predetermined questions. This report provides some of the key points to emerge from the discussions³; fuller coverage will be included in *NABC Report 19*.

Breakout Workshop #1

Sustainability: Impacts and Issues

Question 1: What are the chief food/feed/fuel competition concerns? What actions are recommended to minimize these concerns?

- Price increases for food crops may even affect people's diets; the pulp and paper industry is concerned that wood prices will increase due to competition for feedstock; in the near future, livestock prices will increase more than for other foods.
- The economics of growing crops in less-developed countries may improve, creating export opportunities.
- Subsidies may be needed by the livestock industry to reduce the effect of rising feed costs; research is needed on developing foods with DDGS.
- A major action item is to reduce demands for conventional and biofuels through public education programs.

Q 2: What incentives and technologies are needed to induce farmers to grow cellulosic crops?

- Guaranteed stable markets will encourage farmers to invest in equipment and make changes in their farming systems; the required farm-gate price for biomass varies from as low as \$40 to as high as \$100/ton; strong markets need to be developed for energy crops because government subsidies should not be needed long term.
- Infrastructural issues related to transportation of ethanol/butanol need to be resolved; convert textile, paper and similar processing plants for energy-crop refining; research is needed on processing options such as distillation, direct combustion and pyrolysis.

¹ Respective affiliations: USDA-ARS North Central Agricultural Research Laboratory, Brookings, SD; South Dakota State University, Brookings, SD.

² These duties were shared as follows: Facilitators—Tom Cheesbrough, Jeremy Freking, Wade French, Darrell Grandbois, Doug Raynie, Craig Russow, Evert VanderSluis, CY Wang; Recorders—Theron Cooper, Basil Dalaly, José Gonzalez, Jim Julson, Joan Kreitlow, Tyler Remund, Lisette Tenlep, Tom West.

³ Views expressed are not necessarily those of the authors, the Agricultural Research Service or South Dakota State University.

- Changes in cropping systems will be more probable if technologies are developed to open up pivot corners and other unproductive lands to grow energy crops; availability of drought-tolerant energy crops for planting in marginal soils; appropriate modification in Conservation Reserve Program (CRP) rules; producers need to participate in a carbon tax credit trading system with incentives for soil and other conservation practices.

Q 3: What measures and policies should be adopted to address environmental concerns over cellulosic biofuel crops?

- As more land is planted to these crops, policies should be instituted to preserve biodiversity.
- Standards for sustainable removal rates (including carbon sequestration) will need to be developed to protect soils, water quality and wildlife habitat.
- Perennial crops have more environmental benefits than negatives.
- The environmental impact of removing forest biomass needs to be better understood.

Q 4: What is the likelihood—and potential impact—of deploying genetically modified (GM) perennial energy crops?

- It will occur and the impact will be positive as with row crops.
- Recombinant DNA technology will be necessary for rapid genetic improvement of perennial energy crops.
- It will be important to prove that GM crops will have no negative environmental effects; societal acceptance will be more likely if GM crops are not for food use.
- Traits that need genetic improvement will need to be precisely identified.

Breakout Workshop #2

Technology: Biomass, Fuels, and Co-products

Q 1: What technologies and agronomic practices need to be applied or developed to improve the quality and quantity of biomass crops?

- Equipment for efficiently harvesting biomass needs to be developed, *e.g.* for high-speed collection of corn and stover in a single pass.
- Logistics of transportation and storage of low-density biomass is a significant issue; in-field or localized processing may offer a solution if the economics of scale can be overcome.
- A huge ramp-up will be needed to bring 50 million acres of biomass into production; seed availability will be an issue.
- Region-specific cultivars with appropriate drought

tolerance, flooding tolerance and disease/insect resistance are in short supply.

Q 2: What are the priorities for processing-technology improvements and how can we encourage development of these technologies? (Or, are market forces sufficient drivers?)

- More research is needed on on-site processes such as densification and pelletization, pre-processing and distributed gasification; processing facilities need to be developed that can be scaled down for local use without losing efficiency.
- Processes also need to be robust enough to accommodate heterogeneous feedstocks.
- Metrics for indexing feedstock quality would allow more standardization of protocols and procedures.

Q 3: How do we evaluate the overall sustainability of various renewable energy systems—biofuels, biopower, or hybrids of the two?

- A process that is carbon neutral and allows recycling carbon instead of releasing trapped carbon is beneficial; a process that captures CO₂ has even greater benefit.
- Sustainability will require maximizing energy output subject to constraints in terms of CO₂ balance, nutrient balance, water quantity and quality and soil quality.
- Rural-community development is closely tied to the possibility of new income sources that are sustainable.
- Renewable energy may not be sustainable without government subsidies.

Q 4: What issues underpin present and future production and use of co-products (such as DDGS, cellulosic ethanol by-products, glycerol from biodiesel)? For example, conversion of corn fiber to ethanol will alter the composition and supply of DDGS.

- The generation, handling and quality control of co-products is important to the success of the biofuels industry.
- Variability of DDGS affects market value.
- Research is needed to develop high-value, unique uses for co-products.
- Amount and type of antibiotics in DDGS will affect use in organic produce markets.

Breakout Workshop #3 Economics and Sustainability

Q 1: What policies will maximize investment in processing plants, distribution infrastructure and consumer adoption of biofuels?

- Consumer adoption will occur when there is economic incentive, *e.g.* lower prices for biofuels or blends at the pump.
- Improved communication with consumers will help to eliminate misinformation on biofuels. Issues such as

fuel quality and vehicle compatibility with biofuels are concerns that impede adoption.

- Funding for biofuel-distribution infrastructure will broaden availability.
- Perfecting the carbon credit trading system could offer economic incentives to farmers as well as biofuel consumers.

Q 2: What policies to stimulate renewable fuels production seem reasonable?

- Government procurement policies, government mandates such as requiring biofuels to be used by public transportation, requiring auto manufacturers to produce flex-fuel vehicles and favorable prices for electricity production.
- Policies requiring fuel blends that are most efficient and requiring blender pumps will make renewable fuels more available.
- Bioenergetic analyses of cellulosic feedstock production and long-term policy in developing cellulosic ethanol production would help to guide the industry.

Q 3: What is the role of the public sector (USDA and universities) in assisting agriculture in its response to the energy situation?

- Key research, extension and teaching areas include: plant breeding of new crops, soil science, plant diseases and insects, agronomic management of crop systems with reduced energy input, processing of co-products, economic analysis/economic policy, water problems raised in Q 4, and support for the transition from starch- to cellulose-based ethanol.
- Universities can play a key role in teaching industry employees and in workforce development; cooperative education programs that allow students to alternate semesters between industry and school can provide a well-trained source of new talent.
- Universities can make a contribution to development of rational public policy by serving as forums to discuss controversial ideas and serving as a voice for farmers and other society sectors.

Q 4: How critical is it that processing facilities generate their power from renewable sources (lignin, wind-power, co-generation, *etc.*) instead of petroleum? Also, how important is net water usage in processing technology?

- The issues of usage of energy and water in processing facilities are critical for the sustainability of the industry.
- Closed-loop systems with an integrated approach such as locating plants near feedlots may reduce petroleum use.
- Water use in the production of energy crops is a bigger issue than the water use in processing the energy crop.
- Water use in cellulosic ethanol production may cause additional pollution concerns. ■

NATIONAL AGRICULTURAL BIOTECHNOLOGY COUNCIL

Continued from page 1 "Letter.."

crucial that we remind ourselves that good agricultural science starts with good fundamental knowledge of how organisms live and grow and interact with their environment. Perhaps consideration of enrolment trends in agricultural sciences should include assessment of enrolment in biological science programs as well.

NABC members advocate for the best science and for putting that science to the best possible uses. We

encourage institutions that are not members to consider joining. We are one of the few organizations that seek a common voice for research-intensive institutions involved in agricultural science, recognizing that the "ABCs" will continue to be vital for the future, and future meetings and white papers will continue to place an emphasis on the role that strong basic science plays.

This newsletter highlights issues raised in the plenary presentations and breakout sessions at NABC 19 at South Dakota State University,

Brookings, SD, May 2007—*Agricultural Biofuels: Technology, Sustainability and Profitability*. NABC's twentieth annual meeting is previewed; it will convene in Columbus, OH, in June 2008, hosted by Ohio State University, and will build on NABC 19's theme: *Reshaping American Agriculture to Meet Its Biofuels Role*. ■



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