Drilling for Oil
It's not just black gold

A Life of Leisure
Alternative barns may be worth extra cost

Super Species
Exotic plants, animals threaten environment

Green Is in the Air
Tall tower monitors carbon
Solutions magazine is published three times a year for friends, alumni, faculty, staff and students at the College of Food, Agricultural and Natural Resource Sciences. Like the college, the magazine focuses on how science leads to solutions for today’s problems in food and agricultural systems; global climate and environmental change; biodiversity; and bioenergy and bioproducts. CFANS is composed of six divisions, 13 academic units (two are held jointly), seven research and outreach centers throughout Minnesota, the Bell Museum of Natural History and the Minnesota Landscape Arboretum. The college also participates in many interdisciplinary centers and cooperatives.

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Welcome to our fourth issue of Solutions.

Welcome to our fourth issue of Solutions magazine. This issue reports on some of the exciting new developments in our strategic areas of focus:

- **Alternative Energy and Biofuels**
  CFANS scientists are looking for oil, but not the kind that gushes out of the ground. Instead, they're looking for oil from offbeat sources and by using innovative methods.

- **Food and Health**
  Researchers are finding that giving livestock animals a more comfortable living situation may be worth the added costs.

- **Biodiversity**
  Invasive species—whether they’re plant or animal—create high financial costs as well as ecological harm and sheer nuisance. We highlight eight of these invaders that CFANS scientists are studying.

- **Environment/Climate Change**
  At UMore Park at Rosemount, a radio tower soars 240 meters high, creating a one-of-a-kind observatory with specialized sensors that allow researchers to make the first direct measurements of isotopic carbon dioxide exchange between earth and atmosphere.

In addition to these stories and others, we highlight the accomplishments of our stellar students, staff, faculty, donors and alumni. This issue also includes a report on generous new funding for some of our key research in biofuels and food/health systems.

Here at CFANS, we emphasize Solution-Driven Science, and Solutions aims to inform and inspire, leading to continued discussions and partnerships in the areas of food, agricultural and natural resource sciences.

Please let us know how we’re doing; we’d love to hear your feedback. Write to us at solutions@umn.edu.

Allen S. Levine (’73—M.S., botany; ’77—Ph.D., nutrition)
Dean
Researchers in Roger Ruan’s lab are testing algae for its potential as an oil source.
Scientists are in the midst of an oil rush, but not for the black gold. This gold is yellow and green, and it comes from plant-based sources.

Some of the oils and their byproducts will be converted to fuel; the rest can be turned into food, either for animals or humans. Fast-changing economics in both the food and fuel markets mean CFANS researchers are searching for oil sources with multiple uses that provide flexibility for growers and processors.

Oil and feed

A couple of years ago, agronomy and plant genetics professor Paul Porter heard from a Wisconsin colleague who was interested in a method that allowed farmers to crush oilseed crops and use the resulting oil to make biodiesel right on their farms. “I thought, if they’re doing it in Wisconsin, why not in northwestern Minnesota where we have a lot of canola?” Porter says. After some grant money became available, Porter and his team bought the necessary equipment and set it up on a farm in Roseau County last summer as a demonstration project.

The machinery involves pressing the oil out of canola—which leaves behind meal that can be fed to livestock—and then creating biodiesel by adding methanol and a catalyst to the oil. The process can be done on a scale ranging from 20 gallons to more than 2,000 gallons, Porter says, so would work as a single-farm operation or for a group of farmers. “It’s an easy process, simpler than making chocolate-chip cookies,” he says.

At around the same time, a master’s degree student working with Porter, Seth Fore, was hired to research whether farmers would use such a system and what complications might be involved. He began interviewing the Wisconsin farmers who’ve been using a system similar to Porter’s, and soon found that the answers are complicated.

“When we started this, canola was 9 cents a pound,” Fore says. “You could make fuel very economically, and do it in a sustainable manner. Now, the economics have changed,” as canola trades at about triple that price, so farmers are adapting. Some are still using the meal byproduct to feed their animals, but are burning the oil as a heating fuel rather than making it into biodiesel, for example.

The demonstration project moved to the University of Minnesota-Crookston for the winter, where students ran tests such as how processing speed and temperature affect the processing and the quality of the finished product. This summer, the project will move back to another farm for more testing, Porter says, which may involve crushing different kinds of oilseed crops in addition to canola.

Many questions remain. “We’re trying to figure out how much to invest in making biodiesel and how much into other uses of this oil,” Porter says. The meal created from pressing on a small scale contains more oil than commercial products so might be more desirable to livestock producers as feed, for example. Or it might make economic sense to press the crops for oil and then simply sell the oil to commercial biodiesel makers. Word from Europe is that some manufacturers are designing tractors that can run on straight vegetable oil, which could radically change U.S. farming if that machinery becomes available here.

“You can use these products in so many ways,” Fore says. “It’s a matter of figuring out, as the economics change, which is most efficient under which set of circumstances.”

Green gold

Roger Ruan’s oil comes from a more unlikely source: wastewater. He’s the leader of efforts at CFANS to extract oil from algae, the green plant matter that grows on top of standing wastewater. Algae has potential as a biofuel because of its extremely high oil content.

In labs on the St. Paul campus, vats of green liquid bubble away while researchers test for the optimal light and temperature conditions for promoting fast algae growth. The project, which is funded in part by the Initiative for Renewable Energy and the Environment, has garnered national media attention and funding from several federal, state and private sources. Researchers in the labs are working on several issues, including which algae species will grow best on wastewater but still yield a high percentage of biomass and oil, and what kind of photobioreactor will work most efficiently.

By Becky Beyers

Paul Porter, professor of agronomy and plant genetics, leads experiments in extracting oil from canola for uses on farms.

Roger Ruan tests for the optimal light and temperature conditions for promoting fast algae growth.
Although some types of algae have been shown to contain as much as 50 percent or more oil, that’s not the deciding factor, Ruan says. As long as algae gets the light and nutrients it needs, “it grows so fast that even 20 percent won’t be bad.”

Once those issues are resolved, the question becomes how to efficiently harvest the algae and get the oil out of it on a production-sized scale. Ruan’s lab is working with the Twin Cities Metropolitan Council—which processes about 250 million gallons of wastewater a day so is a prodigious source of nutrients for algae—to figure out how to make the process technically and economically feasible on a bigger scale. That will likely involve the prototype systems that Ruan, a professor in the Department of Bioproducts and Biosystems Engineering, hopes to have running at a Twin Cities wastewater treatment plant by sometime later this year.

Whether algae can be a competitor in the commercial biofuels market remains to be seen, he says. “The key is feedstock. It’s going to be a matter of who can produce the major quantities efficiently.” While it’s clear that oil from algae can be used as biodiesel feedstock on a small scale, testing on a major scale is needed, he says. “That’s when we can talk about the economics. Right now, it’s just too soon to tell.”

Switching to soybeans

Jim Orf and his colleagues are working on a well-known source of oil: the soybean. But they’re trying to find a way to make beans better as both a fuel and a food.

“Basically this project is aimed at discovering the genes in soybeans that act like a switch to control the amount of oil in the bean versus the amount of protein or carbohydrates, depending on needs,” says Orf, a professor of agronomy and plant genetics. If that gene can be isolated, soybean plants eventually could be bred to create beans with either high oil or high protein and carbs.

Orf and his collaborators, Sue Gibson and Jane Glazebrook, both associate professors in the Department of Plant Biology, are concentrating their search by using a set of recombinant inbred lines to cross varieties of soybean, then evaluating the offspring for oil and protein content. “We’re sort of reshuffling the deck of genes,” Orf says, and looking for the desirable traits. For example, they’re looking at genes that become active near the end of the growing season, because that’s when soybeans’ oil content increases.

The goal isn’t necessarily to make more oil for biofuel uses. Most soybean oil is still used for human consumption around the world, but increased demand is making it more expensive, particularly in developing countries. At the same time, people around the world are eating more meat, which creates a demand for more protein to feed livestock—a need that high-protein soybean could satisfy.

Minnesota was the first state to mandate some biodiesel use and legislators have discussed strengthening the requirement, so higher-oil beans would be particularly valuable here, Orf says. But demand also remains high for protein, both for animal and human consumption, and that likely won’t change. “Maybe we end up with two kinds of beans, one with high oil and the other with high protein—almost like taking one crop and making two out of it.”

Such a scenario is at least 15 to 20 years away, he adds, because of the time involved in going from cross-breeding to introducing a new variety. “The first thing is to make sure that this will work; then we adapt the techniques to beans that will grow in Minnesota, and then we put this into the varieties farmers want.”

Jim Orf, professor in agronomy and plant genetics, works on different varieties of soybeans.
Think about building a new cellulosic ethanol plant, and the questions that must be answered can be daunting: How big should the plant be? How much biomass will be needed? How will the plant and the crops that feed it affect the environment?

Four CFANS scientists are working on ways to answer those questions as part of a two-year study funded through the college’s grant program. They’re using specific data from the LeSueur watershed district in southern Minnesota to create an analysis tool, but expect that their work will be adaptable to other regions in the state and the nation.

“Basically what we’ve done is break this into four parts,” says Jeffrey Apland, a professor in the Department of Applied Economics and one of the four investigators. He will use economic modeling to forecast production economics involved in a hypothetical plant—for example, how much farmers will need to be paid for biomass in order to produce it profitably. At the same time, David Mulla, a professor in the Department of Soil, Water and Climate, will estimate the environmental costs to the watershed district, such as how planting perennial biomass crops would affect erosion and the amounts of nutrients and pesticides in the area’s soil and water. Shri Ramaswamy, head of the Department of Bioproducts and Biosystems Engineering, will take the data compiled by the other scientists and do a life-cycle assessment, which essentially means putting together all the pieces of the puzzle and figuring out the implications of the project toward the environment, he says. The project is complicated because all the factors—supply and demand of biomass, prices of feedstocks, the cost of running a plant—are all connected and change almost constantly, and because the research combines both economic and environmental analysis.

The project is nearing the end of its first year of funding; the next year will involve more analysis of alternatives along with adjustments for changing market factors, Apland says. “The whole idea is to find a way to organize all this data in a form that’s useful for planning the biofuels economy.”

Ramaswamy says the project will try to answer questions about whether cellulosic ethanol production can coexist and be economically viable in the same region where corn ethanol already is established. Adjustments may have to be made along the way for matters of size and scale, he says; each part of the project is somewhat dependent on the other pieces, so the investigators will share their data along the way and shift their own research accordingly.

Mulla, who has studied the LeSueur watershed district for other projects, says the area works well for this project because its 1,112 square miles include a variety of terrain and land use as well as a river that’s considered impaired. Part of his research will involve determining which crops—an annual commodities like soybeans and corn, or perennial crops for biofuels—work best on which kinds of terrain and drainage situations.

He’s optimistic that the project will be useful in other situations and scenarios. “This is a project that will really help the state determine the policies and incentives involved in biofuel production.” —Becky Beyers

The study will examine how ethanol plants will affect the economy and environment surrounding them. One question is whether cellulosic plants can coexist with corn ethanol plants like this one.
Arboretum celebrates milestones, changes leadership

On a notable anniversary, change is in the air at the Minnesota Landscape Arboretum. This is the Arboretum’s 50th anniversary and the 100th anniversary of the university’s Horticultural Research Center next door.

Longtime director Peter J. Olin will step aside in July after nearly 25 years. He’ll continue to do research and teach as a member of the Department of Horticultural Science faculty. Mary Meyer (’93–Ph.D., horticulture), a professor in the horticultural science department, will be interim director of the Arboretum, with a permanent replacement expected to be named by July 2009.

Events for the anniversary celebrations include a research symposium on hardy plants; the “Treeology” summer exhibition; a “toast and taste in the garden” event; a reception, dinner dance and auction; and a free Family Day with family activities and birthday cake. See www.arboretum.umn.edu for details.

Faculty, staff win U-wide awards for excellence

Four CFANS faculty and staff won 2007–08 University-wide honors for excellence in teaching and advising.

Todd Arnold, associate professor in the Department of Fisheries, Wildlife and Conservation Biology and Kristen Nelson, associate professor in the departments of Forest Resources and Fisheries, Wildlife and Conservation Biology, both are recipients of the Morse-Alumni Award for outstanding contributions to undergraduate education. Douglas Foster, professor in the Department of Animal Science, is a recipient of the Outstanding Contributions to Postbaccalaureate, Graduate, and Professional Education Award. Gary Cooper, undergraduate program coordinator in the Department of Applied Economics, earned the John Tate Award for excellence in undergraduate advising.

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Students recognized for leadership

Four CFANS students have won 2008 university-wide leadership awards: Shefali Mehta, a recent Ph.D. graduate in applied economics, earned the Mary McEvoy Award for Public Engagement and Leadership, which is given annually to graduate and professional students who display leadership and public engagement that is clearly above and beyond one’s normal duties and responsibilities. Undergraduate students Ann Miron and Virginia Pollock both received University of Minnesota Alumni Association leadership awards, which recognize academic achievement, personal character, leadership qualities and contributions to the university. Mehta, Pollock, Miron and undergraduate student Brian Limborg all also received the President’s Student Leadership and Service Award.

Society for Conservation Biology honors Kapuscinski

Anne Kapuscinski, a professor in the Department of Fisheries, Wildlife and Conservation Biology, is one of five recipients of the international Society for Conservation Biology’s Distinguished Service Award for 2008. The award, which will be presented in July, recognizes Kapuscinski’s “extraordinary contributions to conservation research, teaching and conservation policy, particularly related to effects of biotechnology policy on aquatic species,” the society says.

The organization presents the awards to organizations and individuals who have made outstanding contributions to advancing the science and practice of conserving the Earth’s biological diversity. Past award winners include the Nature Conservancy and documentary filmmaker Sir David Attenborough.

Kapuscinski is well-known for her expertise in biosafety policies and science, ecological effects of genetically engineered organisms and genetically engineered fish and other marine organisms. She is a founding fellow of the University of Minnesota’s Institute on the Environment and directs the Institute for Social, Economic and Ecological Sustainability.
### ROC funding approved

Funding for two construction projects at Research and Outreach Centers was approved by both the state legislature and Gov. Tim Pawlenty. The projects will cost a total of $5.3 million, with $3.5 million provided through the bonding bill.

At the Northwest Research and Outreach Center in Crookston, a new 8,000-square-foot maintenance/farm research building will house scientists working on renewable energy and provide an educational and demonstration area for public interaction.

At the West Central Research and Outreach Center in Morris, space will be added to the Administration Building to house the center’s expanding research and outreach staff, especially in the renewable energy area.

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### Bell Museum funding vetoed

The Bell Museum building project was a priority of the University of Minnesota’s bonding request to the Minnesota State Legislature during the 2008 session. Though it was included in the bonding bill approved by the legislature, the Bell project was among those that were line-item vetoed by Gov. Tim Pawlenty.

The museum remains among university president Robert Bruininks’ highest priorities and, pending approval of the Board of Regents this fall, will be included in the University’s 2010 bonding request.

Of the $36 million project cost, $12 million will come from private and federal gifts and appropriations, and $24 million is anticipated in state bonding.

While groundbreaking and construction may be postponed, planning and design for the new facility continues on schedule.

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### Chronicle of Higher Education grants CFANS high marks

Several CFANS departments earned very high rankings in the *Chronicle of Higher Education’s 2007 Faculty Scholarly Productivity Index*. Departments and their national rankings include: Agronomy and Plant Genetics, 4th; Food Science and Nutrition, 7th; Soil, Water and Climate, 7th; Entomology, 10th; Plant Pathology, 9th; Applied Economics, 8th and Plant Biological Sciences, which ranked 6th. Fisheries, Wildlife and Conservation Biology is split by the Chronicle into separate fisheries science, natural resources and conservation and wildlife science categories, which ranked 4th, 10th and 3rd, respectively. The rankings include Ph.D. faculty members listed on each department’s web site, with productivity determined by a weighted system that includes publications, grants and awards.

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### Celebrate a tribute to trees, and an über-green anniversary year at the Arboretum.

**TREEOLOGY**

**SUMMER EXHIBITION**

**MAY 24 – OCTOBER 12**
Three renewable-energy projects led by CFANS researchers are part of a $4.5 million grant from the Xcel Energy Renewable Development Fund. Nearly 100 proposals were reviewed. Five University of Minnesota projects were chosen; the CFANS projects include:

- Evaluating and addressing of economic and technical issues related to biomass integrated gasification combined cycle technology in electricity generation at ethanol-producing plants. Led by professor Vance Morey, Department of Biosystems and Bioproducts Engineering. Amount awarded: $819,159.
- Development of an efficient system for the production, pre-processing and delivery of biomass feedstock for energy production that minimizes feedstock cost for energy facilities, while maximizing landowner income and the environmental benefits of biomass production. Led by research associate Dean Current, Center for Integrated Natural Resource and Agricultural Management. Amount awarded: $992,989.

Several of the awarded projects were initially established and supported by the University of Minnesota’s Initiative for Renewable Energy and the Environment (IREE).

Recent significant grants boost biofuels, food research

Three ongoing research projects led by faculty in the Department of Bioproducts and Biosystems Engineering have been awarded about $2.27 million over the next three years as part of a joint effort by the U.S. Department of Agriculture (USDA) and the U.S. Department of Energy (DOE) to encourage biomass research and development. The awards, part of a national $18.4 million investment, are aimed at addressing barriers to making production of biomass more efficient and cost-effective. All three projects have been funded through the Initiative for Renewable Energy and the Environment.

The projects are:

- Developing scalable distributed biorefining processes for conversion of cellulosic biomass to bio-oils with microwave-assisted pyrolysis and other systems. Led by professor Roger Ruan. Amount awarded: up to $975,676.
- Exploring sustainable pathways to achieving U.S. bioenergy policy goals, identifying economically viable and environmentally benign options for biofuel development, and identifying potential technological bottlenecks and policy instruments to meet the national bioenergy goals. Led by assistant professor Sangwon Suh. Amount awarded: up to $715,340.
- Researching how brown rot fungi extract and metabolize carbohydrates from biomass without destroying lignin, which has implications for biorefining plant tissues. Led by assistant professor Jonathan Schilling. Amount awarded: up to $576,368.
Eliminating stalls for swine

Pigs are social animals that naturally socialize with each other, says Yuzhi Li, an assistant professor of animal science who works on alternative swine systems at the West Central Research and Outreach Center in Morris. But most modern sows are housed in tight-fitting stalls during pregnancy and farrowing that restrict their movements. The stalls became the industry standard in the mid-1970s because of their efficiency, but researchers have found some sows’ behavior and health declines while confined.

Li has been testing sow group housing, where sows and piglets move around freely in a pen with thick straw bedding that absorbs most of their manure. The setting allows each sow to choose its micro-environment and companions, resulting in more natural behavior with less risk of lameness and difficult pregnancy and birthing.

Gestation stalls have been outlawed in Europe; in the United States, movement away from them has been driven by consumers, rather than legislation. Last year, the nation’s biggest pork supplier, Smithfield Foods, said it was responding to demands from its customers—including McDonald’s—by requiring its growers to phase out gestation stalls in the next 10 years.

Those changes eventually will filter down to Minnesota pork producers, Li says. While fewer than 5 percent of producers now use group housing of both gestating and farrowing sows, she expects that number will grow as scientists find ways to solve the challenges of group housing—primarily aggression and biting between sows and the problem of sows that crush their piglets by lying down on them.
Gathering more data will help find solutions to those problems, Li says. For example, two studies at the WCROC may help reduce the sows’ aggressive behavior and reduce piglet mortality. One involves adding tryptophan—the same amino acid that is believed to make humans sleepy after Thanksgiving dinner—to the pigs’ diets to reduce their aggression. Another behavioral study shows that first-time mothers who crush their piglets tend to do so with subsequent litters; it’s possible that eliminating those careless mothers from the herd will eventually help reduce piglet mortality, Li says.

“With more research, these problems are manageable,” Li says. “Confinement has animal welfare problems, and those are systematic problems that can’t be fixed by management. The alternatives have problems too. Different systems have different problems, but these are issues we can deal with by management strategies.”

**Compost beds for dairy cows**

Some Minnesota dairy cows have been living in close housing since 2001, when a pair of Sleepy Eye farmers built the state’s first compost-bedded dairy barn.

The new-style barns are still a minority, but gradually are gaining popularity, says Marcia Endres (’95–Ph.D., animal science), an associate professor in the Department of Animal Science. Rather than the traditional stalls, cows in compost-bedded dairy barns spend most of their time standing, sitting and lying down in a deep bed of compostable material such as sawdust or straw. The compost bedding—which must be aerated twice a day by the farmer, but is only removed from the barn once or twice a year—can get as high as 4 feet deep and absorbs the animal waste, Endres says. It can be spread on fields like manure or further composted outside the barn.

While one advantage is the reduced labor
costs for manure handling, cows are the big beneficiaries of the new barns, she says. “They’re free to move around, and they don’t have to stand on concrete all day.” Along with producing more milk and more easily reproducing when compared to tie-stalls, studies by Endres and others found that cows in compost-bedded barns are less likely to come up lame and tend to be cleaner.

While measuring comfort can be difficult, behavioral observations show the cows exhibiting more natural interaction with each other, Endres says. “They’re not as socially stressed, and when they’re more comfortable there’s more milk and less disease.”

The system isn’t for every producer, she cautions. Most of the barns using compost bedding are relatively small, with fewer than 200 cows. The compost does require specific maintenance, and the cows must be kept very clean to reduce the risk of mastitis.

In addition, dairies using compost bedding are now faced with an unexpected difficulty: bedding materials are getting more expensive and less available. Most barns use sawdust, but some are experimenting with combinations of different kinds of straw and even wood chips.

Last year, the animal science department hosted an international conference on compost-bedded barns, and Endres says she’s had inquiries from farmers around the world. “This is a very different management system, and it’s not perfect for everyone. But for some, it works very well.”

**Flies: A never-ending problem**

Roger Moon has spent years dealing with a different animal comfort issue, one that has no easy solution: flies.

“For horses, it’s mainly a question of comfort, but with food animals it could affect their productivity,” says the professor in the Department of Entomology. Until about the 1940s, flies were simply a fact of life; since the advent of insecticides, animals can get some relief, but the insects have evolved resistance in some cases, and eliminating all flies just doesn’t seem possible.

Four main kinds of flies affect livestock in Minnesota: the stable fly, the horned fly, the house fly and the face fly. Stable flies in particular can affect dairy production, because in summer heat, the cows bunch together and don’t eat as much while trying to get away from the flies. Face flies have a more visible effect—they can cause pinkeye in cattle because they feed on tears and mucus around the cows’ eyes and nose—but no one has traced that discomfort to a direct effect on productivity, Moon says.

“It’s difficult to deal with pests in animals,” he says. “For plants, dealing with pests comes to simple economics. But with animals, there’s this other dimension.”

While Moon has researched the question of biological control—finding a natural enemy that could be introduced in Minnesota barns to eliminate flies—the search found few possibilities, he says. “Our basic sermon to farmers at this point is to understand where the flies come from and try to eliminate these sources through prevention, sanitation and waste disposal—including composting. Source reduction is really about the only thing that works.”

**Sustainable comfort**

Smaller scale farmers have long used some of the alternative practices now being adopted by some in the production ag community, says Martin. But within the sustainable agriculture community, practices vary widely and economics still rule. For example, some farmers have tried group farrowing and nurseries for sows, but are put off by the higher piglet mortality rates. “Even if they like the idea, sometimes the economic issue results in resistance to adoption of the practice,” he says.

High costs for feeding animals are driving decisions about production now, he says. “Everybody’s worried about just trying to survive,” because even though meat prices are increasing at the supermarket, farmers are paying record prices to feed their animals.

Martin believes that small farmers who develop a niche or direct market enterprise based on consumers’ desire for locally grown foods will have a better chance of surviving over the long run, especially if they offer something unique, such as traditional breeds with stronger flavor and more fatty meat. Creating a direct marketing enterprise to sell meat from the farm is a good idea, but takes extra work, almost like starting a second farm enterprise. But small farm operations must be creative if they are going to remain profitable. “Consumers’ preferences for quality attributes tend to go up with income,” he says. “If this economy is a long-term thing, you may see people eating less meat but going for higher quality.”

One aspect of that may be how animals are raised, but consumers also have to understand that animals have characteristics, such as aggression, that must be managed, Martin says. “One of the big problems for our industry is that people are so far removed from agriculture. Their perception of a pig is Babe, and that’s just not the reality.”
Can’t Get No Respect
Oats conference showcases forgotten grain

Oats are the Rodney Dangerfield of the small-grain world.
While prices rise and farm policy tilts toward wheat, corn and soybeans, oats don’t get much respect, even though they provide health benefits and have many uses beyond food.

Changing that perception is the focus of an international convention taking place in Minneapolis in early July. The International Oat Conference, composed of oat researchers and workers in the oat industry, has met every four years since the early 1980s; the meeting here will be only the second meeting, and the first since 1982, to be held in the United States.

The conference focuses on oat research, but it also will emphasize the health benefits of oat foods and showcase the variety of products that can be made from oats, says Deon Stuthman, a professor in the Department of Agronomy and Plant Genetics and the conference’s chief organizer.

“One of the ideas is that as long as oats is seen as only a cereal crop, that crop isn’t going to last too much longer,” Stuthman says. “We’ve got to start highlighting the other products that can be made, and to better define the health benefits of oat.”

The conference, hosted by CFANS and the U.S. Department of Agriculture, also includes panel discussions and presentations on topics ranging from oat genomics and disease prevention to oats as a healthy food. Poster presentations and a tour of the St. Paul campus oat test plots also will be part of the conference, which runs from June 28–July 2.

Minnesota is the nation’s second-largest oat producer, but National Agricultural Statistics Service figures show the number of acres planted in oats has been falling steadily, dropping 10 percent between 2006 and 2007 alone. Grain production figures show a similar slide.

Economics have played a role; federal subsidies discourage farmers from growing oats, Stuthman says. But if farmers see more possibilities for marketing their crops, either through innovative products or with new research that explores the nutraceutical benefits of eating oats, that could change.

Oat promoters also might try the green approach. “Oat is the most environmentally friendly crop out there,” Stuthman says. “It’s a great crop for rotation; it’s solid-seeded so there’s not so much erosion and you don’t need to use as many chemicals if you’re rotating crops.” Planting multiple varieties of oats in a field provides a poly-culture that protects against pests and disease.

“If we can pull all of these things together,” Stuthman says, “we can put oats back into a more attractive situation.” —Becky Beyers

Agronomy and plant genetics professor Deon Stuthman is the chief organizer of the International Oat Conference.
Like Kal-El crash landing his spaceship from Krypton, non-native plants and animals are arriving at our doorstep. And like Superman, some of them have traits—developed in their home environment—that allow them to flourish in their new homes.

Unfortunately, the impact of non-native species is anything but a comic book fantasy. A 2005 study by Cornell University estimated invasive species cost the U.S. more than $138 billion per year in damage and control costs. Control costs approach $500 million per year in the Great Lakes Basin alone.

These costs affect Minnesotans. For example, zebra mussels have now entered the St. Paul water system and likely will increase water costs by clogging pipes and shutting down water supplies. The total cost to the United States of the zebra mussel invasion is estimated at $3.1 billion over the next ten years.

But it’s not just the economic impact; these invaders also bring ecological harm and sheer nuisance.
Understanding the issues

Invasive species are organisms whose superior abilities enable them to out-compete other species in the race for nutrients and reproduction. These “Clark Kents” have been introduced by accident or on purpose. Scientists estimate there are more than 125 non-native invasive species in Minnesota. And those are the ones we know about.

“Unlike climate change and habitat loss, invasive species can go undetected, sometimes even when they are at their most severe,” says David Andow, professor of entomology in CFANS. “It requires a trained eye to identify an invasive insect or plant.”

The history of invasive species in the Minnesota landscape stretches back over 100 years. We’ve learned to adapt to these strangers in our midst. But our relationship with invasive species today is vastly different due to our increased regional mobility and our growing dependence on global trade. And perhaps the most significant difference is the confluence of various environmental problems.

“We should worry about invasive species to the same extent that we care about habitat loss and global warming because, together, they are the triple-threat to biodiversity and the health of our planet,” says Susan Solarz (’95–M.S.; ’98–Ph.D., fisheries and wildlife), who is coordinating a new University of Minnesota program in invasive species.

Our response

If that sounds a bit defensive, it is. The scientists and resource managers involved in controlling these invaders feel the invasive species problem is overlooked. One example of this is our inconsistent reaction to the threat posed by invasive species.

For instance, wood-cargo crates are inspected before entry to the U.S. to prevent the introduction of various tree pests, yet the crate contents, including wood products, are not inspected.

“Our policies remain a sieve to invasive species introduction,” says professor Ray Newman (’82–M.S.; ’85–Ph.D., fisheries and wildlife), an aquatic ecologist in CFANS. “Minnesota needs a comprehensive approach to invasive-species prevention and management.” Newman believes piecemeal, species-specific approaches must be complemented with broader strategies and better predictive models that address multiple species and pathways and can anticipate future problems.

Newman, Andow and Solarz are part of a team that’s attempting to assemble a more comprehensive approach. Their team of more than 40 faculty in 16 departments throughout the University is conducting invasive species research in many areas, including the economic tradeoffs of prevention and control, the evolution of invasiveness, the modeling of species spread and potential impacts, developing control strategies, and restoring ecosystems after successful control.

A $3 million grant from the National Science Foundation will train up to 25 Ph.D. students to better assess, predict and manage risks of invasive species. The faculty and agency collaborations developed will enable the university to develop more creative and synthetic approaches. You can learn more about the project by visiting http://isg-igert.umn.edu

Building a network of resource managers, policy makers, scientists and concerned citizens may just be the Kryptonite that eradicates invasive species from our landscape—or at least gives us better control over them. Newman says, “We are listening to what information agencies need in order to best prevent and control invasives and then targeting our research accordingly. In this way, as a team, we will combat invasive species most effectively.”
Hardwood forests across Minnesota are losing their thick forest floors. Invasive species of earthworms are consuming the nutrient-rich “duff” layer, which is home to many forest plants and wildlife. Research has found that as the earthworms consume the duff layer, they kill plant species rooted there, such as trillium, mayflowers and sugar maple seedlings. They also create an environment unsuitable for seed germination. Other creatures that live in the duff and forest litter like salamanders and ground-nesting birds are affected as well.

Soybean aphid
The soybean aphid is native to eastern Asia and was discovered in Wisconsin soybean fields in the summer of 2000. It has spread to infest virtually all of the soybean-growing areas in North America, which has put the 65 million acres of soybean crop grown in the Upper Midwest at risk of needing insecticide treatment, which would be unusual for soybean. Because of soybean aphid’s dispersal behavior, virus transmission capabilities, and interactions with other pests, this insect is responsible for driving pest management decisions in multiple crops at the landscape level.

Carp
The common carp is the most damaging invasive fish yet to be introduced to North America and is widespread in the southern two-thirds of Minnesota. Ongoing research by professor Peter Sorensen’s lab is discovering that the common carp currently makes up most of the biomass of fish in many of Minnesota’s shallow lakes and wetlands. Its habit of feeding deeply in the bottom—where no native fish feed—stirs up sediments, uproots valuable aquatic vegetation, and serves to pump nutrients into the open water. This species appears to be one of the primary factors driving poor water quality in many Minnesota lakes.

Invasive Asian carp have made the news because they leap high out of the water when disturbed by watercraft. Boaters have been injured when speeding watercraft struck leaping fish. Asian carp can reach 110 pounds, and they feed voraciously on plankton, eating 40 percent to 60 percent of their body weight each day, which leaves less food for native fish species.

Reed canary grass
Although reed canary grass is planted as a forage crop in some areas, the species poses a significant threat to the state’s wetlands. Reed canary grass spreads rapidly in fertile, wet soils forming persistent monocultures in wetlands and riparian areas. This species poses special problems in restored wetlands because reed canary grass moves in first and dominates before others arrive. Reed canary grass is also limiting forest regeneration across extensive areas of the Upper Mississippi River and Minnesota River floodplains. Methods to shift forests and wet meadows from reed canary grass back to diverse communities has eluded natural resource managers. University of Minnesota researchers are attempting to devise ways to reverse the invasions which should improve habitat quality across tens of thousands of acres of wildlife refuges statewide.

Invasive Non-native Earthworms
Hardwood forests across Minnesota are losing their thick forest floors. Invasive species of earthworms are consuming the nutrient-rich “duff” layer, which is home to many forest plants and wildlife. Research has found that as the earthworms consume the duff layer, they kill plant species rooted there, such as trillium, mayflowers and sugar maple seedlings. They also create an environment unsuitable for seed germination. Other creatures that live in the duff and forest litter like salamanders and ground-nesting birds are affected as well.
Common buckthorn was introduced in Minnesota from Europe in the mid-1800s as a very popular hedging material. The nursery industry stopped selling it in the 1930s, but many buckthorn hedges still may be found in older neighborhoods throughout Minnesota. Buckthorn out-competes native plants for nutrients, light, and moisture, it degrades wildlife habitat, and threatens the future of forests, wetlands, prairies and other natural habitats. Buckthorn also contributes to erosion by shading out other plants that grow on the forest floor, and serving as a host to other pests, such as crown rust fungus and soybean aphid.

and AFTER earthworm invasion.

Eurasian watermilfoil and curlyleaf pondweed

Eurasian watermilfoil and curly leaf pondweed are invasive, underwater plants that spread by clinging to recreational boats. Curlyleaf pondweed is found in over 700 Minnesota lakes and is the more recently introduced Eurasian watermilfoil now occupies more than 190 water bodies throughout Minnesota. Both plants can form thick underwater stands of tangled stems and vast mats of vegetation on the water’s surface, especially in shallow, nutrient-rich water. These mats can limit boating, swimming, and fishing. The plants also disrupt the ecology of a water body by crowding out important native aquatic plants needed for a healthy fishery.

VHS (viral hemorrhagic septicemia)

VHS is an extremely serious pathogen of fresh and saltwater fish that basically causes the infected fish to bleed to death. The impact of VHS is spreading from the Great Lakes area to nearby states, including Wisconsin. Scientists believe this new strain of the virus is responsible for die-offs of muskellunge, smallmouth bass, northern pike, freshwater drum, gizzard shad, yellow perch, black crappie, bluegill, rock bass, white bass, redhorse sucker, bluntnose sucker, round goby and walleye.

Emerald ash borer

The emerald ash borer can kill all sizes and species of ash trees including green, black and white ash within three years. Larvae live under the bark until they emerge as adult beetles. Trees are killed by the tunneling of the larvae under the tree’s bark. Since its discovery in Detroit, Michigan and Windsor, Ontario, in 2002, the emerald ash borer has spread outward in ash firewood, nursery stock and possibly other ash materials to a number of new areas. Minnesota has one of the highest concentrations of ash trees in the U.S. with an estimated 867 million acres of forestland ash trees plus the thousands more planted in urban forests.

Photos by David Hansen

Photos courtesy Ling Shen

Photos by Jeffrey Hahn

Photos by David Hansen
Mysteries of *Medicago*

Five-year project to map genome nears completion

Sometime near the end of this year, Nevin Young and his colleagues around the world will report that they’ve achieved a milestone: they’ve mapped the genome of *Medicago trunculata*, a model plant for legume biology.

“Basically what we’re doing with this mapping project is making a giant parts list,” says Young, a Distinguished McKnight University Professor in the departments of plant pathology and plant biology who leads the five-year, $15-million National Science Foundation-funded project. The parts list provides clues to how *Medicago* and other legumes perform symbiotic nitrogen fixation.

“Genes play an important role in these processes and knowing the genome sequence will help us understand it better,” Young says. *Medicago trunculata* is a model legume, so by sequencing its genes, scientists ultimately will be able to understand the genetic systems of crops like alfalfa, peas and beans. That understanding, in turn, can lead to breeding improvements that increase crop production and disease resistance.

“It’s important from a nutrition perspective,” Young says. “Legumes are the most important source of protein. They are fundamental to the food security around the world. And...
there’s a secondary benefit to the environment, because if nitrogen production can be naturally increased, fertilizer use would dramatically decrease.”

Mapping the Medicago genome has taken five years, which seems like a long time, but really isn’t for a complex gene-sequencing project like this one, Young says. It began with a collaborative project between his lab and the University of Oklahoma, and grew from there.

Technology has improved along the way, which speeded up the project, he says. Gene-sequencing can be done one of two ways: the “BAC by BAC” method, which is how the human genome was mapped and is considered the gold standard, or the “shotgun” method, which is less expensive and faster. Young’s project, which includes scientists from all over the world, is using BAC by BAC.

“It’s been a mixed blessing to do it this way—it’s very high quality but very high cost,” he says. Because of the added expense, only a few genomes can be mapped this way, but because Medicago is a model, what’s learned will translate to other plants. The U.S. Department of Energy is working on completing the gene sequence of the soybean, another legume, and expects to complete its work at around the same time as Young’s team.

Mapping the Medicago sequence involves eight chromosomes, six of them at U.S. labs and two in Europe; the European Union’s Sixth Framework Programme is helping to pay for the project.

Ultimately, the genomes of other legumes will be mapped too, Young says. “In five or 10 years, when we have five or 10 legumes genomically mapped, we’ll be able to look at the ancestry, the evolution of these plants. It will be the ultimate parts list for these plants.” —Becky Beyers
The world is heating up, and so is the debate over how to slow it down.

Policymakers across the planet look for answers now to the problem of global warming—what can they do today to minimize the damage tomorrow? But climate change is an evolving science, and true readings of climatic shifts happen over decades or centuries, not weeks or months.

So mostly questions remain: Is global warming a result of the quantity of greenhouse gasses humans and industry expel? If so, where does it all come from? In our rush to cut emissions of carbon dioxide and other greenhouse gasses from one source, have we overlooked another? Are we just creating new problems in our efforts to solve others?

The resulting search for biofuels that release less carbon into the air is affecting agricultural practices across the countryside—so what impression does such a change in the farming landscape make on the carbon cycle? How do we quantify or even measure that impact?

Researchers at CFANS are tackling these tough questions from the ground to the sky, hoping to provide the information needed to make tough policy decisions.

By Sara Specht
Eye in the sky

The University of Minnesota possesses a unique tool to unravel the mysteries of carbon exchange in the agricultural Midwest.

At the Rosemount Research and Outreach Center (ROC) at UMore Park, a radio tower soars 240 meters above acres of corn and soybean fields, broadcasting Minnesota Public Radio's “The Current” to listeners across the state. This Tall Tower Trace Gas Observatory also supports specialized sensors that have allowed researchers to make, for the first time, direct measurement of isotopic carbon dioxide exchange between land and atmosphere.

Funded by a five-year grant from the National Science Foundation (NSF) and partially supported by the U.S. Department of Energy, the Tall Tower’s sensors were installed last spring at 200 meters and 100 meters up, and have a range, or footprint, large and diverse enough to allow scientists to make climatic conclusions on a regional scale. Tim Grifﬁs, a professor in the Department of Soil, Water and Climate, leads the NSF study to determine how much carbon is taken up and lost by the ecosystem under varying climate and land management conditions.

“One of the things we’re interested in is, if Minnesota starts to increase corn or soybean production for biofuels, we should be able to detect those changes in the atmosphere, both in terms of concentration of carbon dioxide and its composition,” Grifﬁs says. “Now we can determine the impact of land use on the carbon budget at a regional scale.”

The Tall Tower is mounted with sonic anemometers that measure wind ﬂuctuations, and air samples are pulled down at about 30 liters per minute to the foot of the tower where a tunable diode laser measures not only the total concentration of carbon dioxide, but also the concentration of different carbon isotopes.

The sensors are recalibrated every few minutes, and readings flow in ten times per second, year round. Previously, most of these kinds of measurements have been done using mass spectrometers, which aren’t field-deployable and have measurement times of minutes, rather than the milliseconds needed for this study.

“We can measure in real time these different isotopes in the atmosphere,” Grifﬁs explains. “We’re getting a handle on how important C4 isotope (corn) production is in the Upper Midwest and how that actually has an impact on the atmosphere’s composition, as well as the budget of carbon dioxide.”

The truly unique opportunity the Tall Tower affords university researchers is the chance to paint a complete picture from the field to the region. Detailed data gathered on the ground in different agricultural settings can be scaled up based on information garnered from the Tall Tower’s larger footprint, allowing Grifﬁs to make conclusions about the regional carbon budget and the main factors affecting it.

“From a Tall Tower perspective, it’s the capacity to say ‘here’s how land use has changed over the last few years, and here’s what it does to the atmosphere,’” Grifﬁs says. “Here are some trends that we see in carbon content in the atmosphere, and this is going to increase or decrease if we do the following.”

On the ground

Hundreds of feet below the Tall Tower’s sensors, John Baker, a USDA-Agricultural Research Service scientist and adjunct professor with the Department of Soil, Water and Climate, helms a research team with Grifﬁs that addresses carbon exchange on a much smaller scale. Using smaller, 10-meter radio towers, they monitor ﬁelds of corn and soybeans side by side farmed under different management systems.

The study, funded by the USDA and U.S. Department of Energy, examines how reduced tillage systems or the use of a cover crop can affect the carbon balance of a local farming system. A reduction in tillage employs a narrower strip till that works a small band of soil and leaves the rest of the soil surface intact.

Winter cover cropping entails planting a cool season crop, such as rye, over a ﬁeld in the fall; it lies dormant through the winter and greens up again in the spring. Corn and soybeans are highly productive crops, but they use only about 100 days of Minnesota’s average 180-day growing season. The use
of a cover crop is intended to preserve the phenomenal midsummer productivity of corn and soybean crops while keeping green on the landscape longer to photosynthesize additional carbon dioxide.

“This is of considerable interest from a climate change perspective,” says Baker. “The goal is to see if we can favorably affect the overall carbon balance of these farming systems with relatively simple adjustments in management practices.”

Using virtually the same measurement techniques on a much smaller scale, Baker’s team catalogs fluctuations in wind speed and concentration of carbon dioxide in the air above their fields many times per second, year round. From that data, they can calculate the net exchange of carbon dioxide between the surface and the atmosphere. These field-scale systems have been operating for several years, addressing the problem that plagues such studies in a region like the Midwest: the weather.

“There’s no such thing as a typical year here in Minnesota. You can draw mistaken conclusions if you only look at something like this once,”

Baker hopes this study will result in realistic management options for Minnesota farmers that will allow them to address both food and energy needs in a way that is safe for the environment. The linkage of scale from his individual fields at the Rosemount ROC to the larger footprint of the Tall Tower gives him and his colleagues the opportunity to understand the effects of their research from the ground up.

“We’re starting to get a better handle on how climate influences our carbon cycle or how human activities influence the carbon cycle,” Griffis says. “Starting from our very small field-scale ecosystems, to the region and then to the globe.”

Up in the air

In the heart of an agriculture-rich region, the real question that remains is how policy to combat global climate change will affect Minnesota’s farmers.

Griffis predicts that the results of research at the Rosemount ROC could be particularly useful in any movement toward a carbon economy that includes carbon credits for land management strategies.

“We’re adopting a lot of different strategies regarding land management, but there’s not a lot of real carbon accounting out there to validate those approaches,” he says. “A practical opportunity is to put hard numbers on these types of activities.”

Baker isn’t sure his research will influence policy, but he thinks it could be important to new developments in biofuel production. For example, if cellulosic biofuels become economically viable, his cover crops could become value-added products in traditional corn and soybean systems. Those fields could continue to produce food and feed, while on the same land base produce biomass useful for fuel production.

“The development of bioenergy is a rapidly changing landscape, both literally and figuratively,” Baker says. “We want to stay ahead of the curve, or at least not behind it—but we don’t want to be creating one problem when we solve another one.”

Photos by David Hansen

John Baker surveys early growth in one of his test plots at the Rosemount ROC. His carbon monitoring occurs much closer to the ground (top left), from towers about ten meters tall.
Luck and preparation are paying off for Alyssa Anderson. Since junior high in Lake Crystal, Minn., she’s learned all she can about aquatic insects. Alyssa’s passion for the field earned her awards and travel to science competitions in California, Florida and the United Kingdom before she came to the University of Minnesota in 2007 seeking a Ph.D. She arrived just in time to study Minnesota’s greatest rainfall event.

In mid-August a stalled weather front dumped buckets of rain in southeast Minnesota. The storm set a new National Weather Service-recorded one-day state record of 15.1 inches of rain, with an unofficial storm total in some areas of nearly 21 inches of rainfall. The storm rerouted several of the region’s 188 trout stream channels and forever changed others. The storm’s effect on the life within those streams was unknown.

The storm created an opportunity for Anderson and entomology professor Len Ferrington to learn more about how aquatic insects react to summer floods. The focus of their work was 15 species of winter-emerging Chironomids, commonly called midges, that are an important source of protein for trout.

The fear was that the storm had given the trout a double-whammy. Many trout were likely displaced by the flooding and realignment of streams, and those that did survive may not have enough food over the winter because the midge population also had been affected.

Their preliminary findings suggest the storm lowered the overall quantity of winter-emerging midges only slightly in the flood-ravaged streams. The surprise was that the rains may have helped diversify the species of midges Anderson and Ferrington found.

“In the hardest-hit streams we saw the greatest diversity of midges,” Anderson says. “We’ve even found a few species that were never collected in previous winters. The August flood may have given these species an opportunity to colonize and fill niches left open by warm-weather midges that suffered greater losses from the flood.”

Anderson says the diversity of species is a great sign. “This indicates that even the streams that were most severely affected are on the road to recovery, and are producing a sustainable amount of food for the fish population inhabiting these streams.”

The timing of the August storm helped minimize the impact on the winter-emerging midges. Anderson says, “In August these midges are in their larval stage and hibernating in the stream beds. So the midges were harmed only where the stream beds were scoured out or exposed because the stream changed its path.”

The results include historical data on 18 trout streams, some of which experienced extreme, moderate or no ill effects from the storm. For three months this winter, Anderson, Ferrington and others made weekly visits to the streams in their study.

“It takes a special person to step into a fast-flowing stream when the air temperature is below zero,” Ferrington says. “I think Alyssa is as cold-adapted as I am—or as crazy about science. Her enthusiasm and eagerness to learn are outstanding.”

Their findings help explain the moderate success anglers found this spring during Minnesota’s trout season opener. Further studies next winter will help determine the long-lasting effects of the August 2007 storm. More information about this project is available at www.entomology.umn.edu/midge.

–Martin Moen
AgStar Sponsors Scholars
Paul DeBriyn gives back to his alma mater

Paul DeBriyn knows how investing can pay off.

As chief executive officer of AgStar Financial Services, he leads one of the nation’s largest farm credit institutions, with about $4.5 billion in assets and business in all 50 states. He’s spent 30 years working in agricultural finance, helping farmers and rural communities find new ways to thrive.

DeBriyn, who graduated from CFANS in 1977 with a degree in agricultural business administration, sees potential in investing in today’s students. That’s why AgStar created its AgStar Scholars program, which provides scholarships and leadership training to students in CFANS and at the University of Wisconsin-River Falls.

Students who are selected as AgStar Scholars for their senior year receive $2,000 scholarships, but the program also emphasizes learning about agricultural finance. Scholars participate in a series of guest lectures with AgStar executives, complete specific research projects for the program—finishing with a presentation of their work to AgStar executives—and have first crack at internships with the Mankato-based cooperative. Six to 10 students are chosen each year based on their application essays, academic standing, agricultural background, career plans and leadership skills.

Helping students with an interest in agriculture is part of the cooperative’s overall mission of enhancing the quality of life in rural Minnesota, DeBriyn says. In recent years, AgStar has moved beyond traditional farm lending to invest in community projects such as bonds for hospitals and assisted-living facilities. In addition, the cooperative’s “Fund for Rural America” corporate giving program—which includes the AgStar Scholars program—awards grants for communities and schools in the areas of technology, environment, education and quality of life.

“Our bread and butter is family farms,” says DeBriyn. Programs like AgStar Scholars are “a way to give back to these communities. That’s where we live and that’s where our people live.” The cooperative also benefits, he says; by supporting students who want to earn a quality education, AgStar is able to connect early on with students who may become interns and ultimately members of the AgStar team.

DeBriyn, who’s also been part of the CFANS Alumni Society’s mentor program and is a frequent guest lecturer in applied economics courses, likes to tell students how the University of Minnesota changed his life.

“I was an officer in the Farm House fraternity, and I learned leadership there,” he says. His adviser helped him find his first job at St. Paul’s AgriBank, which launched his career in agricultural finance. And he met his wife, who also was a student on the St. Paul campus.

“You could say that the University of Minnesota had a major effect on my life,” he says. “I wanted to keep that connection going.” —Becky Beyers

2008’s CFANS AgStar Scholars:
Matthew Heers—Agricultural and Food Business Management/Agronomy
Amanda Rasmussen—Animal Science
James Seitzer—Agricultural and Food Business Management
Lucas Sjostrom—Agricultural Education/Animal Science
Ryan Statz—Applied Economics

DeBriyn often visits with farmers who have benefitted from AgStar’s help.
Alumni Update
A message from CFANS Alumni Relations director Mary Buschette

As we approach the end of the academic year, I find myself thinking back to the time that I spent as a student at the U of M. Although I believe I looked at my commencement ceremony as the end of my college career, another meaning of the word commencement is “beginning” or “the act of starting something.”

Commencement is an exciting time at the university: watching students, many of whom we’ve known since they arrived as freshmen, walk across the stage with big smiles, cheers from the audience, hugs from their advisers, an alumni lapel pin from the president of the Alumni Society, a rose from the student marshals and then they’re off. Off to start something! A new job, an advanced degree, or perhaps for nontraditional students, a new perspective about a current job.

Recognizing all the people along the way who make it possible for a student to stand on that stage and see ahead to a new beginning is important. It really does take a community to support a student along the path to commencement. At CFANS, our student-support community is a diverse and passionate group of students, employees and alumni.

Although there wasn’t an official alumni-sponsored mentor program when I was a student, several individuals filled that role for me. I knew that I could share my dreams and fears about the future with one person in particular. I wanted to travel before I settled down to a job. This person was a guide, reference, resource, adviser and a friend who helped me make that dream possible. What a gift! I still go to this mentor today when I need a reality check.

How about you? Would you like to give a gift to a student in the college? The gift of your time? Your wisdom? A perspective about opportunities in your industry? If so, I hope you’ll consider completing an application for the CFANS mentor program at our alumni Web site: www.cfans.umn.edu/MentorProgram.html. You are a valued member of the CFANS community and I invite you to take an active role in shaping the life of one of our current students. It’s a wonderful way to help a student approaching commencement be more prepared when it’s his or her turn to start something.
Camping trips to Colorado, a day at the Minneapolis Grain Exchange and a visit with state agriculture commissioner Gene Hugoson are all part of the curriculum in Natasha Mortenson’s classroom.

Mortenson, 29 (’01–B.S.; ’06–M.Ed., agricultural education), was one of 28 Minnesota Teacher of the Year semifinalists for 2007–08. She’s been the agricultural education teacher and FFA adviser at Morris Area High School for the past seven years. On May 4, Mortenson was honored at Education Minnesota’s annual banquet.

“It was a shocker” is how Mortenson describes hearing about being named a Teacher of the Year semifinalist. “When I found out about the top 28, I actually read it in the newspaper.” Last fall, one teacher from each of the Morris district’s schools was nominated by their peers and one from the district was chosen to go on to state competition. On May 4, Mortenson was honored at Education Minnesota’s annual banquet.

In her role as FFA adviser, Mortenson also gets students out into the world of agriculture. FFA members take trips to the Minneapolis Grain Exchange and spend a day at the state Department of Agriculture, which includes a meeting with the state commissioner. “I really like to open their eyes to what agriculture has to offer,” she says. “FFA offers a chance for leadership development, which is the most important aspect. Leadership doesn’t know boundaries of agriculture. It’s not just for farm kids.”

Other teachers have noticed her ambitious programming. “She has developed into a leader in our profession,” says Joel Larson, Minnesota FFA advisor. “Natasha has had a tremendous impact on the lives of young people, the agricultural education program in Morris and on agricultural education in Minnesota.” Her students are active in statewide events and competitions and have been recognized for their leadership.

Mortenson’s dedication to her job may be unmatched. Four years ago, she was expecting her first child and organizing her FFA chapter’s annual trip to the state FFA convention. Just as a precaution, Mortenson arranged for backup advisers and had enlisted the help of her students’ parents in the case of an early delivery. Sure enough, she needed their help. “I was actually in the delivery room on the phone with students,” Mortenson says; the students needed some help with last-minute convention details.

Her children are now two and four years old. How does she balance the demands of a family with her teaching and advising? “We are a fine-tuned machine,” she says. “My husband is great, and my students are great.” Mortenson and her husband, who both grew up on farms, hope to someday raise their children on a farm. “I don’t live on a farm now, but someday that may happen! My husband grew up farming, and he would love to do it as well.”

She grew up on a farm, as well, but didn’t realize how important it was until she joined FFA. “FFA opened my heart to agriculture,” she says.

But even for her students who don’t plan to stay on the farm, ag education has a role, she says. “Students who have a basic understanding of agriculture will find success because they understand a major employer in the U.S. Most students can find something within agriculture they already enjoy. That could include plants, flowers, animals, mechanics, public speaking, etc. There is so much more than farming.”

—Lana Olson
Alumni Society presents annual awards

They are:

**Distinguished Alumni Award:** Ed Hegland (’92–B.S., agronomy), Appleton, Minn., farmer and chairman of the National Biodiesel Board. He also is a board member of the Minnesota Soybean Growers Association.

**Outstanding Friend Award:** Jim Boerboom (’73–B.S.; ’77–M.A., agricultural education) of Waseca, Minn., is a strong proponent for agricultural sciences at the U of M in his role as Minnesota’s Deputy Commissioner of Agriculture.

**Distinguished Faculty Award:** Brad Greiman, assistant professor in CFANS. He advises more than 90 undergraduate and graduate students and is a strong advocate for agricultural education and leadership programs.

**Student Leadership Award:** Megan Hines and Sangeetha Gummadi. Hines, a junior in environmental science, policy and management and president of the Student Board, is involved in numerous CFANS activities. Gummadi, a junior in agricultural education, also is involved in a number of college activities and is a former candidate for national FFA office.

**Alumni Service Award:** Cliff Vrieze (’67–B.S.; ’72–M.A., agricultural education) of Truman, Minn., a farm business management instructor who’s been active in advocating for agricultural and vocational education statewide and nationally.

**Lifetime Achievement Award** (new this year): Gerald R. McKay (’39–B.S.; ’49–M.A., agricultural education) was an active member of the School of Agriculture Alumni Association (SAUM) and the University of Minnesota Alumni Association. In 2001, he received the Outstanding Achievement Award, the highest award presented to alumni of the university. He died in August 2007, two months before his 99th birthday.

The Awards were presented at the CFANS Borealis Night of Excellence on April 29, 2008.

![Photo by Martin Moen](Image)

From left: Boerboom, Gummadi, Greiman, Carolyn McKay—daughter of Gerald McKay, Hegland, Hines and Vrieze.

The criteria for the awards is on the web at: [www.cfans.umn.edu/Award_Criteria_Summaries.html](http://www.cfans.umn.edu/Award_Criteria_Summaries.html)

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**BY THE NUMBERS**

Maroon & gold goes green

- **7**
  - Number of student groups on the Twin Cities campus with the words “environment” and “green” in their name.

- **45**
  - Number of days it takes for biodegradable packaging used by University Dining Services to break down in compost piles.

- **28,000**
  - Total grant dollars awarded to student and departmental groups for campus improvements on Beautiful U Day.

- **10,000**
  - Number of tons of compost collected in fall 2007 from campus restaurants and food service providers.

- **78**
  - Number of tons of compost collected in fall 2007 from campus restaurants and food service providers.

- **35**
  - Number of Metro Transit bus routes that serve the Twin Cities campus.

- **1,200**
  - Gallons of used cooking oil donated for recycling from university food services in 2006.

Sources: University Dining Services, Beautiful U Day

[www.cfans.umn.edu](http://www.cfans.umn.edu)
Can You Identify this Photo?

Please tell us who these women are and what they’re doing. Everyone who sends us the correct answer will be entered in a drawing to win a CFANS coffee mug. Send your answers to bbeyers@umn.edu.

Last issue’s answer

In our last issue, we asked readers to identify this group of women and to explain why they were posing in the snow. But one reader topped that—she recognized herself! Here’s her response:

Yes, I can. It is Forestry day celebration January 23, 1942. The gals are; Jan Faulkner (McKenzie) that’s me, forestry major; plus the home economics gals: Anita Clarkin, Marion Orlaske, Audrey St. Cyr, Queen Gloria Barber, Irene and Eileen Brown, and Florence Debel. All are on snowshoes for the race. I won that race.

–Jan Faulkner McKenzie

While many other readers correctly identified the women and the fact that they were candidates for the “Daughters of Paul” crown, which once was part of Forestry Day festivities, nobody else could say they were part of the group. To honor her knowledge and good sportswomanship, Jan wins a fabulous CFANS coffee mug.
Researchers at the Bell Museum of Natural History and Villanova University in Pennsylvania are shaking up the gecko family tree. While these large-eyed lizards might be best known for hawking car insurance, scientists have long been interested in their evolution and biology. In the past, geckos were classified by their unique toes, which allow many species to climb up smooth surfaces. For the new study, the scientists sequenced DNA from 44 species of gecko. The result is a novel view of gecko evolution that includes a new family of geckos.

“No previous research has ever suggested a link between these species of gecko,” says lead author, fisheries, wildlife and conservation biology graduate student Tony Gamble. “This was totally out of the blue. In fact, some of the species in this new family were considered closely related to geckos from southern Africa. We were really surprised that our data did not support that old grouping.”

The new family is named the *Phyllodactylidae* referring to the leaf-shaped toes of many of the species in this group (phyllo = leaf; dactyl = finger or toe). Members of this new family are found in Central and South America as well as northern Africa and the Middle East. The research will be reported in *Zoologica Scripta*, published on behalf of the Norwegian Academy of Science and Letters and the Royal Swedish Academy of Sciences.
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These are some of the many events supported by the College of Food, Agricultural and Natural Resource Sciences. All are open to the public; some may require a registration or fee to attend. Visit www.cfans.umn.edu/Events2.html or contact Honey VanderVenter at 612-625-6710 or hvander@umn.edu for more information.