Grad students are saving the world sustainably.

Filling the STEM pipeline
Let's go, LEGO!

STEM-enthused competitors from around Iowa egg on their entries in the FIRST LEGO League State Championship, held each January on Iowa State's campus.

From engaging K-12 students in science subjects to preparing college graduates in science and technology fields, Iowa State University is helping fill the science, technology, engineering and mathematics pipeline that's central to America's ability to advance globally.
Mike Zeller is Suave shampoo, STawberries and Suave shampoo, Mike Zeller is spreading the word about science at Iowa State University. About 40 kids in kindergarten, first and second grades at Ames’ Kate Mitchell Elementary School are gathered for an after-school science club. They combine shampoo, water, salt and bananas, then strain the mixture through a coffee filter. While they wait, it’s snack time. “I’ll bet you’d never guess smoothies could be a scientific endeavor,” says Zeller, education coordinator for Iowa State’s Biotechnology Outreach Education Center. After washing the battle-scarred blender used for the experiment, Zeller swipes together more bananas, strawberries, tofu and other ingredients. As the kids slurp it down, Zeller tells them “you just ate…” “Banana DNA!” one boy shouts. Next the young biotechnologists put the strained liquid into test tubes of alcohol. “Everyone notice the white, kind of snotty-looking stuff in there?” Zeller asks. “That’s your banana DNA.” Zeller does dozens of these demonstrations each year. He knows the kids won’t remember everything he said about genetics. At this age, “if they leave here and say it was fun, I’m happy,” he says. “When I get them to Iowa State, I want them to think science is fun.” For now, “I want them to think science is fun,” Zeller adds. Yet the focus on STEM is intensifying, he says, partly due to attention from the White House, the National Academy of Engineering and the National Academy of Sciences. Over the past decade, each has called for improved STEM education as a matter of economic and national security. In 2005’s “Rising Above the Gathering Storm” report, the National Academies warned that, without upgrading its education and research establishments, the United States will lose its economic edge. While scientists and engineers comprise just 4 percent of the nation’s work force, they disproportionately create jobs for the other 96 percent, the report said. Lawmakers responded in 2007 with the America COMPETES Act to invest in research and science. But when the report’s authors revisited their conclusions in 2010, they found little change. (See “The state of STEM ed,” p. 5.)

**Iowa’s initiative**

Iowa leaders are taking action. In 2011, Gov. Terry Branstad launched the Governor’s STEM Initiative to unite educational institutions, industry and government to boost education and meet demand for technically trained workers in the state. Iowa State University President Steven Leath, meanwhile, pledged at his installation to accelerate Iowa State’s efforts on this front. “Our youth programs which focus on science, technology, engineering and math skills will support the Governor’s STEM Initiative and help create the next generation of scientists and engineers,” Leath said.

Wickert sits on the Governor’s STEM Advisory Council, which seeks to reach nearly 40,000 Iowa K-12 students through “scale-up” grants to help schools participate in established STEM activities. With STEM programs serving nearly 100,000 Iowa youth and more than 1,000 teachers annually, Iowa State is helping build the STEM-skilled workforce that will enable Iowa to prosper.

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**IT INTERESTED**
Developed by the Iowa State Information Assurance Center, IT-Adventures aims to increase high school students’ interest in information technology via inquiry-based learning in cyber defense, game design programming, and robotics.

**BIOTECH BASICS**
The Biotechnology Outreach Education Center provides hands-on lab experiences and bioethics activities for more than 20,000 elementary- through college-age students and adults annually.

**THE CLOVERLEAF’S STEM**
More than 20 percent of Iowa youth are involved in 4-H, including 4-H STEM programs, which reach out to young people and the adults who work with them to provide resources for hands-on STEM education.
programs and curricula. The initiative has given Iowa an edge, with Iowa State’s century-long extension and outreach service to all 99 Iowa counties providing an even greater advantage, Wicksen says. “The outcome so far has been coordination and participation of different organizations” that few other states can match, knitting together schools, community colleges, area education agencies, regents institutions, government units, and businesses.

Lynne Campbell, manager of the campus-based North Central Iowa STEM Hub, works with all these groups: Iowa State is one of six institutions chosen to run regional hubs, which increase access to and coordinate with STEM resources.

Campbell can tap an arsenal of Iowa State-backed precollege efforts: 4-H programs in robotics, aerospace, environmental science, and other subjects; the College of Agriculture and Life Sciences’ support for Future Farmers of America programs; Project Lead the Way, a precollege engineering program and a 2013-14 STEM scale-up grant recipient; and many others.

The university also is partnering with schools in new and innovative ways, such as Destination STEM, an initiative launched by Vice President for ISU Extension and Outreach Cathann Kress to improve connections between Iowa State and the K-12 community, offering professional development to support teachers, staff and volunteers. “We’re hoping to build a coordinated system where people can access all the rich resources here,” Campbell says.

STEM’s front line: our teachers

Indeed, teacher training is pivotal to Iowa’s STEM education efforts, says Pamela White, dean of the College of Human Sciences at Iowa State.

“How teacher education graduates are highly skilled in the STEM fields,” White says. She cites the elementary education program in particular: “Our students take a special series of mathematics courses that helps them to teach math to their students. We now have data showing the test scores of students taught math by our Iowa State graduates are significantly greater than that of teachers not coming through Iowa State’s program.”

It helps that among Iowa State’s School of Education faculty are national and international STEM education leaders: Michael Clough, associate professor of science education, is president of the International History, Philosophy and Science Teaching Group, which promotes improved school and university science and mathematics education. Associate Professor Joanne Olson is president-elect of the Association for Science Teacher Education, which enhances teacher training around the world.

Olson also is interim head of the Center for Excellence in Science, Mathematics and Engineering Education, part of the school’s drive to improve STEM education training. The center helps teachers, teacher trainers and researchers collaborate on STEM education research.

Funneling STEM fun

For a taste of precollege STEM energy, visit Iowa State’s Howe Hall in January for the FIRST LEGO League State Championship. The music and voices border on ear-splitting. Spectators jam the mezzanines, watching participants below crowd around tables where their robots interact with LEGO structures to score points. The College of Engineering is the state partner for the international FIRST LEGO League.

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program, which is one of the STEM councils 2012-13 scale-ups. It serves as many as 4,000 9- to 14-year-old Iowa students each year.

Such programs, Wickert says, help Iowa State boost enrollment in STEM disciplines. “If we care about our university programs, we have to build the pipeline. That precollegiate thrust is a vital part of what we do.” (See “The scope of Iowa State,” p. 5.)

Other programs specifically target women and minorities, groups traditionally underrepresented in STEM careers. The Program for Women in Science and Engineering supports women in STEM majors at Iowa State and engages girls and young women in the sciences through outreach programs. (See “Forging new paths,” p. 7.)

Science Bound works with the Des Moines, Denison and Marshalltown school districts to attract minorities. Students participate in activities such as academic boot camps and on-campus workshops, and potentially earn scholarships to pursue STEM majors at Iowa State.

**Fueling the pipeline: philanthropy**

Science Bound is just one example of the difference donors can make. The program receives support from individuals like Oonolee and Olin Trapp, and companies like Smithfield Foods and DuPont Pioneer, helping enrollment grow to more than 375 students.

In fact, philanthropy, Wickert says, “is a central part of STEM education, now and into the future.” Scholarships lift financial burdens, helping students meet the demands of their majors.

Donors also support student activities, like the PliSun solar-powered car, or the Center for Sustainable Rural Livelihoods, which sends undergraduates to work on rural development in Uganda. These opportunities engage students, allow them to put lessons into practice, and motivate them to graduate, Wickert says.

White says one of the best ways to strengthen STEM education both locally and nationally is to provide support for students to go into STEM teaching areas. “Students who are interested in STEM subjects may not see a teaching degree as a way to pass their experience and interest on to students in their own classrooms. Scholarships go a long way to get these talented students to become our talented teachers.”

Endowed professorships also are vital. “The backbone of what we do, whether it’s precollegiate programs or research, is the faculty,” Wickert says. Private support helps the university attract the best STEM professors and researchers.

Preminent faculty, in turn, often provide STEM opportunities to K-12 students. For example, Doug Jacobson, University Professor of electrical and computer engineering, stages IT-Adventures, engaging high school students in robotics, game design and information security activities, culminating in an annual IT Olympics. Private giving supports many similar ventures.

These programs also let Iowa State faculty and students act as indispensable role models to aspiring scientists and engineers. They demonstrate that “STEM careers are not just about the nerdy part of graphs and numbers,” Wickert says.

After all, he adds, STEM pursuits address issues in energy, environment, health and more – in short, improving life. “If you frame STEM careers as helping people – as a way to use technology to help people – that’s very powerful.”

**What you can do**

**Philanthropy at Iowa State is central to STEM education and outreach, with its impact reaching far beyond Iowa’s borders:**

- Merit and need-based scholarships for women, minorities and low-income students to pursue STEM majors helps build the highly-skilled, diverse workforce needed to make the nation stronger.
- Scholarships for student participants in organizations allow them to work less and engage more fully in these programs.
- Program support engages K-12 students, allowing them to put lessons into practice and envision their future at Iowa State.
- Endowed faculty positions help Iowa State attract the best STEM professors and researchers.

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**Watch Video**

on Betsy Saina’s meteoric running career at www.foundation.iastate.edu/forwardmag

Photo: Cameron Campbell
GROWING UP IN MUSCATINE, IOWA, Meghan Fick looked up to her grandfather, veterinarian Dr. Donald Fick. “He was a surgeon, radiologist, dermatologist, ophthalmologist, anesthetist, dentist, internist, and so much more,” she said. “I knew I wanted that same challenge every day.”

Because her grandfather attended Iowa State University’s College of Veterinary Medicine, “I refused to apply to any other veterinary school,” Fick said. So it was especially affirming to receive a scholarship funded by her grandfather and his close-knit classmates.

The Veterinary Medicine Class of 1964 Scholarship allowed Fick to take advantage of an array of opportunities not available to veterinary students in her grandfather’s day: externships in shelter medicine in Kansas City, emergency care in Los Angeles, and sea turtle rehabilitation in Georgia, as well as study abroad in Hungary and Italy. “I got to see how veterinary medicine was practiced in different fields, and even in different countries,” she said. “I learned from places I never would have been able to visit and made contacts I'll use in the future.”

Since 1999, the veterinary medicine class of 1964 has funded scholarships for veterinary students, and fellowships and stipends for graduate students. The class’ intent is to provide veterinary students greater opportunities to develop the skills and perspectives needed to lead in their profession.

“This fund is an admirable example of the generosity toward and passion for the profession shown by our alumni,” said Dr. Lisa Nolan, Dr. Stephen G. Juelsgaard Dean of the College of Veterinary Medicine.

Michael Rahe, another example of today’s veterinary student, is pursuing a master’s degree in veterinary public health at the University of Minnesota. “He’s been there for me since I decided to attend veterinary school and continues to answer my questions and provide support when I need it. He retired in December, after 49 years of practice.”

“He’s been an exceptional reward,” said Rahe. “Since my grandfather is a member of the class of 1964, receiving this scholarship has been significantly more special to me,” said Meghan Fick, who is pursuing a master’s degree in veterinary medicine she has encountered. As a contributor to the class’ fund before Meghan applied to Iowa State, he said, “It’s always rewarding to see a good student receive the scholarship. That it also happens to be someone special to me is an exceptional reward.”

“His is an example of someone I look up to,” said Rahe. “I've been following in his footsteps and continue to learn from him.”

Michael Rahe is another example of today’s veterinary student. The recent veterinary medicine graduate concurrently pursued a Master of Public Health at the University of Iowa while at Iowa State. He has conducted research on the dengue virus at Stanford University, studied abroad in Thailand, and assisted with H5N1 avian influenza surveillance in Romania.

Rahe says receiving the Class of 1964 Scholarship only confirms his career choice, showing him that this group of experienced veterinarians “love what they do professionally, and they want others to have similar experiences.” Rahe will pursue a doctorate in immunology at the University of Minnesota this fall.

As for Donald Fick, it has been wonderful to see his granddaughter embrace every aspect of veterinary medicine he has encountered. As a contributor to the class’ fund before Meghan applied to Iowa State, he said, “It’s always rewarding to see a good student receive the scholarship. That it also happens to be someone special to me is an exceptional reward.”

“Since my grandfather is a member of the class of 1964, receiving this scholarship has been significantly more special to me,” said Meghan Fick, who is pursuing a master’s degree in veterinary gross anatomy in addition to her Doctor of Veterinary Medicine. “He’s been there for me since I decided to attend veterinary school and continues to answer my questions and provide support when I need it. He retired in December, after 49 years of practice. While I’m sad to see him leave the profession, I know he’s excited to see where it will lead me.”

WATCH ONLINE
Learn more about the legacy the class of 1964 is creating at Iowa State. www.foundation.iastate.edu/forwardmag

A NEW BREED OF GENTLE DOCTORS

Members of Iowa State’s veterinary medicine class of 1964 have joined together to ensure new graduates are prepared to lead their profession.

By Veronica Lorson Fowler | Photo: Erich Ernst
MANY COMPANIES TODAY ARE still reluctant to take proactive environmentally-friendly measures for fear that implementation costs will not bring a corresponding payback.

Yet according to Jing Dai's research as part of her Ph.D. in business and technology program at Iowa State University, implementing environmentally-friendly processes and products, particularly in cooperation with suppliers, not only helps companies improve their operational performance, but also enhances their innovation potential and ability to enter new markets.

“I'm interested in helping companies effectively deploy green supply chains and remain competitive,” Dai said about the research she will continue to pursue as an academic after she gains another year of teaching experience at Iowa State.

Dai is one of the first graduates of the Ph.D. in business and technology program, which this spring also marked the first doctoral degrees ever awarded in the College of business—an important step for the relatively young college as it builds its reputation as a comprehensive business program, and helps meet the need nationally for qualified business faculty.

The journey to establishing a doctoral degree program began 20 years ago. The topnotch faculty the college had succeeded in attracting were encouraged to reach for the stars in developing a program, says Sridhar Ramaswami, director of the program and Dean’s Faculty Fellow in Marketing. Discussions coalesced around a niche emphasis faculty identified in the college’s strong transportation and logistics program.

“We focused on the interdisciplinary phenomenon we see at work,” Ramaswami explained. “Companies have teams working on new products for customers, teams working on the supply chain – manufacturing operations, distribution, shipping – and teams working to understand businesses’ information infrastructure. We designed a Ph.D. program that actively promotes integration among these three areas.”

The resulting interdisciplinary doctoral-level business program already is enabling the college to differentiate itself nationally. Just as important, the Ph.D. program raises all boats. The research emphasis of the program enhances the education of students at all levels in the college, and challenges the faculty working with doctoral candidates on intensive literature reviews and research investigations.

In fact, Dai and fellow Ph.D. program graduate Andy Luse received the Iowa State University Research Excellence Award, which recognizes “the best of the best” of graduating students who have submitted theses and dissertations.

Ramaswami credits Emeritus Dean Labh Hira for his tireless advocacy of the Ph.D. program, and donors such as Ann and the late Russ Gerdin and David and Ellen Raisbeck for their support of the college’s efforts to become a comprehensive business college.

That goal is much closer with the new graduates of the Ph.D. in business and technology program. They are now “the engine behind the growth of the program,” Ramaswami says, as they become the academics and researchers creating solutions to the challenges of a world that is increasingly global and technologically focused.

To support students in the College of Business, contact us:
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toll-free 866.419.6768
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**Gifts at Work / In Brief**

**Iowa State's All Business**
Iowa State University's College of Business enrolls more Iowa high school graduates than any other business program in the state. Resident students comprise nearly 65 percent of the college’s enrollment.

**Impact**

**Journey for a Lifetime**
Michelle Browning found her calling high in the Andes Mountains in South America, far from Iowa State University.

It began in summer 2011 when May 2013 graduate in child, adult and family services spent two weeks in an impoverished village in Ecuador with the national organization Student Athletes Leading Social Change. The Iowa State gymnast worked with the community members building classrooms in the local school and organized activities with a girls club to encourage female leadership.

“I saw how dramatically culture and environment affect a person’s identity,” Browning said. “I saw the ways I’ve grown up with privilege.”

The experience provided the impetus for Browning to apply for—and win—the prestigious Benjamin A. Gilman International Scholarship, which allowed her to travel the following summer to Cusco, Peru, in the heart of the ancient Incan Empire. For eight weeks, she lived with a host family and attended classes. Each week she and other students traveled to a rural village to offer residents nutrition workshops or assist with construction projects.

“I’d traveled before, but the service element of my trips to Ecuador and Peru gave me a completely different perspective,” the Houston, Texas, native said. “I learned so much.”

The next leg in Browning’s journey takes her to Honduras to work with schoolchildren. Still on the horizon is her dream career: working in refugee resettlement helping people displaced from their home countries.

“My study abroad experiences at Iowa State broadened my worldview and confirmed that I want to work with international populations,” she said.

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**LEEDing the Way**
Since 2008, Iowa State has sought LEED gold certification or better on all of its building projects. Among them is the College of Design King Pavilion (platinum), Hach Hall (gold), Biorenewables Research Laboratory (gold) and the Morrill Hall renovation (silver), all of which were made possible in part through private giving.

**YOU’VE COME A LONG WAY, CBE**
Among the milestones Iowa State’s Department of Chemical and Biological Engineering will celebrate at its centennial in September:

- Established in 1913 as one of the first chemical engineering departments in the nation.
- Two graduates were in the first class. Today’s undergraduate enrollment is 600, up more than 50 percent since 2008.
- Research funding has more than doubled over the past three years.
- Seventy CBE alumni hold faculty positions nationally or internationally in chemical engineering or related fields.
- About one third of CBE students received a total $390,000 in scholarships and fellowships from alumni and friends in 2012.
- The 1964 wing of Sweeney Hall, named for Orland Russell Sweeney, the first and longest serving department head (1920-1947), recently underwent a $2.78 million comprehensive renovation, with support from the National Science Foundation and private giving.

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** Universities like Iowa State need to teach engineers and scientists how to open startups and infect [these individuals] with the bug of entrepreneurship.**

— Dan Shechtman, Distinguished Professor in materials science and engineering and 2011 Nobel laureate in chemistry, speaking at Iowa State in March.

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**Excelling from Classroom to Basketball Court**
Waldo W. Wegner Basketball Scholarship recipient Melvin Ejim was named the inaugural Big 12 Scholar-Athlete of the Year in men’s basketball. The history major from Toronto, Ontario, earned a 3.74 GPA in the classroom while leading the Big 12 in rebounding with an average 9.3 per game.
The people have spoken

Two interior design seniors received the People’s Choice Award for their entry in the International Interior Design Association’s 2012 Student Sustainable Design Competition. Ashley Olson, recipient of the Janice Peterson Anderson Excellence Award and Scholarship, and Erica Riha, recipient of the Lori L. Beard Raymond Interior Design Scholarship, created their project, “Vitality Assisted Living Facility,” in the junior healthcare design studio.

Support

Fighting for truth, justice and the sustainable ag way

Superhero. The word conjures an image of a costumed crusader who protects the world. Although Iowa State University graduate students working with the Leopold Center for Sustainable Agriculture may not wear costumes, they are superheroes in their own right as they work to develop sustainable agriculture and preserve the environment.

That’s the intent of the Leopold Center’s Facebook series “Superheroes in Training,” which spotlights students whose research is funded in part by the center. “The series makes space for the voices of young people who are shaping the future,” said Melissa Sevigny, Leopold Center graduate research assistant and the series’ developer. “These graduate students are quite literally working to save the world by studying farming systems, biofuel options, water quality and climate change.”

One “superhero” is Stefan Gailans, a graduate student in crop production and physiology and sustainable agriculture from Mequon, Wis. The recipient of several privately funded scholarships – including the Pioneer hi-bred Endowment for Agronomy Scholarship and the Print and Grace Powers Hudson Scholarship in Agriculture – studies alternative cropping systems that could cover the landscape during the off-season, such as winter varieties of canola and wheat.

“When you don’t have cover on the agricultural ground, the soil, water and nutrients are vulnerable to being lost from that field,” Gailans said. His dream job is to educate students, community members and farmers alike about the important intersection between agriculture and the environment.

Perhaps it’s not surprising, then, that the superhero with whom Gailans most identifies is Batman because, he says, “when it comes down to it, he’s just a human being who had to work really long and hard to achieve superhero status.”

Learn more about Gailans and other “Superheroes in Training” at www.facebook.com/LeopoldCenter/notes.
HERITAGE SUSTAINED

With help from the Butler Graduate Student Travel Award, students carry on Henry A. Wallace’s legacy: fighting global hunger, inequality and poverty.

By Debra Solberg Gibson | Photo: DuPont Pioneer

AS PART OF HER graduate program in community and regional planning and sustainable agriculture at Iowa State University, Shelley Oltmans spent last summer determining whether there were food deserts—a lack of access to the fresh, affordable foods needed to maintain a healthy diet—in a fast-developing neighborhood in Accra, Ghana.

What she found instead increased access to processed foods may be causing a shift away from traditional diets and toward a western diet. “I learned that, although fresh food was accessible to these residents, that didn’t make for more nutritious eating habits,” Oltmans said.

Making such discoveries is precisely the purpose of the Butler Graduate Student Travel Award for International Study in Sustainable Livelihoods, which Oltmans received to support her research.

“Bob and Lorna [Michael] Butler have long understood that in order to do anything useful in Africa, they needed to really get to know the culture they were working with,” said David Acker, associate dean of academic and global agriculture.

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“The main goal of our family’s scholarship is simply to give an Iowa State student—someday hopefully more than one a year—the chance to dedicate as much time as possible to pursuing track and field and their design or engineering studies without the pressure of needing a job to pay for school. We are excited to provide opportunities for students to explore alternative options earlier in their career.

– STEVE FOUTCH

Class of 1988, and Mary Jane Foutch, with Honor and Jackson, of Weatherly Lake, Mo., who established the Steve and Mary Jane Foutch Family Scholarship Endowment through current and planned gifts to Iowa State University.
What you make possible

Fashioning their future

Many student designers and producers for the annual Textiles and Clothing Fashion Show receive private scholarships that enable them to immerse themselves in this time and talent intensive experience, such as Nicki McLellan (right), recipient of the Noma Scott Lloyd Scholarship and others, shown with her 2013 Best in Show design.