Momentum!

Fall 2013

"We always encourage that balance – doing a good job in school, in football and making good choices off the field."

– Mike Riley, Head Coach

Oregon State UNIVERSITY

EDITOR
Thuy T. Tran

CONTRIBUTING WRITERS
Romel Hernandez, Gregg Kleiner, Marie Oliver, Chelsi Rayford and Warren Volkmann

GRAPHIC DESIGNER
Long Lam

COPY EDITOR
Marie Oliver
(Clarity Writing & Editing)

PHOTOGRAPHERS
Jeffrey Basinger, Jim Carroll, Ethan Erickson, Karl Maasdam, Dave Nishitani, Kovit Pholsena and Stoddard Reynolds

FRONT COVER
Keith Kostol, an electrical engineering junior, pinned the Arizona State Sun Devils deep in their own territory during the Beavers' 36-26 win last November in Corvallis. Starting as the backup punter two seasons ago, Kostol quickly became the starting punter in 2012 and is regarded as one of the top punters in the Pac-12 Conference this fall. Kostol excels on and off the field. (Photo by Dave Nishitani)

BACK COVER
Alyssa Martin, civil engineering junior and guard on the Oregon State women's basketball team, helped secure a 68-49 win against the Oregon Ducks in January. Martin's 127 3-pointers place her third among the highest career record holders at Oregon State. She earned a Pac-12 All-Academic Honorable Mention after her sophomore and junior seasons. (Photo by Stoddard Reynolds)

COLLEGE OF ENGINEERING
Oregon State University
101 Covell Hall
Corvallis, OR 97331
541-737-3101
engineering.oregonstate.edu

Momentum!

Spring 2013

Momentum! is published by the College of Engineering's Marketing Communications group. Comments and questions about this publication can be sent to the editor at **editor@engr.oregonstate.edu**

College of Engineering faculty and staff gathered at Reser Stadium for the 2012 Fall Awards Breakfast.

Building and maintaining our physical infrastructure is critical to furthering the College of Engineering's mission, and it simply would not be possible without private support. We are extremely grateful to all our donors. "Oregon has a pressing need for innovation, and facilities like this can support collaborative research and hands-on learning for generations of OSU faculty and students," said Peter Johnson '55, a key college supporter whose contribution will help build a new interdisciplinary teaching and research facility.

The pursuit of excellence

We develop engineering leaders. We provide our students with an excellent education by developing and delivering innovative programs. We pioneer research that bridges disciplines and addresses global challenges, and we drive economic, social and environmental prosperity. We accomplish this in a collaborative culture that values leadership, diversity and excellence.

This issue of *Momentum!* showcases distinctive examples of the teaching, learning, research and outreach in which our engineering faculty, students and alumni engage each day to support Oregon State University's mission as a land-, sea-, space- and sun-grant institution.

We educate the best and brightest students and develop programs to help them succeed in their chosen path. For example, students like Keith Kostol, Alyssa Martin and Stephanie McGregor excel in the classroom while pursuing their various team sports. As student athletes, they personify the richness that comes with developing diverse interests and skills while embodying a tremendous work ethic.

As our engineering program broadens and deepens, we will welcome 21 new faculty members this fall. As usual, we have attracted top scholars with a true entrepreneurial mindset and a proven commitment to collaborative research. Greg Herman, who brought 17 years worth of national laboratory and private industry experience in nanotechnology, surface science and catalysis when he joined us a few years ago, is just one example. We share his story in this issue. You'll also meet Adam Higgins, who applies microfluidic devices and cryopreservation techniques in handling and preserving blood — techniques that could cure sepsis and improve kidney dialysis.

If you were on campus in May for the Engineering Expo, you would have seen how our seniors apply their ingenuity to solve diverse technical challenges in a wide range of engineering disciplines. Perhaps one of them will go on to make a real economic and social impact like Jon DeVaan ('85 Computer Science and Mathematics), whose 28 years at Microsoft literally helped change the world.

Early this year, I announced $20 million in private support for a new facility that will house interdisciplinary teaching and research laboratories, new state-of-the-art classrooms and a center focused on improved student recruitment and retention. We are deeply grateful to Peter ('55 Chemical Engineering) and Rosalie Johnson and an anonymous donor for their exceptionally generous contributions that enabled us to show strong community support. I'm happy to tell you that the 2013 Oregon Legislature recently approved $20 million in matching state bonds. We can now move into design and construction.

I hope you enjoy reading these stories, which all reflect our commitment to excellence, and I look forward to hearing your input. Be sure to stop by and visit when you're in town — I'd love to talk with you about our college's exciting growth and brainstorm with you about how you can play a part in forwarding our momentum.

Sincerely,

Sandra Woods

Sandra L. Woods, Dean
Oregon State University
College of Engineering

Sweating it out in two worlds

By Romel Hernandez

Two very different worlds consume all of Keith Kostol's attention each fall: football and engineering. As a junior in electrical engineering and the starting punter on the Beaver football team, he doesn't let the intensity of either world get the best of him.

"You go to practice, you go to class, you do homework, then you might have an hour to hang out before going to bed," Kostol said. "You have to stay focused."

Oregon State was an obvious choice for Kostol because of its outstanding engineering programs. Ever since he can remember, he has been obsessed with taking things apart — remote control cars, disk drives, lawn mowers — to discover their inner workings. "I always just knew I would be an engineer," he said.

He warmed up to football a little more slowly, actually quitting his peewee football team after a single year. "I was on the smaller side, and it just wasn't for me," he said. He played soccer instead, and then returned to football as the kicker and punter for Tigard High School.

Meanwhile, he grew a little. He's 6 feet 4 inches now.

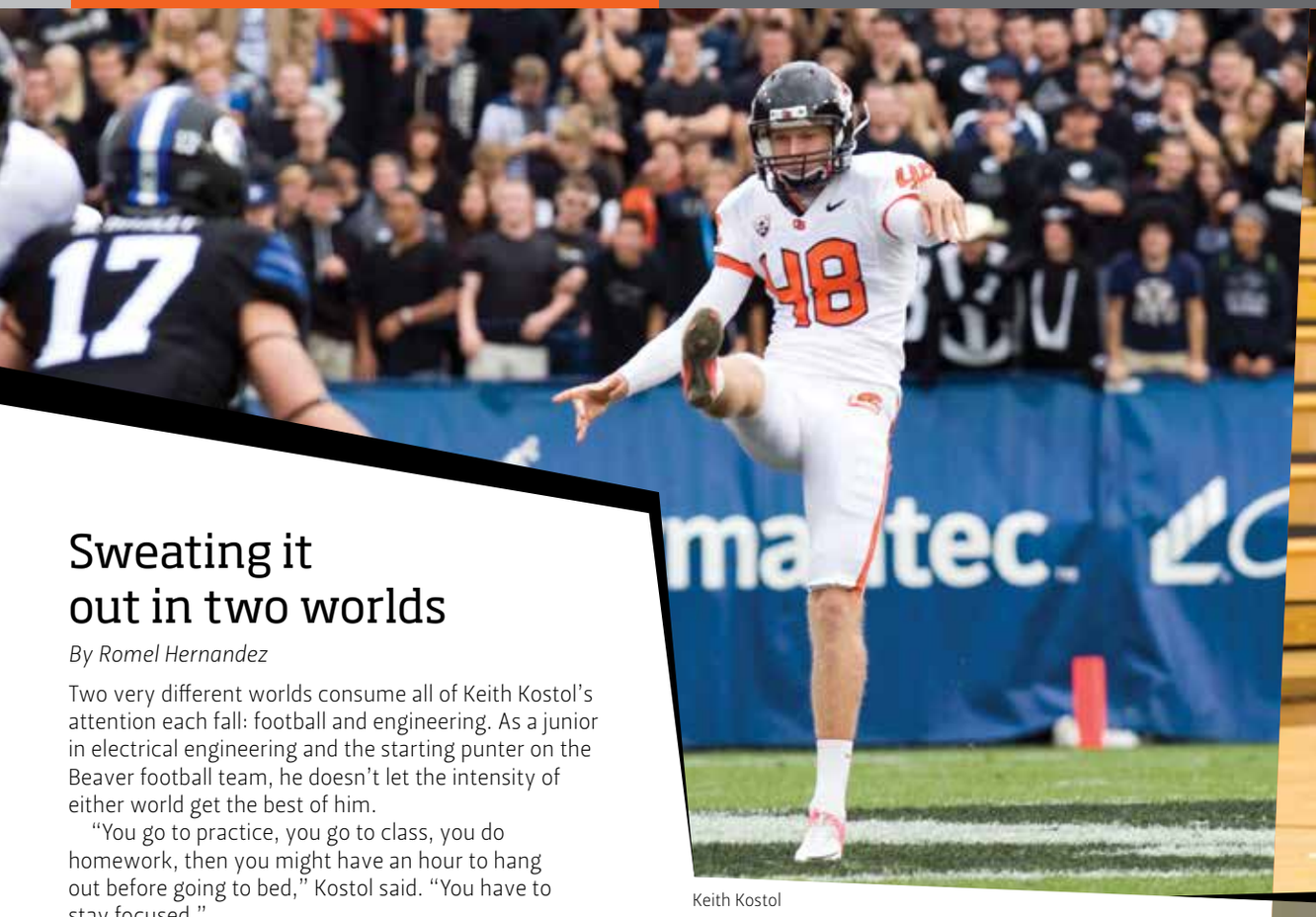
During the application process for Oregon State, he sent game film to the Beavers' coaching staff on a whim. He made the team as a walk-on and earned the backup spot to star punter Johnny Hekker, who now plays for the NFL.

By 2012–13, everything came together for Kostol. He was accepted into the College of Engineering Professional School and also won a head-to-head competition in training camp to become the team's starting punter. He enjoyed an excellent season for the Beavers, averaging 41.9 yards per punt (although he notes that hang time is just as important as distance for punters). He was named Pac-12 Special Teams Player of the Week for his standout play in a key game against UCLA.

Football Head Coach Mike Riley said it's Kostol's determination and dedication to hard work that have made him a success on the football field as well as in the classroom. "Many times during the quiet times of the offseason, I'll be in my office looking down into the stadium and Keith will be out there by himself with a bag of balls practicing his punting," Riley said. "He has a tremendous work ethic. We always encourage that balance — doing a good job in school, in football and making good choices off the field."

Perhaps part of Kostol's success could be attributed to the fact that he sees his successes in sports and academics as separate issues. "When I'm in class, we don't talk football, and when I'm at practice, we don't talk engineering," he said.

After playing for two more years for the Beavers, Kostol plans to study digital signal processing in graduate school. But first, he is going to try his luck playing professionally in the NFL. "I'm going to give that a shot," he said. "Why not?" **M!**



Keith Kostol

Alyssa Martin

Finding the right balance

By Chelsi Rayford

As if being a full-time engineering student isn't enough to keep a person busy, Alyssa Martin takes it one step further. She takes great care to balance her demanding pursuit of a civil engineering degree with her position as a valued guard for the Oregon State University women's basketball team.

Sports have always been a big part of Martin's life. She first started playing basketball as a kindergartener and has participated in many other sports over the years. "Sports have always been kind of ingrained and something my family always did," she said. Her dream was to play for the Beavers.

A previous Oregon State coach recruited her. She made the All-Freshman Pac-10 team, and heading into her senior year, she continues to impress her coaches. "Alyssa is a coach's dream," said Head Coach Scott Rueck.

Martin works hard to be the best person she can be as an athlete and a student. "I don't want to have any regrets, so 'just leave it out on the court' is a saying we have in basketball," she said. This attitude allows her to focus on schoolwork when off the court. She is proud of her ability to keep her grades up, and attending the university's annual 3.2 (GPA) Dinner for Athletes has been a goal every year.

One of the most difficult things for Martin since entering college has been the need to re-learn study habits. "It's important to make friends who will take notes for me when I'm not in class. We miss two to three days every other week (traveling for games)," she said. Martin believes that being diligent with time management and knowing how to tell friends she can't hang out because she has homework to do is key to keeping her grades up.

"Alyssa quickly taught us that we could count on her to be a consistent high achiever and that is what she has provided the women's basketball program at Oregon State from the day she arrived on campus," said Rueck. "She is a dynamic player who bleeds orange and black."

In her spare time, Martin loves to train and participate in triathlons. A typical triathlon encompasses a half-mile swim, 12-mile bike ride, and a 3K run.

Coach Rueck said Oregon State is particularly impressed with players who understand that playing for the Beavers goes beyond the individual athlete, and Martin understood that concept from the beginning.

"We recruit individuals who are achievers, but more than anything, desire to become elite as a group," said Rueck. "While each athlete is taking care of her role to the best of her ability, she also has the presence and vision to see the needs of others and pull them along. Alyssa Martin provides a wonderful example of exactly that." **M!**

Stephanie McGregor

Following her bliss

By Chelsi Rayford

Stephanie McGregor was only three years old when she fell in love with gymnastics, and she was still quite young when she began competing. It was a significant time commitment — competitive gymnastics requires athletes to practice 20 to 30 hours a week. The long hours did nothing to dampen her ardor for the sport, however, and McGregor wanted to continue competing while attending college.

Collegiate gymnastics doesn't exist in Canada, so as a high school junior in Calgary, Alberta, she did some research and discovered that colleges in the United States granted scholarships for gymnasts.

Oregon State was among the schools she applied to for an athletic scholarship. She sent videos and a resume, and the coaches liked what they saw. They went to watch her at the Canadian Nationals. In subsequent visits, they watched her practice and met her family. Finally, she was invited for an official campus visit. "I fell in love with the coaches and the team," McGregor said. "It seemed like a good place to be for four or five years."

It's been a good match. The Beavers won the 2013 Pac-12 women's gymnastics championship for the second time in three years, and McGregor was named Pac-12 scholar athlete of the year. And her enthusiasm for the team hasn't diminished. "I love it!" she said about her experiences as part of the Beaver team. "It is such a privilege to be able to compete for the Beavers. The coaches are amazing as far as caring about you as people; we aren't just athletes."

McGregor is a graduating senior in the bioengineering program at Oregon State, a choice of major she made because she had always excelled in and enjoyed math and problem solving. "I don't exactly know how I ended up in engineering, but I'm very glad I did!" she said.

McGregor was already used to working hard and applying top-notch time management skills, and she needed both to remain successful in the two worlds of engineering and gymnastics — worlds that are demanding in their own ways. It has been helpful to have the camaraderie of the team behind her. She said she has really appreciated the team aspect of gymnastics at Oregon State. "In high school, gymnastics is an individual sport, so when I came to college and the focus is all about the team, that makes it so much more fun," she said.

McGregor also has been pleasantly surprised at the support she receives from the local community. "In high school, you do gymnastics and nobody really cares, but then you come here and I'll be grocery shopping in normal clothes, and fans will come up and congratulate me or wish me luck," she said.

McGregor encourages high school students with a love of gymnastics to apply their skills in pursuit of a college degree. "Some girls get burnt out on the sport after putting in so many years and so many hours, and working with a team can help them regain their love for the sport. In terms of the opportunities it provides, universities recognize the fact that people know them by their athletics, so they do a great job of taking care of their student athletes, making sure you have the best resources available."

McGregor turned 23 in June, and she sees that milestone as the end of her days as a competitive gymnast. "If you think about the Olympics, that's basically the top of the sport, and those (competitors) are around 16 or 17," she said. "So I'm basically a grandma in the sport!"

Although unsure what path she will take following graduation, McGregor has applied for a work visa so she can stay in the United States if she chooses. **M!**

Graduate student Ratih Lusianti and Assistant Professor Adam Higgins examine a sample on the freeze drying cryomicroscope.

Engineering life on the edge of ice

By Warren Volkmann

Peering through the double eyepieces of a $20,000 microscope equipped with a $30,000 high-speed video camera, Assistant Professor Adam Higgins sees more than just microbes, cells and corpuscles freezing and thawing. In his mind's eye, he sees portable devices for kidney dialysis and new cures for sepsis — a blood infection that kills more people than AIDS, prostate cancer and breast cancer combined.

He sees wounded soldiers getting blood transfusions more quickly thanks to new preservation techniques. He sees infertile couples celebrating the birth of long-awaited babies. He envisions artificial lungs that provide life-giving oxygen to blood flowing through microscopic channels. And when he considers what life will be like in the 22nd century, he foresees freeze-dried bacteria and sugar-encrusted plants and animals transported to distant planets in a state of suspended animation.

The National Science Foundation shares at least one of Higgins' visions. In 2012, it gave him a prestigious CAREER award of $400,000 to support his

THE PATH THAT LED ADAM HIGGINS TO A $400,000 CAREER AWARD FROM THE NATIONAL SCIENCE FOUNDATION started and ended at Oregon State. As an undergraduate, he spent four months in Ecuador preparing his undergraduate thesis: *Medical research and the ethics of distribution: Nisin-treated catheters in Ecuador and Oregon*. It earned him a double degree in bioengineering and international studies in 2002.

Returning to the U.S., Higgins received a Ph.D. in bioengineering from the Georgia Institute of Technology in 2008. Under the mentorship of Dr. Jens O.M. Karlsson, a leader in cryopreservation, he studied the effects of freezing on cells and tissues. His thesis was titled: *Intracellular ice formation in tissue constructs and the effects of mass transport across the cell membrane*.

Higgins returned to Oregon State in 2008 as an assistant professor in the School of Chemical, Biological and Environmental Engineering.

Higgins fills a capillary tube with blood for measurement of hematocrit.

research into the use of micro-channels and freezing to preserve cells and tissues. The award, given to faculty in the first five years of their careers, will be used entirely to operate his lab on the second floor of Gleeson Hall. The research that drew the NSF's attention lies at the intersection of Higgins' Ph.D. studies in tissue preservation and his application of microfluidics to preserve and handle blood.

Bedside blood

Higgins and his Oregon State research team — Allyson Fry, Ratih Lusianti, John Lahmann and Alex Vian — are developing techniques that could revolutionize blood banking and battlefield medicine by allowing frozen blood to be readied for transfusion in minutes. In hospitals and blood banks, most blood is refrigerated rather than frozen. Refrigerated blood can be stored for only six weeks, but frozen blood can be preserved for 10 years, perhaps longer. Nevertheless, only rare blood types are frozen and stockpiled.

"The prospect of thawing blood as needed in an emergency is not practical now," Higgins explained. "Complicated things happen when you freeze something. To keep red blood cells from shrinking when they freeze, glycerol is added. But it takes about an hour to coax the glycerol out of the cells after the blood is thawed."

Like explorers of a microscopic arctic, Higgins and his researchers are experimenting with life at the edge of ice. Besides the Leica microscope, which is equipped with a temperature-controlled stage and a slow-motion video camera, the main tool for their research is math. Sophisticated computer models predict how cell membranes will respond to freezing and thawing. The models make predictions. The microscope shows whether cells survived or died. The video camera enables them to share their findings with the world.

"We have done some mathematical modeling of red blood cells, and theoretically it is possible to remove the glycerol in less than one minute," said Higgins. "We are working on a practical method of implementing this. That's where microfluidics comes in. Our short-term goal is to make it more practical to use freezing in the blood banking industry. The long-term goal is bedside warming — hanging a bag of thawed blood above a micro-fluidic device that removes the glycerol as the blood is transfused into the patient. This capability would make it possible to stockpile frozen blood and make the nation better prepared for a national emergency."

Dry and high

Higgins and his team are pursuing another method for preserving blood: freeze-drying. Technically called lyophilization, freeze-drying makes blood light and easy to transport without refrigeration.

"There is no completely successful freeze-drying procedure," Higgins said. "You can dry, store and rehydrate blood, but only about half of the blood cells survive. We think we can do better than that."

In the future, freeze-drying techniques may be the key to transporting large quantities of oxygen-producing bacteria into space. Payloads of protozoans may one day generate a new atmosphere on Mars, turning the red planet green and making it habitable for human colonization.

Cryobiology

Although freeze-drying is intriguing, low temperature storage in an ice-free, glassy state — a technique called vitrification — holds more immediate promise. In 2011, Higgins joined others at the university to bring the annual meeting of the Society of Cryobiology to Oregon State. At the conference, Allyson Fry, a Ph.D. researcher in Higgins' lab, won an award for her work in which she used computer modeling to optimize vitrification of cells. She later applied that optimization approach at Life Technologies Corp. in Eugene to improve cryopreservation of stem cells, which hold great promise in the treatment of illnesses like heart disease and Parkinson's.

Reliably coaxing frozen egg cells back to life could avoid one of the most vexing moral and political dilemmas facing science, medicine and society — freezing and banking human embryos, the seeds of life.

"If we can freeze and thaw oocytes — the unfertilized egg cells — without losing too many, then we could affect the way *in vitro* fertilization is done," said Higgins. "You can collect and freeze sperm cells by the millions, so a 50 percent survival rate is acceptable, but egg cells are much more precious. You want every egg to survive."

Water bears

Higgins is reminded of the vast potential of his work by a microscopic creature commonly called the water bear or moss piglet. Formally named the tardigrade, the tiny creature has the ability to replace the water in its body with sugars that put it into a state of suspended animation that is nearly impervious to heat, cold and radiation. It has even survived trips into the vacuum of space.

For Higgins and his team, the tardigrade shows how much remains to be learned. Cryopreservation techniques and microfluidic devices developed in their lab may one day give life, save lives and carry life out into space. Higgins is reminded of those tantalizing possibilities every time he puts his eyes to the microscope. **M!**

Postdoctoral fellow Rose Ruther and Associate Professor Greg Herman synthesize cluster solutions.

Industry experience adds teaching value

By Marie Oliver

When Greg Herman joined Oregon State University's School of Chemical, Biological and Environmental Engineering (CBEE) as an associate professor in 2009, he brought with him 17 years worth of national laboratory and private industry experience. His varied research and development background in surface science, heterogeneous catalysis, thin film growth, device physics, nanotechnology, manufacturing and commercialization enables him to provide a broad industry perspective that is highly valued among engineering students and his research peers.

Learning while doing

Originally from Wisconsin, Herman was the first person in his family to earn a college degree. He reached that milestone in 1985 when he received a B.S. in chemistry from the University of Wisconsin–Parkside. But he didn't stop there; he went on to earn a Ph.D. in physical chemistry from the University of Hawaii at Manoa in 1992.

As a Ph.D. student, Herman joined an experimental research group under Charles S. Fadley, an early pioneer in X-ray photoelectron spectroscopy. Herman's research focused on chemical processes related to the initial stages of thin film growth. "We were always pushing ourselves to better understand the physics and chemistry of interfacial phenomena. As Ph.D. students, we were expected to become leaders in the field," he said about his experience in Fadley's group.

Herman has fulfilled that expectation.

By the time he left Hawaii, Herman had published 20 peer-reviewed papers and given more than a dozen conference presentations around the world. He held two post-doctoral fellowships, first at the Naval Research Laboratory and then at the Environmental Molecular Sciences Laboratory (EMSL) at Pacific Northwest National Laboratory. From 1995 until 2000, he was a senior research scientist at the EMSL, where he was able to pursue his passion for understanding how chemical processes can be used to reduce environmental contamination. He worked toward improving automobile exhaust catalysis, sought ways to produce hydrogen fuels from water, and studied how surface water and groundwater interact with minerals in the environment.

Taking a leadership role

In 2001, Hewlett-Packard sought Herman's expertise to lead a materials team in developing solid oxide fuel cells for portable power in technologies such as cell phones and laptops. Although the company eventually discontinued the project, Herman remained to lead another technical team in researching transparent transistors and printed electronics. In that capacity, he began developing strong partnerships with several scientists at Oregon State and served on the CBEE advisory board for many years.

By the time he left HP, Herman had secured more than 20 patents related to oxide semiconductors and transparent electronics. He and his research partners were awarded the foundational patent for indium gallium zinc oxide (IGZO), which is used to manufacture displays for the iPad. HP licensed the IGZO patent and other patents secured by Herman and his colleagues to several companies for manufacturing displays.

Herman transitioned to Sharp Laboratories of America in 2007 so he could continue working on emerging technologies for displays and other flexible electronic applications and have a direct commercialization path through Sharp Corporation. He served as a senior scientist in the Materials and Device Applications Laboratory, working closely with the company's research groups in Japan and developing a new process for manufacturing IGZO-based devices. "IGZO has better performance than the materials they previously used, and there's the potential for making devices with this material that are much more environmentally friendly than the standard approach," he said. In 2010, Herman earned Sharp Laboratories of America's Invention of the Year award for his amorphous oxide semiconductor (e.g., IGZO) process and device.

To date, Herman has published more than 80 peer-reviewed scientific publications and holds 60 patents. He is associate director of the Oregon Process Innovation Center for Sustainable Solar Cell Manufacturing.

Passing along the wisdom

During the eight years he spent at HP and Sharp Laboratories of America, Herman worked closely with faculty, graduate students and interns from Oregon State, and those relationships piqued his interest in academia. "I found that I really enjoyed interacting with the students, providing mentorship and inspiration," he said. "I thought I could add to the educational experience for the students here. It's nice for them to have a broader view of how research is done, and it's nice for me to have the time to probe deeper into the fundamental research."

A traditional curriculum offers textbook solutions to problems that have already been solved. Involving students in research develops critical thinking skills that will allow them to tackle tomorrow's problems. "Having undergraduate and graduate students working in active research groups in the College of Engineering provides educational experiences that will allow these students to be better prepared for the next stage of their careers," said Herman.

Herman also encourages students to learn to effectively run meetings, work well with other research group members, read the available literature before launching into their research, think in advance about opportunities and — most importantly — plan their experimental research process in advance.

"At the university, you don't want to hold students too tightly to a project plan or the timeframe — sometimes a random walk starts in one direction and you can make an unexpected discovery — but doing the work up front provides some structure and keeps you on track," he said. "Making new discoveries and disseminating this knowledge is exciting, but watching the students come up with and apply their new ideas is extremely satisfying." **M!**

Ph.D. candidate Brendan Flynn prepares a nanoparticle precursor.

Jon DeVaan meets with students after delivering the College of Business Dean's Distinguished Lecture in January.

Oregon State experience propels alum through twenty-eight years at Microsoft

By Gregg Kleiner

After Jon DeVaan graduated from Oregon State University in 1985 with dual bachelor's degrees in mathematics and computer science, he went to work for a relatively unknown software company that employed about 600 people in the Seattle area. That company was Microsoft, and it was developing a new spreadsheet product called Excel.

Today, Microsoft has more than 90,000 employees worldwide, Excel is a household name, and DeVaan is 28 years into a luminous career with the company. He led the software teams that developed Microsoft Excel, Office and Windows and is now a corporate vice president.

DeVaan said his time at Oregon State gave him the tools, training and curiosity that have helped him succeed at Microsoft.

"The campus environment at Oregon State really helped me focus on my education and work habits," he said. "In those days, there was a lot going on in the world of computer science — lots of different machine architectures and lots of experimentation with programming languages. But that campus environment helped me focus and really understand the basics about algorithms and data structures and how they got expressed on actual machines."

DeVaan pointed to the quality of professors he had at Oregon State, particularly praising Bella Bose and Bill Bregar, and said the university prepared him well for his career.

"When I started at Microsoft, the ratio of Harvard/Stanford/MIT folks was almost 10-to-1 over other universities, but I never felt at a disadvantage," he said. "In fact, I think I had some significant advantages in terms of what I knew. My mathematics education served me well, and OSU's computer science curriculum was very good and allowed me to do well on the job, but also in the interview process."

He credits his twin degrees with giving him a useful, two-pronged approach to problem-solving: "Where others might struggle to find a solution to a complex problem, with my math background, I was able to say, 'Hey, let's map out the possibilities and evaluate each one.' "

DeVaan is a big believer in taking liberal arts classes in conjunction with science and engineering coursework and, in hindsight, wishes he'd taken more. It was in a ceramics class, he said, that he learned about creativity and paying attention to feelings.

"Through the arts you get to read and see and experience things to understand you're not the only one who might feel a certain way," he said. "And when you get to a point in your career where you're leading people, you need to be able to relate to people, make decisions and communicate with conviction. I find that very hard to do unless you know how you feel about the situation you're in...and the arts can help build that dimension of yourself."

A lot has changed in nearly three decades of growth and change at Microsoft. Some of his original projects involved just four or five people, whereas today the Windows group alone numbers 5,000. Although coordinating large projects and getting so many team members to know "which way the compass points" have been big adaptations, DeVaan said a lot of the day-to-day work is really about the same.

"People come in, write code, test code, and understand the person they're making that code for so they can make good decisions about how it should work and how it fits into the whole," he said.

The term DeVaan uses again and again to describe his time at Microsoft is short and simple: fun.

"It's been a lot of fun to be able to go anywhere in the world and meet people who know my work," he said. "I've heard all kinds of stories about how PCs and Office have liberated people and improved their lives. It is a unique and humbling opportunity to have your work used by over 1.5 billion people." **M!**

At left: James Teeter explains his capstone project to Peter Johnson '55, Engineering Expo grand marshal and a longtime college supporter. Center: A possible future engineer tests the mettle of a student-built robot. At right: More than 2,000 people attended the 2013 Engineering Expo.

Engineering Expo serves diverse purposes

By Marie Oliver

Walking around the Oregon State University Engineering Expo, Max Weider's imagination runs wild. Max, 11, thinks he'd like to become a Lego designer, and maybe design a video game or two.

Jim Weider, Max's father and an Oregon State alum, introduced his son to the expo last year, and Max eagerly anticipated attending again this year. Jim hopes that by exposing Max to the myriad directions engineering could take him, Max might work a little harder to develop his natural abilities in math and science.

Liliana Conrad is also interested in the exciting world of Legos. She came to the expo with Girls on Fire!, a middle-school 4-H group from Bend, Ore., that recently qualified to compete in this year's Intel Oregon FIRST® LEGO® League state robotics championship.

"Some of our group had heard about [the expo] from friends or had done it before," said Liliana, adding that she enjoys math and science and got into the Lego robotics group for that reason.

The group's leader, Molly Slough, said the expo helps keep the group motivated to do well in their studies. "We decided to come here just to inspire them to continue with science and technology," she said.

Build it, and they will come . . .

Although Legos and other types of robotics are some of the more visually appealing and interactive engineering projects on view at the Engineering Expo, attendees find much more. First held in 1999 to showcase one department, the event now completely fills Kelley Engineering Center and spills out onto the surrounding grassy areas and parking lot. Working in teams, students presented more than 150 projects this year, including at least 30 focused on some form of sustainability.

"We started the expo 14 years ago to grow the awareness of OSU engineering and demonstrate the high caliber of our students," said Terri Fiez, head of the School of Electrical Engineering and Computer Science. "After industry representatives saw the projects the first year, they started contributing their time and resources to support the students. Other departments joined in over time, until it became an engineering-wide event with several thousand people attending."

Senior engineering students must complete a capstone project to graduate, and all projects are either based on Oregon State research or sponsored by industry partners that want to commercialize their ideas. "The academic motivation for the capstone projects is to provide the students an opportunity to integrate all of their learning from the previous years into a cohesive project," said Phil Harding, professor and Linus Pauling chair in Chemical, Biological and Environmental Engineering who is also faculty sponsor for several student projects.

Harding points out that the projects mimic what happens in the professional world and thus prepare students to move seamlessly into their careers. "In professional practice, how an idea is communicated is often what differentiates whether something happens or not," he said.

The expo can be more than a little nerve-wracking for the students, because they may not know whether the people they are talking to are there to judge them and their work. Members of the industry advisory board who are charged with that task may or may not be wearing a nametag that identifies them.

Presenters must be prepared to explain their project to young children and also to answer highly technical questions another engineer might ask. "It's a great opportunity for them to communicate their project on a lot of different levels," said Fiez.

Teamwork is a major emphasis of the capstone projects and students' ability to perform well in a group determines their success. "They have to understand what other people are good at, what other people need, how to keep teams together, share credit, share the stage. These projects are a great opportunity to practice those skills, which are highly valued by the real world," said Harding.

. . . from everywhere

People from all over the state attend the expo. Sue Decker, a former public librarian, and her husband drove down from Portland this year because one of her husband's former high school students was presenting a project. She said she was impressed by how articulate the students were in explaining their projects.

"They respond really nicely if you have even the most minor of questions to ask them. From my once-removed point of view, it looks to me like they're being well-trained," said Decker with a little laugh. "This is a golden opportunity for them, not only for them to present their own projects, but to have a chance to look at the other students' projects and maybe compare — not necessarily in terms of content, but in how it's presented and what might have been better for them."

Graduating seniors are not the only people who benefit from participating in the expo. By partnering with the university, industry supporters can gain fresh perspectives on their technologies and their commercial potential. Sponsoring companies and other industry representatives can scout talented and energetic graduates to add to their company's engineering teams.

The expo also benefits underclassmen who might be wondering what to expect in their senior year, said Harding. "I teach a class of juniors, and they've got a term project where they're responsible for coming to the expo, interviewing several teams, and then doing a research project on one of them."

Many K-12 teachers bring their students to the expo on field trips. "It's a chance for them to say, 'See, this is what you can do when you go to college — this is what you can build'," said Harding.

As Max and Liliana discovered, the expo helps children see the diverse occupational paths available to an engineer and some of the exciting ways they can contribute to humanity's progress.

"I really like all of the different projects and demonstrations here. I like how they were creative and how they explained their topics very well," said Liliana, summing up the view expressed by many attendees to the 2013 Engineering Expo. **M!**

"We recruit individuals who are achievers, but more than anything, desire to become elite as a group."

– Scott Rueck, Head Coach

OSU
Oregon State
UNIVERSITY
College of Engineering