

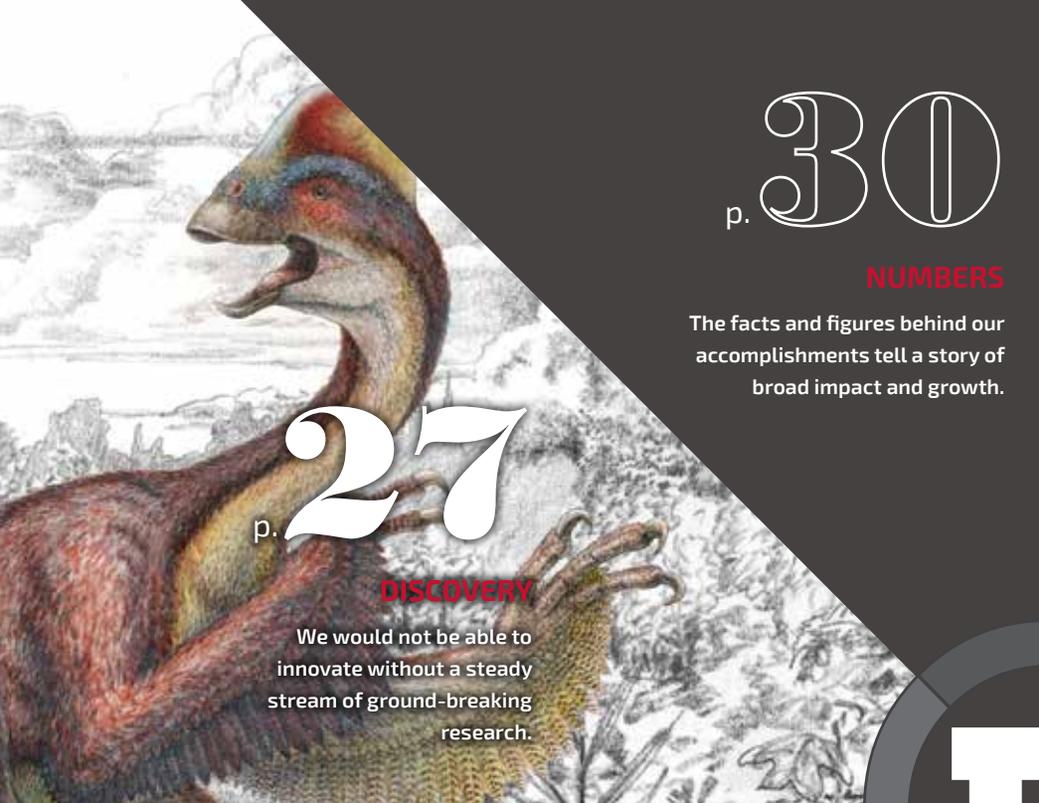
INNOVATE.

THE INNOVATION ECOSYSTEM @ THE UNIVERSITY OF UTAH

INNOVATION



®



p. 27

DISCOVERY

We would not be able to innovate without a steady stream of ground-breaking research.

p. 30

NUMBERS

The facts and figures behind our accomplishments tell a story of broad impact and growth.



p. 05

ECOSYSTEM

Innovation starts with a strong ecosystem that fosters collaboration and new ideas.

p. 08

PEOPLE

The U has a wealth of diverse, innovative and passionate faculty and students that are pushing boundaries in many areas.



p. 23

HISTORY

Our legacy of excellence is as old as the University of Utah. Discover a few highlights.

p. 19

STARTUPS

The U and the state of Utah has a long tradition of forming startup companies around innovative ideas and products.



p. 12

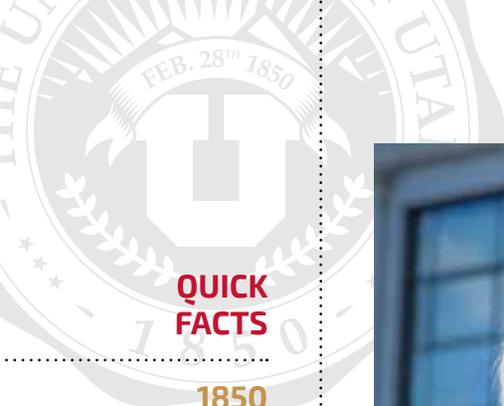
PLACES

Our remarkable facilities and buildings enable us to gather, develop our ideas and teach.

p. 15

PARTNERS

We collaborate across departments, industries and the world to find creative solutions to some of the biggest problems.



QUICK FACTS

1850

Year university founded

32,077

Total students
2013

7,786

Degrees awarded
2012-13

1,554

Total faculty members
2013

\$389M

Research funding
FY 2014

78

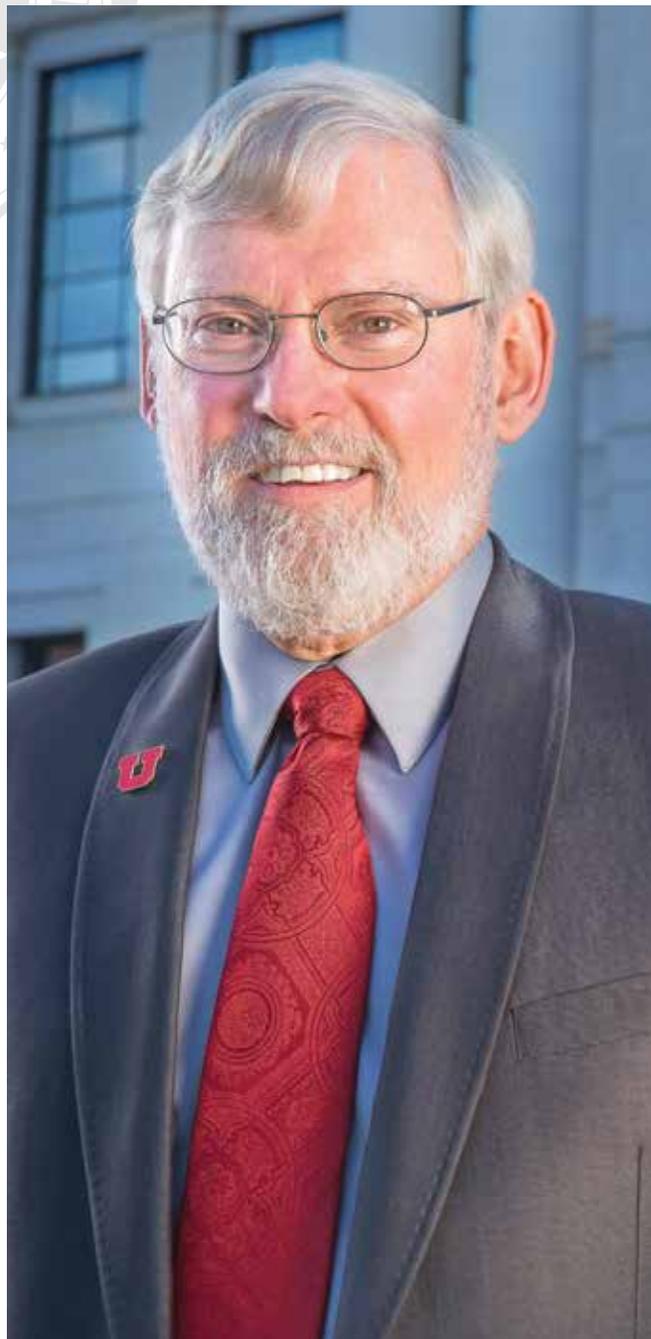
Total U.S. patents
FY 2014

179

Invention disclosures
FY 2014

147

Total faculty inventors
FY 2014



ONLY AT IMAGINE U

Within this report, you will find a celebration of innovation. These remarkable examples of success illustrate the unique spirit of interdisciplinary collaboration and discovery that permeates all areas of study at the University of Utah. The U is a place where professors and researchers are given the freedom to imagine ways to make a lasting impact on humanity and the resources to make those ideas real.

Our students also benefit from this spirit of collaboration and discovery. They are the innovators of the future, and here at this world-class research institution, they work with extraordinary mentors on cutting-edge research projects and exciting commercial ventures. Through these hands-on learning experiences, students develop a passion for knowledge, to ask the complex questions, explore and create something new. This invaluable involvement cultivates the skills necessary for success in the 21st century.

The successful commercialization of university research has strengthened the state's economy and bolstered its reputation as a national leader in business creation, innovation and technology, enabling the U to aid in job creation while providing an excellent education for the future workforce.

I congratulate those who have contributed to the U's culture of innovation in the past year. Your involvement benefits everyone. I invite those who have not yet considered the possibilities to do so. Invent something. Discover something. In short, Imagine. Then do.

— **DAVID PERSHING**, *University of Utah President*

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Coordinating Council

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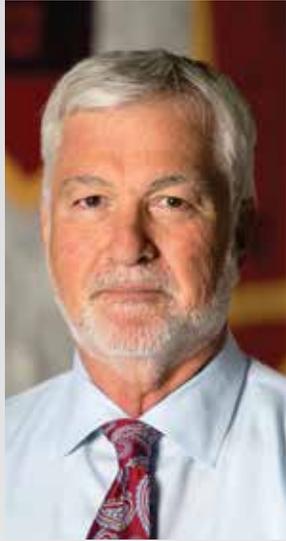
Florian Solzbacher — Professor of Electrical Engineering and Director of Center for Engineering Innovation

ABOUT 'INNOVATE'

"Innovate" is an annual publication dedicated to celebrating the innovation ecosystem at the University of Utah. It is produced with oversight from the Internal Commercialization Coordinating Council. Find an electronic edition and more at www.utah.edu/innovate.

WHY THE UNIVERSITY OF UTAH?

1



“Experienced faculty here encourage and help first-time faculty inventors and the entrepreneurially-inclined faculty support student involvement in innovation. The university’s main focus in technology commercialization is to help faculty and students further their career development.”

— **TOM PARKS**, V.P. for Research

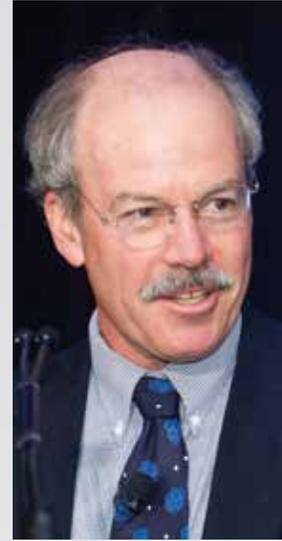
2



“It’s either our culture or there’s something in the water here that you don’t see at other institutions. Our ecology breaks down silos, spawns collaboration and organizes innovation around its most central core for success: great ideas.”

— **VIVIAN LEE**, V.P. for Health Sciences

3



“The U efficiently harnesses the creativity of its faculty and students, it embraces multidisciplinary solutions to problems in key societal needs in energy and health, it captures the passion and drive of students ... and it unites academic and business communities in growing Utah’s economy.”

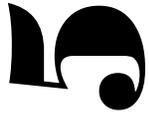
— **GLENN PRESTWICH**,
Director of Entrepreneurial Faculty Scholars

4



“Some of the university’s most creative and inspired innovation is taking place where the arts and design intersect with the other disciplines across campus through research, creation and appreciation of art in its varied forms.”

— **RAYMOND TYMAS-JONES**, Associate V.P. for the Arts and Dean of the College of Fine Arts



“The U provides rich opportunities for students who want to learn how to invent new products and launch businesses. Through interdisciplinary programs like our Lassonde Entrepreneur Institute, we are training the next generation of business leaders.”

— **TAYLOR RANDALL**, *Dean of the David Eccles School of Business*



“Our faculty and students conduct research at the leading edge of technological innovation, and the unique environment at the U supports commercialization of these research breakthroughs.”

— **RICHARD BROWN**, *Dean of the College of Engineering*



“Innovation at the U is about people. It's about visionary researchers and creative, engaged students all working together to make the world safer and healthier for all of us. It's a great place to be.”

— **CYNTHIA FURSE**, *Associate V.P. for Research and Professor of Electrical Engineering*



“Utah actually makes things happen. Utah is not arrogant and hierarchical. There are a lot of people that put the cause before their own interests, and rules and regulations are not set in stone.”

— **FLORIAN SOLZBACHER**, *Director of Center for Engineering Innovation*



“The University of Utah was not satisfied in being a leader in genetic research. The university gave birth to [companies including Myriad Genetics and the ARUP]. ... From Fentanyl lollipops to treatment of hypoparathyroidism, the University of Utah has valued and celebrated this tradition of innovation.”

— **DEAN LI**, *Associate V.P. for Research, Health Sciences*



ECCO SYS TEM

About the Innovation Ecosystem

The innovation ecosystem at the University of Utah is much like a mountain range. Numerous innovation centers, institutes and functions form individual mountain peaks, but they overlap through many collaborations to form a mountain range similar to the Wasatch Mountains next to Salt Lake City.

The core innovation functions that lead the U's innovation ecosystem come together through the Internal Commercialization Coordinating Council (IC3). The council serves as a forum for collaboration.

ECOSYSTEM PARTNERS

TECHNOLOGY & VENTURE COMMERCIALIZATION

Technology and Venture Commercialization (formerly the Technology Commercialization Office) manages the U's intellectual property and works with new and established companies to develop technologies.

tvc.utah.edu

LASSONDE ENTREPRENEUR INSTITUTE

The Lassonde Entrepreneur Institute is home base for student entrepreneur programs at the U. Programs include student business plan competitions, innovation courses, internships and commercialization opportunities.

lassonde.utah.edu

ENTREPRENEURIAL FACULTY SCHOLARS

The Entrepreneurial Faculty Scholars program brings together innovative faculty at the U who share the common dedication to motivating and enriching the translational experience for faculty and student entrepreneurs.

efs.utah.edu

CENTER FOR MEDICAL INNOVATION

Medical doctors and students interested in innovation have a one-stop-shop for resources at the Center for Medical Innovation. It serves as an information and gathering hub for faculty, students and industry in the health sciences.

healthsciences.utah.edu/center-for-medical-innovation

CENTER FOR ENGINEERING INNOVATION

The College of Engineering, with the Utah Nanofabrication Laboratory, established the Center for Engineering Innovation. It bridges the gap between basic science and engineering innovation and commercial product development.

cei.utah.edu

CORPORATE CONCIERGE

The new Corporate Concierge Program at the University of Utah is working to help community partners leverage the entire set of capabilities at the U. The program helps coordinate everything from scholarships and internships to sponsored research and entrepreneurship.

greg.jones@hsc.utah.edu

V.P. FOR RESEARCH

The Vice President for Research office at the U oversees many aspects of research and related activities across campus, including commercialization, compliance and education. The office also manages many related institutes, centers and initiatives.

research.utah.edu





PEOPLE

MARTINEZ IMPROVING COMMUNITIES THROUGH ART

A professor of drawing and painting, V. Kim Martinez is an accomplished artist, professor, mentor and art advocate, and a recipient of the U's 2014 Distinguished Innovation and Impact Award. She has taught painting and drawing at the U since 2001. She holds a bachelor of fine

Watch video
profile at
bit.ly/1tb1ZPb

arts from the U and a master of fine arts from the School of the Art Institute of Chicago. Her work has appeared across the world in exhibits and books. She has lectured broadly and received many grants and awards.

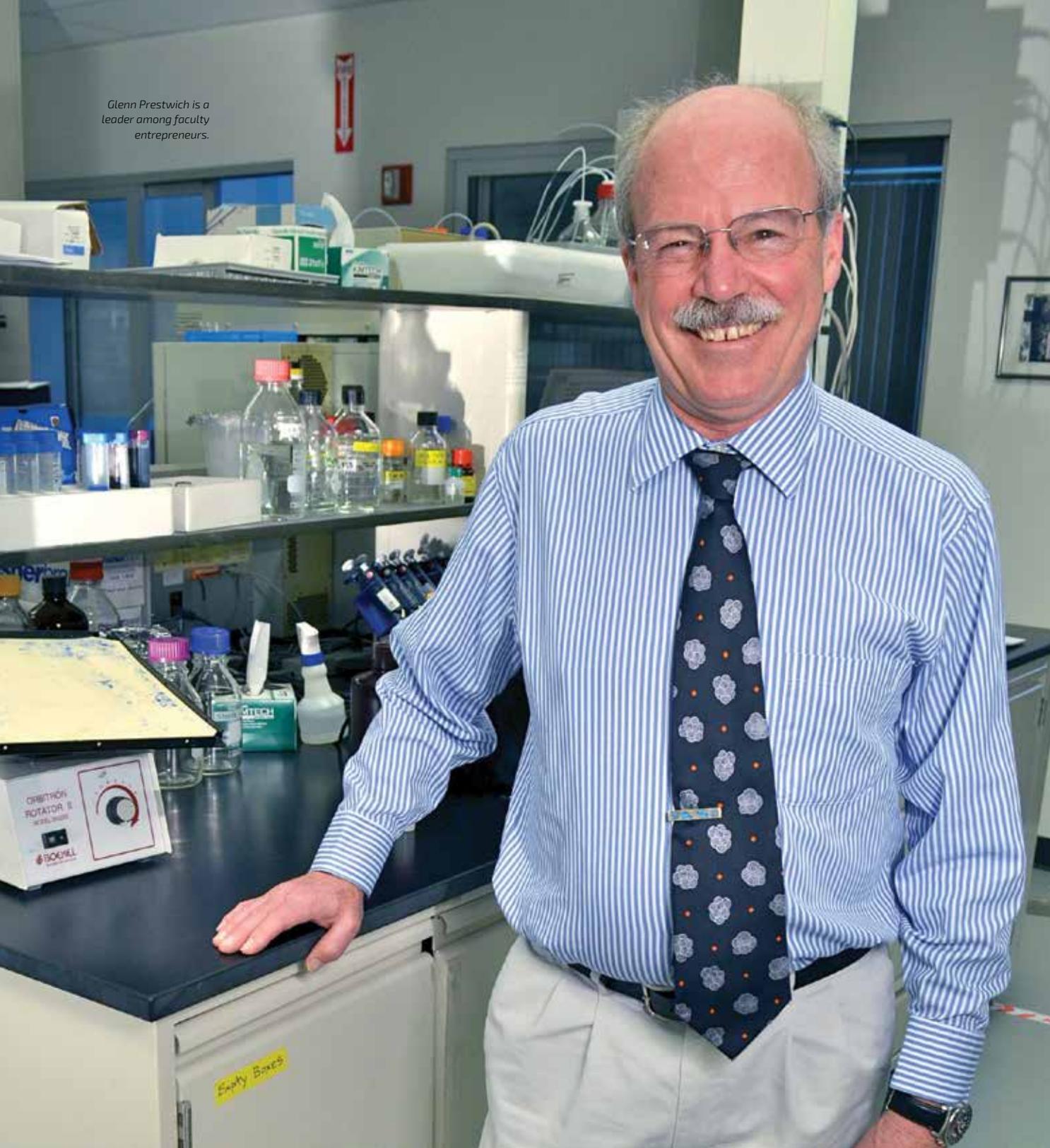
Among her many accomplishments, Martinez is known for the mural course she started in 2003 at the U. Through the course, she matches students with community groups to discuss, plan and create murals across Salt Lake City. Partner organizations have included Salt Lake County, the City of South Salt Lake, the state of Utah and Primary Children's Medical Center.

"I strive to design and implement curricular goals that launch real-life projects to address unexpected practices and connections that enable cultural and artistic entrepreneurship, in an effort to expand innovative, visual dialogue between the university and Salt Lake community," Martinez says.

V. Kim Martinez
recruits students
to help paint
community murals.



Glenn Prestwich is a leader among faculty entrepreneurs.



INVENTOR, CHEMIST AND SERIAL ENTREPRENEUR

A presidential professor of medicinal chemistry, Glenn Prestwich is an inventor, chemist, serial entrepreneur, the founder of the U's Entrepreneurial Faculty Scholars program and a recipient of the U's 2014 Distinguished Innovation and Impact Award. He has taught at the U since 1996 and holds a bachelor's degree from the California Institute of Technology and a doctorate in organic chemistry from Stanford. His many academic accomplishments include authoring 574 peer-reviewed publications, four books and 59 chapters.

Watch video profile at bit.ly/1tb1ZPb

Beyond research, Prestwich is a well-known faculty entrepreneur who has 65 patents or patent applications in areas including pest control, mercury sensing, drug discovery, regenerative medicine and anti-inflammatory therapies. He co-founded eight companies, and three are actively selling products — Echelon Biosciences for drug discovery, Glycosan/BioTime for clinical biomaterials for cell therapy and Sentrx Animal Care for veterinary wound care.

"We are not focused primarily on the money of commercialization; we are interested in commercialization in order to have an impact," Prestwich says. "Nothing gets to the research lab or to a company or to a patient unless it's commercialized."



Chemistry and materials science professor Shelly Minter is developing sugar-fueled batteries that burn carbs.

MINTEER TURNING SWEETS INTO BATTERY POWER

When we think sugar, we think ice cream sundaes and sugar-buzzed kids. But when Shelley Minter, professor of chemistry and materials science at the U, thinks sugar, she thinks battery power. For the last decade, Minter has worked on sugar-fueled

batteries — batteries that burn carbs like our bodies. And although she founded Akermin more than a decade ago, she's not all that into business development and marketing. "I really enjoy the innovation side of being an entrepreneur," she explains, "not the day-

to-day business operation or the marketing aspects." Which is good, because alongside teaching, making sugar-fueled batteries more efficient and innovating photosynthesis-like batteries, she doesn't have much time for board meetings.



Dolly Holt is a recent Ph.D. graduate in bioengineering, an inventor and an entrepreneur.

BALLPOINT PENS AND HEALTH CARE

When Dolly Holt, a recent Ph.D. graduate in bioengineering, learned of a problem surgeons encountered with tendon suture tearing, she found a potential solution in something quite simple — a ballpoint pen. She removed the spring from the pen to test her theory that a coil could tighten when pulled and be used to surround and support damaged ligaments.

Holt's biodegradable device offers a safe alternative to suturing ligament and tendon tears, and her fully functional prototype is being tested in preparation for licensing opportunities. "I'm an inventor now learning how to become entrepreneur," she says. Holt plans to create more medical technologies in hopes of improving lives.



U professor David Strayer with the driving simulator he uses in some of his research.

WHY WE SHOULD JUST TAKE THE BUS

We all think we can sneak a text behind the wheel, but we're not as smooth as we think. And David Strayer, University of Utah psychology professor, has the stats to prove it. "We always think distraction is a problem for the other guy," he explains, "but a recent study estimated inattention was a factor in 78 percent of all crashes and near crashes." So it's not just the other guy. Which might be why Strayer prefers rafting and scuba diving when he's not teaching about perception and addressing the U.S. Senate.



PIAAC CES

LASSONDE STUDIOS: THE PLACE FOR STUDENTS TO 'LIVE, CREATE, LAUNCH'

The Lassonde Entrepreneur Institute and the David Eccles School of Business announced plans in April 2014 for an incredible new building for student entrepreneurs.

The \$45 million building, called the Lassonde Studios, will house about 400 unique student residences and a 20,000-square-foot "garage" where any student on campus can build a

More at
lassonde.utah.edu/studios

prototype, attend an event or launch a company. It will be the place where students "Live. Create. Launch." The building is made possible by a new \$12 million donation from Pierre Lassonde. Similar to apprentice studios common during the Renaissance, U students will learn and practice skills for the 21st Century in these entrepreneurial studios.

Groundbreaking is planned for fall 2014, and student inventors and entrepreneurs will begin creating in the studios in fall 2016.

The Lassonde Studios building will be 148,000 square feet in total. It will sit near the heart of campus and the David Eccles School of Business. The exterior design of the building is inspired by the slopes and angles of the canyons along the Wasatch Front. The Lassonde Studios will enable students from all disciplines on campus to collaborate while pursuing their applied learning of the entrepreneurial arts.



The \$45 million Lassonde Studios will support interdisciplinary students in their applied learning of the entrepreneurial arts.



The Nanofab at the U is a multimillion dollar facility for building a wide variety of devices.

NANOFAB COMPLETE

If you thought nanotechnology was science fiction, then you might find the U's

Nanofab a little hard to believe.

A \$15 million nanofabrication

facility, it can make everything from a movement sensor for your phone to a device that connects your brain with an artificial arm. It contains complex microscopes and manufacturing tools for

engineers and scientists to make very tiny structures; some of which are 100 times smaller than a strand of hair.

The Nanofab is a first for Utah. Other local schools have smaller versions, but the U's Nanofab will soon rival facilities across the globe.

"Over \$100 million of research being performed at the University of Utah is linked to this facility," says director Bruce Gale.

The Nanofab will be

fully functional in spring 2015, but the it has already fostered impressive projects — like a device to check glucose levels without drawing blood and a tool to check blood for diseases without visiting a doctor.

Go take a look if you don't believe it. The lab fills an entire wing of the James L. Sorenson Molecular Biotechnology Building and has windows for observation.



Managers of "the Synapse" from left: John Langell, Jean Shipman, Megan McIntyre and Tallie Casucci.

SYNAPSE CONNECTS

The Spencer S. Eccles Health Sciences Library and the Center for Medical Innovation partnered to create "the Synapse" for the advancement of innovation and discovery. As books and journals are being delivered electronically, the Garden Level of the library now enables collaborations among innovators, librarians, researchers, industry mentors and others. The official opening of this remodeled space

will be fall 2014.

"We have created a one-of-kind innovation center that will be open to faculty, students and the entire community to meet and create devices, apps and all sorts of new inventions," says John Langell, surgeon and the executive director of the Center for Medical Innovation.

The Synapse, when complete, will include meeting and lounging areas, event space,

prototyping tools and medical simulation equipment. The space also offers the expertise of an "innovation librarian" who encourages collisions with information and evidence as well as the support of the Center for Medical Innovation staff.

"We are no longer the curators of static information," says Jean Shipman, the library director. "We are actively engaged in the creation of new knowledge."



PART NERS



The U's Center for Engineering Innovation opens the door to technology commercialization.

CENTER FOR ENGINEERING INNOVATION SERVES COMMUNITY

Researchers at the University of Utah and around the state are on the cutting edge of new technologies, but there can be a huge gap between ideas and real products and services. For the last year, the U's new Center for Engineering Innovation has helped bridge this gap by providing information and technical help to accelerate the commercialization process.

"What we want to accomplish is to make the University of Utah a leader at translational development and close the gap between invention and commercial applications," says Florian Solzbacher, director of the center and a professor of electrical engineering.

More at
cei.utah.edu

The center is embedded within the U's College of Engineering and its many labs and experts. Faculty, students, companies and other universities can use the center for everything from prototyping and product development to computer-chip design and grant writing. The center is also helping increase attention to these topics by hosting COMS, an the international commercialization conference, in fall 2014.

"These activities would not be possible without the support of our university partners," Solzbacher says.

Q&A

Greg Jones, Director of New Corporate Concierge Program, Talks about Future of Partnerships with the U

Greg Jones is the director of the U's new Corporate Concierge Program, which will help coordinate and promote partnerships between the university and companies. The U has many partnerships involving everything from internships to corporate sponsored research. Jones is also the associate director at the U's Scientific Computing and Imaging (SCI) Institute. He has years of experience working in government, universities and private industry.

Q: What is the mission of the Corporate Concierge Program?

The Concierge Program will help the University of Utah's corporate partners leverage the university's entire set of capabilities. From student scholarship and internship programs to engaging with student entrepreneurs or gaining access to some of the top researchers in the world to help companies create the next game-changing innovation, the U offers a variety of ways to help companies grow and succeed.

Q: How did the office get started?

We are really just forming the idea of the "corporate concierge" at the university. Senior administrators at the U wanted to find a way to increase the ease and efficiency of creating effective university cor-

porate relationships. One company might have three different relationships on campus with different departments, and some companies might want to get something specific from the university.

Sometimes licensing or contractual issues come up and companies have no idea who to talk to. We want to coordinate these partnerships and connect companies with the right resources.

Q: Why are corporate partnerships important for the U?

The University of Utah is an economic development engine. We want to keep the state innovating at a very high level. We want to keep our students educated right at the cutting edge with the companies so when they graduate they are ready to innovate with the companies and ready to work with the companies. We want to stay closely aligned with our community.

Q: What do you hope the office can accomplish?

The office is part outreach and

part coordination in three main areas. We are looking at workforce development — how do we make sure companies know what graduates are available? That's what the University of Utah provides

the state — a highly educated, highly effective workforce of young people with degrees. ... Second, universities are innovation hubs. We innovate, and we are looking at how to innovate with our

state's ecosystem and with companies nationally and internationally. ... The third area is how do we take existing relationships and how do we make them even better for the companies?

Q: How does this office compare to what the U has already been doing?

The U has a large number of partnerships, and the majority of those partnerships are very effective and won't change. The Concierge Program will attempt to steer companies to existing resources. It will also work to improve those

relationships where it makes sense. We want to explore deeper relationships with our corporate partners.

Q: What are your greatest hopes for the office?

We want to help make sure every student has a chance at an internship, which will help to achieve a high placement rate for graduates. We are also seeking to create a continuous stream of innovations to companies in our state and the U.S. We want every faculty member, if they want, to have the opportunity to get corporate sponsored research as part of their research portfolio. We also want to see the next generation of research centers, collaborating with industry, in Utah.

Q: Why is the U a unique place for innovation?

We have a world-class university in a relatively small state where everyone knows everyone. ... Every CEO in the state and every faculty member at a world-class university are two phone calls away.



Greg Jones

“The Concierge Program will help the University of Utah's corporate partners leverage the university's entire set of capabilities.”

“We want to explore deeper relationships with our corporate partners.”

TVC ENGINE

Commercialization Office Engages Faculty and Community through "Engine" Process

Technology and Venture Commercialization (TVC) at the U is dedicated to commercializing new technologies and inventions from discoveries made and developed at the U. It accomplishes this by applying a stage-gated, milestone-driven process called "The Commercialization Engine," a value-

adding process through which all university inventions pass after disclosure to TVC. Its goal is to take early-stage technologies, and through a process of derisking, transform them into life-changing and productive applications. This is accomplished by thoroughly understanding inventions,

finding their value, determining their market fit, acting on feedback from potential customers, protecting IP, creating a strong business model, identifying milestones and executing an acceleration plan.

Navillum at the Forefront of TVC's Startup Transformation

Navillum was at a crossroads. Formed in early 2012 as a quantum dots manufacturing company, the U startup had been the recipient of multiple awards and grants, winner of numerous national business contests, and beneficiary of generous press coverage. Despite these accomplishments, however, Navillum had a problem: it had no customers or sales.

As part of its efforts to help companies in this situation, TVC launched the Accelerator in 2014. It is a 12-week program that is part of the Commercialization Engine process. The Accelerator is designed to advance 6-10 U startups from an early-stage to having a scalable and repeatable business model. It creates value by connecting companies to experienced mentors, product development professionals and the necessary equipment and resources for testing and refining assumptions.

"The Accelerator is basically a method that allows us to put more focus on the most promising U technologies," says Taylor Bench, director of economic development at TVC. "The time, energy and resources we invest in the technologies in the Accelerator greatly increase their valuation."

Bryan Ritchie, executive director of TVC, explains: "Starting companies at TVC is no longer sufficient. Even though we have done well and are a leading commercialization office, only 0.7 percent of our technologies have generated more than a million dollars in revenue for the university, and only 3 percent have generated any revenue at all. If we can double these percentages, meaning that if instead of failing 97 percent of

the time we fail 94 percent, we will dramatically improve our industry-leading performance."

Navillum had a choice when it learned it had been chosen to participate in the TVC Accelerator: "We could either continue spending the next two years pursuing grants to perfect

our core technology, or we could begin commercializing the product," says David Robinson, Navillum's CEO. "Ultimately, we decided that it was time for us to go to market. We needed to find a commercial partner and develop a new commercial plan. After discussing the Accelerator's process with TVC, we knew it was going to be the process that would allow us to accomplish our goals."

"We realized," adds Matt

Gardner, a business development manager at TVC, "that Navillum's situation pre-Accelerator was somewhat indicative of where a number of U technologies were: doing well but not at their highest potential."

When Navillum entered the Accelerator, TVC assembled a team of students, an accomplished mentor, Navillum employees and TVC analysts to move the company forward. Each week the team met and determined the next most critical step it needed to take for that week. It then acted on that step by communicating and talking to experts, companies in the market and potential customers.

"Through the amazing and diligent work of the students on our team, we were able to have critical conversations with some extremely big players, including one of the largest companies in the world," Robinson says. "The feedback we received from these calls

caused us to completely change our business model, refocus our technology, obtain customers and move into more immediate and promising markets."

As a direct result of the Accelerator, Navillum has gained its first six customers, \$1.5 million in committed investment funding, critical business partnerships, a new commercialization plan and a Phase II SBIR grant from the National Science Foundation for \$750,000.

"Because of the Accelerator, we are now making money, staffing up and delivering samples to customers in expectation of scaling our business," Robinson says.

"The Accelerator," Ritchie says, "will allow us to repeatedly apply proven methods and processes to U technologies and startups that will bring better results for the university and startups like Navillum."



Navillum produces quantum dots.

More at www.tvc.utah.edu



ST ART UPS

CERAMATEC GROWN UP

*One of U's Oldest Startup
Companies Solving Energy
Problems and More Since the 70's*

Back in the 70's when cell phones were bigger than bricks, U Materials Science and Engineering professors Ronald Gordon and Abraham Sosin took the energy world by storm. With funding from the National Science Foundation, they worked with Ford and a team of researchers at the U to improve the sodium-sulfur battery. Their team made it viable for commercialization. And in 1976 they founded Ceramatec, a company that solved energy issues by creating advanced batteries, oxygen separation systems, and other ceramic and electronic innovations. The company got its start in the U's Research Park, and by 1989 it had over 150 employees and was attracting international attention.

"Ceramatec was created primarily through federal and industrial research contracts," says Anil Virkar, a Materials Science and Engineering professor who worked with the team at the time, "and it has remained stable as a research and development company for 40 years, proving that you can sustain a company and provide jobs through federally funded research."

The company has switched hands a few times — the Norwegian company Elkem acquired it in the 80's and CoorsTek in 2008 — but Ceramatec's philosophy and infrastructure has remained pretty stable. Except that now it solves environmental challenges as well as energy-related ones. And now it's in the major leagues. Ceramatec competes for grants against companies like General Electric and United Technologies.

In the last 12 years, Ceramatec has formed 10 different offshoot



*An employee works at
the Ceramatec facility in
Salt Lake City.*

companies. Today Aplion is working with Intermountain Healthcare to create a wound-healing device, while in year 2000 SofCo, a joint venture between Ceramtec and McDermott, was purchased by McDermott. But sometimes the technology Ceramtec creates is best suited for licensing or developing further with strategic partners. "This was the very basic premise under which Ceramtec was founded in 1976," Virkar says. "Some of Ceramtec biggest projects today, like SofCo's fuel cells, are technologies that were developed during Ron Gordon's leadership."

The most recognizable of Ceramtec's inventions is probably a tiny micropump. Now they license it to power devices for toilet sanitization, fragrance delivery and wound healing applications. But you probably know from airport bathrooms. The micropump is what's inside the little white box dispensing fragrance.

Since it works with energy and conservation, some of Ceramtec's innovations have deep implications. Alberta, Canada, has oil mixed with sand, so they use hydrogen generated from methane to upgrade it. This method of generating hydrogen is expensive and leads to higher greenhouse gas emissions. Ceramtec created a way to upgrade the oil using sodium instead, making it less expensive and more environmentally friendly.



Ceramtec was founded in the 70's by two U professors of material science.

Of course, every entrepreneur dreams of a legacy like Ceramtec's. But according to vice president Anthony Nickens, the most important element is pretty simple. "People," he explains, "it's the people that bring the technology to life. Without that, you've got a lot of intellectual property, but it's just sitting on the shelf. Like a warship without sailors."

Ceramtec may have grown up and acquired new owners, but that doesn't mean it's lost its roots. It recently updated the original sodium-sulfur battery developed at the U, making it more safe and economical. And they collaborate with the U on several projects.

Meanwhile, the sodium-sulfur battery they improved back in the day has taken on a life of its own.

In Japan, NGK makes sodium-sulfur batteries the size of large buildings.

The core of Ceramtec isn't much altered from how Ron Gordon ran it in 1989. And it now has dozens of awards and successes to boast about, as well as 10 spinoff companies. Not bad for a team of U researchers.

“It has remained stable as a research and development company for 40 years, proving that you can sustain a company and provide jobs through federally funded research.”

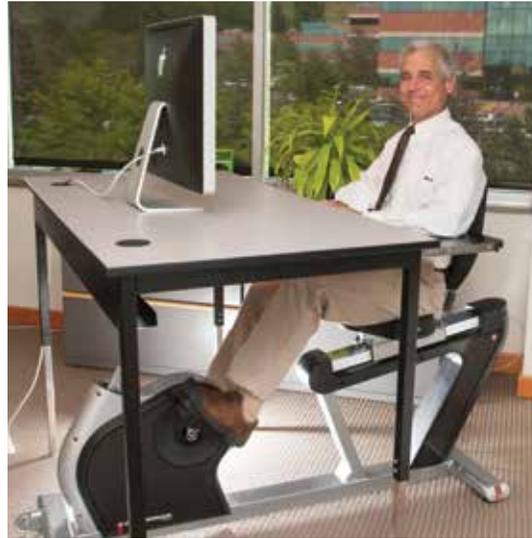


U professors Scott Wright and Cheryl Wright are helping students on the autism spectrum develop technical skills.

NEUROVERSITY TAKES ON AUTISM

U startup NeuroVersity is helping students on the autism spectrum tap into the natural aptitude many have for detailed projects and visual-spatial reasoning by teaching them how to use 3-D modeling software. Through this training, they start developing valuable professional skills that are increasingly in demand. Autism is considered the fastest growing developmental disability, so matching these students with training and employment opportunities is increasingly urgent.

"Our company helps transition-aged students with autism turn their strengths into highly sought-after abilities and technical skills," says Scott Wright, a professor of nursing, who co-founded NeuroVersity with Cheryl Wright, a professor of family and consumer studies.

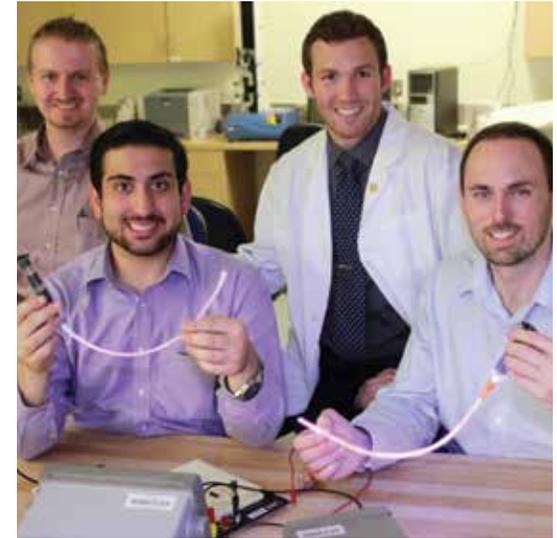


Jim Martin, an associate professor of exercise and sport science, launched a startup to see his exercise-desk invention.

ACTIVEDESK IMPROVING HEALTH

Shortly after returning from a conference in 2011, Jim Martin, an associate professor of exercise and sport science, was stirring over discussions about sedentary workplace environments. He had learned that prolonged sitting is an independent risk factor for cardiovascular and metabolic disorders, even for those who engage in regular exercise. In search of a solution to this problem, Martin built an integrated exercise bike and computer workstation; Active Desk was born.

Initially, Martin created Active Desk because he wanted one for himself, but he soon realized the potential this technology could have on desk-bound office workers' health. With an advanced prototype and a pilot study at the U, things are moving forward for Active Desk. "I want to offer a healthier option for people who are stuck at their desk all day," says Martin, and he is doing just that.



Veritas Medical team clockwise from top left: Nate Rhodes, Martin de la Presa, James Allen and Ahrash Poursaid. Not pictured: Mitch Barneck.

VERITAS REINVENTS CATHETER

A team of bioengineering and medical students are hoping to reduce the number of catheter infections through their startup company Veritas Medical, which is developing a catheter that emits bacteria-killing light.

The team has already received substantial funding and plans to use the proceeds to begin medical trials. Among other competitions, they won first place and \$75,000 at the International Business Model Competition hosted by Brigham Young University. The competition drew more than 2,500 teams from 200 schools representing 20 countries from around the world.

"This competition was a huge validation for what we have created," says Nate Rhodes, a team member who received a master's in bioengineering from the U in spring 2014.



HIST ORY

WHERE RESEARCH GOES TO PLAY

U's Research Park Celebrates Success as 50th Anniversary Approaches

The U's Research Park is easy to overlook. Located south of campus, where most faculty and students don't walk, it features wide boulevards, meandering roads and lots of green space. But since the Utah State Legislature established the

More at vp.admin.utah.edu/research

park in 1969, it has become an increasingly vital part of campus and a major source of economic development.

When the U first received the 325 acres, the property was mostly rolling foothills with more deer than people. Today, the park is home to more than 53 companies and 47

buildings. More than 10,500 people work there, and the park generated \$4.8 million in land lease income in fiscal year 2014. "If managed well and if located close to a research center, research parks are an engine for economic development," says Jonathon Bates, park director.

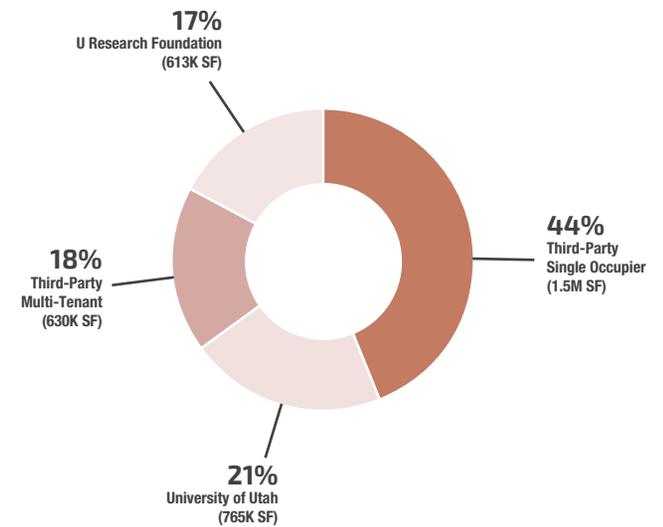
The U's Research Park has several benefits over similar developments. It's located next to the scenic Wasatch Mountains, which helps attract companies and employees. The park is also a huge beneficiary of the U's long tradition of technology commercialization,

particularly in health sciences and biotechnology. Some of the biggest companies created from research at the U are located in Research Park.

As the park approaches its 50th anniversary, it is nearly built out with only two lots remaining. But administrators are taking a fresh look to make it even more walkable, friendly and, possibly, dense. "We want to make the park even more connected to main campus and are envisioning how we can make the next 50 years even better," Bates says.

“If managed well and if located close to a research center, research parks are an engine for economic development.”

SQUARE FOOTAGE BY OWNERSHIP



The U's Research Park has 3.6 million square feet of building space. The largest category of tenant is third-party single occupiers. SOURCE: Real Estate Administration.

TENANTS OVER TIME

Fiscal Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Value				8,064	8,171	9,131	9,566	9,801	10,533	10,580
Revenue	7,273	7,199	7,161							

\$350M

Value of buildings in Research Park FY 2014

\$13M

Revenue to U Research Foundation FY 2014

6 LEADING COMPANIES IN RESEARCH PARK

Companies and institutions in the U's Research Park range from financial services to the new dental school now under construction. What they all have in common are core research missions and often deep ties to the university. Here are some of the standouts.

BLACKROCK MICROSYSTEMS:

A privately held company that provides enabling tools for the neuroscience, neural engineering and neuroprosthetics research and clinical community worldwide.

BIOFIRE DIAGNOSTICS:

A clinical diagnostics company with more than 85 patents related to polymerase chain reaction. It has used its extensive patent portfolio to successfully market nearly 200 products.

MYRIAD GENETICS:

A molecular diagnostic company discovering and commercializing transformative tests to assess a person's risk of developing disease, guide treatment and assess risk of disease progression and recurrence.

ARUP LABORATORIES:

A nonprofit enterprise of the U, a national clinical and anatomic pathology reference laboratory, and a worldwide leader in innovative laboratory research and development.

WASATCH ADVISORS:

The investment manager to Wasatch Funds, an employee-owned firm with 20 mutual fund offerings, as well as separately managed institutional and individual portfolios.

ACTAVIS:

Formerly Watson Pharmaceuticals, a global, integrated specialty pharmaceutical company focused on developing, manufacturing and distributing generic, brand and biosimilar products.

“ With the Bayh-Dole Act, everything changed because now everything that was being funded by the federal government was owned by the university.”

“ This year, this office will have the very best year it has ever had.”

Q&A

Bryan Ritchie, Director of TVC, Explains the Past, Present and Future of the U's Commercialization Efforts

Bryan Ritchie is entering his fourth year as director of the U's Technology and Venture Commercialization office, which works with faculty to develop their technologies and license them to companies. He explains massive changes at the office since the Bayh-Dole Act of 1980, which gave universities ownership of inventions resulting from federal research.

Q: When did the U's technology transfer office start?

The technology commercialization operation at the University of Utah started in 1968, so it's been around for a long time. In the early years, it was really kind of an organization that was here to file patents. ... With the Bayh-Dole Act, everything changed because now everything that was being funded by the federal government was owned by the university, so we got into a situation where the amount of activity in this office, which was called the Technology Transfer Office at the time, was growing pretty rapidly.

Q: The U is known for starting companies. When did that begin?

In 2006, things changed pretty dramatically when Mike Young [former U president] came and set up the Technology Venture Devel-

opment group. ... The real focus centered around startups, and that fit well because there are a lot of people in the community interested in entrepreneurship.

Q: How have you tried to change the department?

When I came three years ago, I saw we had thousands of technologies on the shelves, and we had hundreds of companies that had been started. ... I said, "Let's keep starting companies, but let's now put the processes and systems in place where we can de-risk those technologies and take them to a further value level where people will be interested in investing in them." So we created a system we call "the Engine." The Engine is a stage-gated, milestone-driven process. ... Every good company that does research and development uses this system, but we modified it for our purposes.

Q: How do you measure success?

Only 3 percent of the university's invention disclosures will produce

any revenue at all. ... We don't need to improve these odds much to have a tremendous impact on the bottom line. ... Right now, 97 percent of our stuff fails. If we could get to 94 percent of our stuff failing, we



Bryan Ritchie

would double or triple our revenues, so the bar is pretty low in the sense that we don't have to improve much at all to really get dramatically different outcomes.

Q: Is there anything people would be surprised to hear about?

This year, this office will have the very best year it has ever had. ... We have generated more equity, more royalty income and did more licenses than this office has ever done in its history. So it's working; we're moving this forward.

Q: What is the department's mission?

I'm convinced that commercialization in a university setting has to both provide quality service to the faculty and a financial return to the university. It's not either-or.

Q: What do you think the first people in this office would think of it now?

I don't think someone 30 years ago would even recognize what we are doing. I don't think someone 10 years ago would even recognize what we are doing. And, in fact, many of our contemporaries walk into here and don't recognize what we are doing because it's all encompassing, it's comprehensive, it's forward-thinking, it's merging the roles of the university with the private sector in ways that no one has really done before.

Q: What does the future hold?

The next thing is really about bundling intellectual property. This might become a multiple-university organization. It might become some form of regional multi-institutional, public-private, commercialization effort.

Q: Anything else?

I'm equally excited about the ecosystem at the University of Utah and how there are so many people at the campus thinking about commercialization. ... There is a lot going on, and these things connect in really interesting ways.



DIS COV ERY



This elephant's tusks are believed to be the biggest at Kenya's Samburu National Reserve.

RESEARCHERS BOMB OUT POACHERS

Slaughtering elephants is illegal, but 30,000 are poached yearly for their tusks. And, until now, there was no way to know whether the ivory was obtained recently or before the poaching ban 25 years ago. But U researchers cracked the code. The open-air nuclear tests of the 50's and 60's left residue behind. And that residue can be read like the rings of a tree inside a tusk. Kevin Uno, who researched this for his Ph.D. at the U, says that "with an accurate age of the ivory, we can verify if the trade is legal or not," hopefully crippling the poaching trade.



A bird-like dinosaur nicknamed the "Chicken from Hell" that roamed the Dakotas 66 million years ago.

NEW DINOS ON THE LOOSE

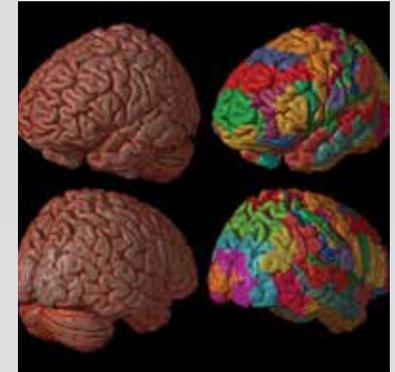
The U has been at the forefront of dinosaur discovery this year — with two new species in Utah alone. The Smithsonian, Carnegie Museum and U unveiled a 10-foot-tall raptor with chicken-shaped head and feathers from North and South Dakota — hence the nickname "Chicken from Hell." And two new dinosaurs were unearthed in Utah's Grand Staircase-Escalante National Monument. The "King of Gore," ancestor to the T. Rex, has a short snout and probably sported expert vision. While *Nasutoceratops titusi* was named for its large nose and horn over each eye. These creatures change our view of ancient Utah.



Face of ant species *Eurhopalothrix semicapillum*, named for the hairy patches on its face.

NEW KILLER ANTS FOUND

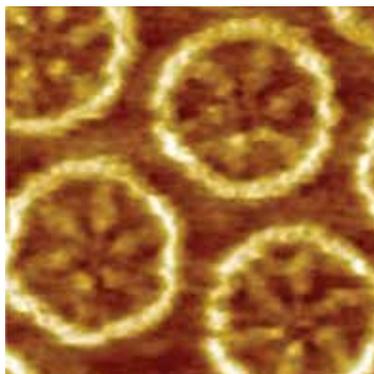
Everyone is afraid of spiders, but no one wants a killer ant on their tail. And U biology professor Jack Longino found 33 new species of them in Central America and the Caribbean. They're basically nightmarish looking, with shield-shaped heads and super-sharp teeth, but this discovery is important for more than its creep factor. "The new species were found mostly in small patches of forest that remain in a largely agricultural landscape," says Longino, "highlighting the importance of forest conservation efforts in Central America." Although it'd be difficult to campaign for the ants preservation after seeing them up close, especially the ones whose jaws open side-to-side.



U researchers find no evidence to support people are left or right-brained.

DEBUNKING LEFT-RIGHT BRAIN MYTH

If you enjoy art galleries, poetry readings and obscure cafés, you probably think you're a "right-brained" thinker. And that those techy, detail-oriented colleagues are "left-brained." But U researchers found that there's really no evidence to support that. "It's absolutely true that some brain functions occur in one or the other side of the brain," says Jeff Anderson, professor of neurobiology at the U. "But people don't tend to have a stronger left- or right-sided brain network." Attention is usually on the right side, and language the left. But personality traits probably have nothing to do with brain hemispheres.



Wagon-wheel molecules that emit light more efficiently than the spaghetti-shaped polymers.

PASTA-SHAPED LIGHT BULBS

LED lights are like lasers, focused in one direction. But U physicists wanted organic LEDs to emit light like other light bulbs, in all directions. And they found their answer in pasta. More specifically, a wagon-wheel pasta shaped molecule that emits light randomly. "This work shows it is possible to scramble the polarization of light from OLEDs and thereby build displays where light doesn't get trapped inside the OLED," says John Lupton, a U physicist. But the technology is still a long way off. So, until then, you can find regular OLEDs in smartphones, extra thin TVs and lightening.



English trumpeter pigeons display some of the color diversity of some 350 breeds of rock pigeons.

PIGEON PIGMENTATION & MELANOMA

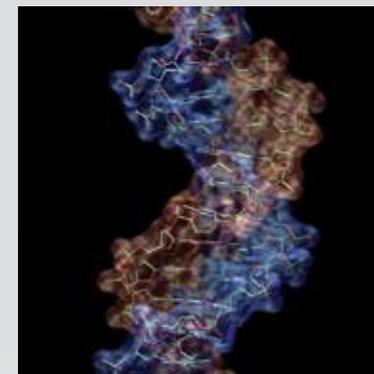
We humans think we're pretty unique. But a recent discovery by U scientists put us in our place. The same genes that cause melanoma and albinism in humans give rock pigeons their variety of feather colors. But this finding is more than just ironic. "[It] provides new insights about how ... the genes work together," says Michael Shapiro, a professor of biology. "Many traits in animals, including susceptibility to diseases such as cancer, are controlled by more than one gene. To understand how these genes work together to produce a trait, we often have to move beyond studies of humans." Which makes their study of pigeon pigmentation pretty important.



Program trains participants to dull pain through positive thoughts.

KILLING PAIN WITH POSITIVE THOUGHTS

Chronic pain can be debilitating, but sustained use of opioids to dull it can lead to addiction and overdose. So U researcher Eric Garland has found a way to dull the pain without addictive risks, all the while rehabilitating addicts. His Mindfulness-Oriented Recovery Enhancement program trains participants to be mindful of habits, reappraise negative events and savor positive ones. "Anything that happens in the brain happens in the body," Garland says, "so by changing brain functioning, you alter the functioning of the body." More than half of his participants saw reduced opioid misuse, and almost a quarter were less impaired due to pain. So something is working.



Researchers invent device to find the cause of disease.

FINDING THE ROOTS OF DISEASE

Scientists at the U and University of Texas have invented a new device to pinpoint the roots of disease. Scientists used to look at one person with a disease to find the genomes causing it. "[But] if you can sequence the whole family it gives a fuller picture of the sequence and variations potentially involved in disease," says Mark Yandell, a U professor of human genetics. And that's what the pVAASST does. It searches the genes in a family with a high occurrence of a particular disease, then pinpoints which identity mutations caused the disease, giving scientists the root.

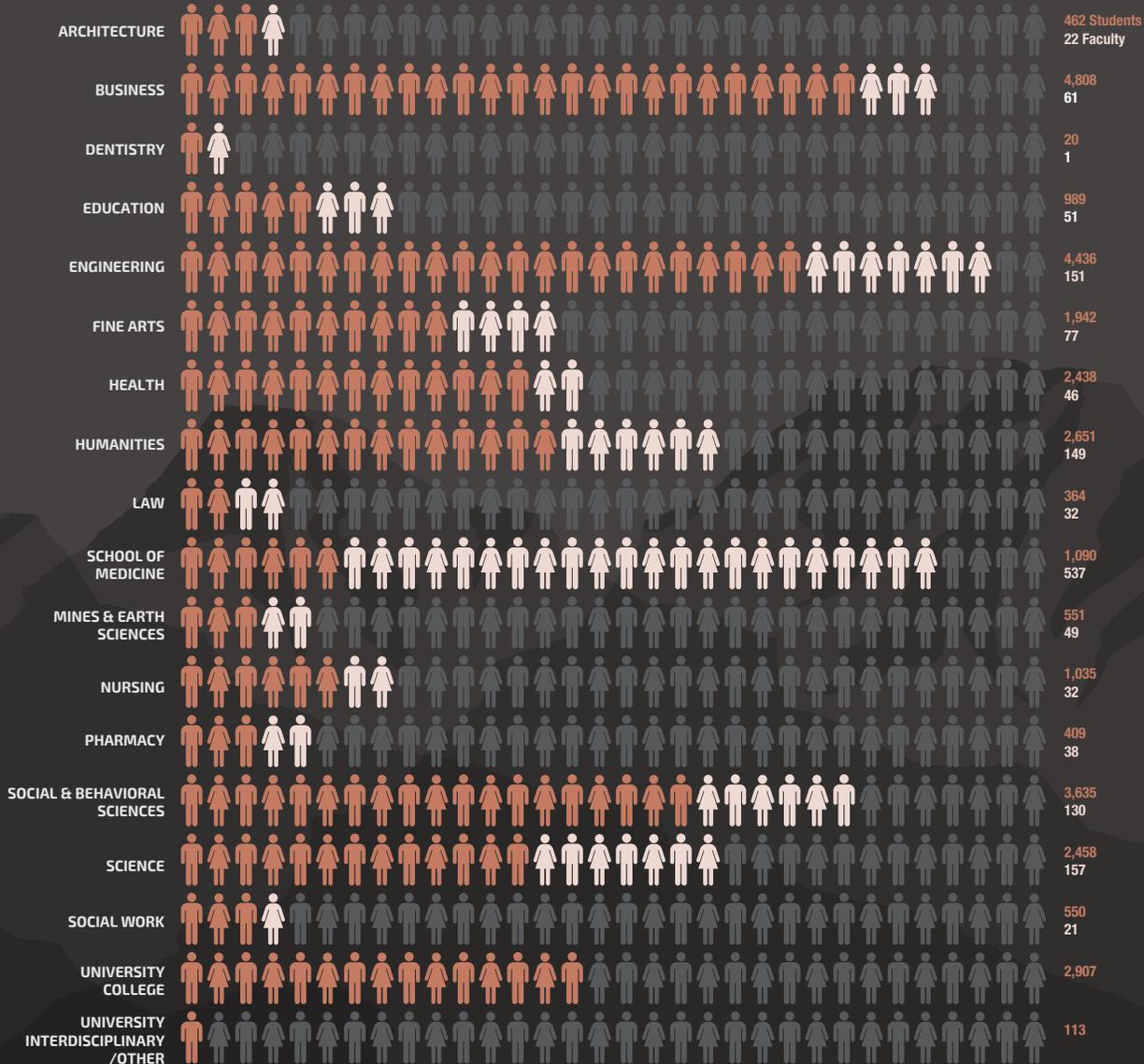


NUMM BEERS

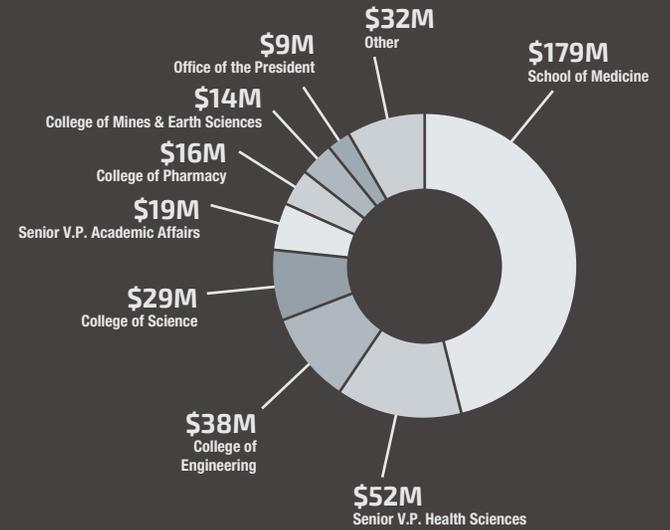
STUDENTS & FACULTY BY COLLEGE

The U had more than 32,000 students and 1,500 faculty members in 2013.
 SOURCE: Office of Budget and Institutional Analysis.

 = 200 students
 = 25 faculty

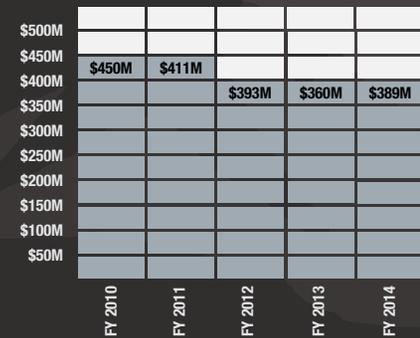


RESEARCH FUNDING BY UNIT



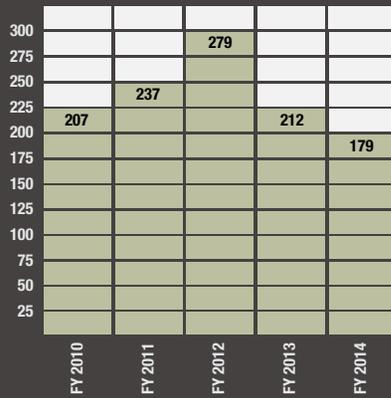
Many colleges and departments at the U receive research awards. Awards in FY 2014 came from federal agencies including the U.S. Department of Health and Human Services, the National Science Foundation and others. SOURCE: Office of Sponsored Projects.

TOTAL RESEARCH FUNDING



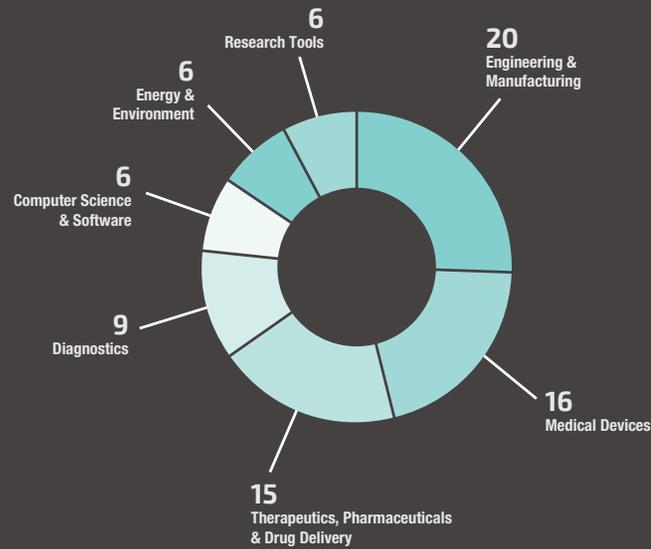
The U is the leading research institution in the state, receiving \$389 million in research awards in FY 2014. SOURCE: Office of Sponsored Projects.

INVENTION DISCLOSURES



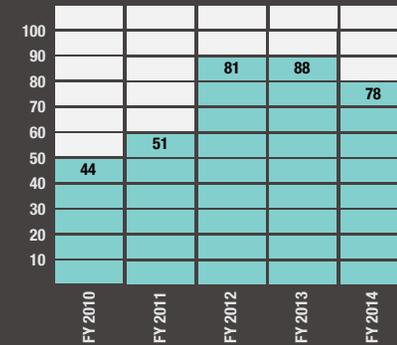
Invention disclosures occur when a faculty member informs Technology and Venture Commercialization of a discovery. **SOURCE:** Technology and Venture Commercialization.

U.S. PATENTS BY TYPE



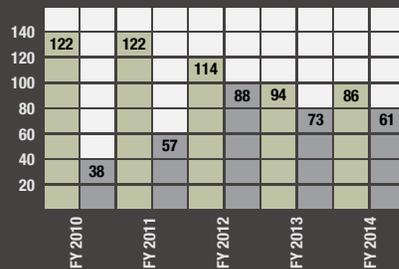
Most of the U.S. patents issued for FY 2014 were for engineering and manufacturing. **SOURCE:** Technology and Venture Commercialization.

U.S. PATENTS



The U has received a steady stream of issued U.S. patents in the last five years. **SOURCE:** Technology and Venture Commercialization.

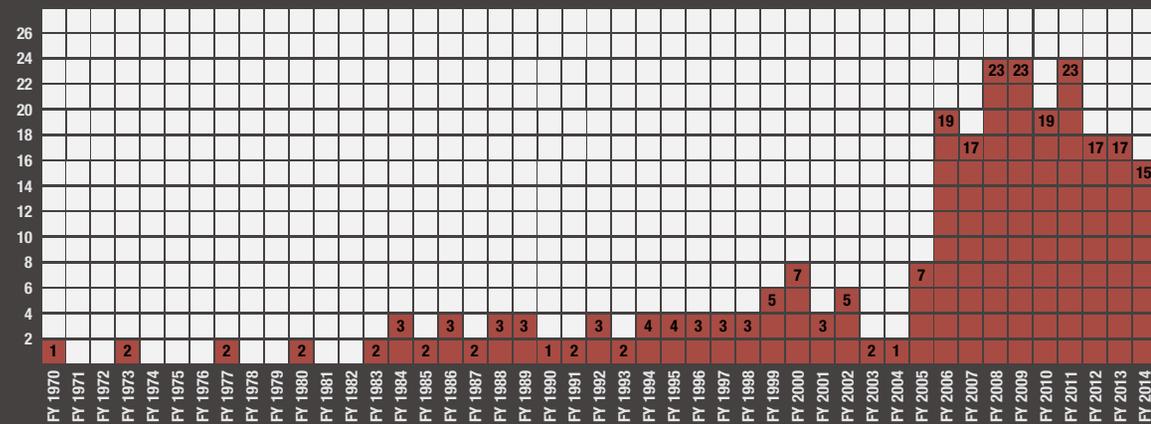
NEW & REPEAT INVENTORS



Repeat inventors
New inventors

Inventors come from all colleges and departments, but most are repeat inventors. **SOURCE:** Technology and Venture Commercialization.

STARTUPS OVER TIME



The U has launched more than 200 startup companies since 1970. The number of startups has steadily risen over time, especially since 2006. The startups are as diverse as the faculty and students that make up the university. **SOURCE:** Technology and Venture Commercialization.



U T A H . E D U / I N N O V A T E
