2015 REPORT

CULTURE OF COLLABORATION AT THE UNIVERSITY OF UTAH

INNOVATE

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VOICES

on interdisciplinary collaboration

DAVID PERSHING
President, University of Utah

"The University of Utah has earned a reputation as a leader in innovation. At the U, we engage our more than 30,000 students in ways that inspire and motivate the exploration of ideas. We encourage research on today's most important topics and have created a cross-disciplinary culture that blends the arts and sciences in exciting ways. In this unique and collaborative environment, students learn, entrepreneurs thrive and scientists flourish. The university is a national leader for patent generation and launching startup companies.

Innovation has no boundaries at the University of Utah. It permeates the campus. There are countless examples of diverse groups, from varied fields, working together to discover new knowledge and pioneer technology that will positively influence lives. We have faculty and students from engineering, arts and medicine developing video games to improve patient health; researchers from humanities, law and the Marriott Library documenting the history of AIDS in Utah; and students from business and bioengineering inventing medical devices and launching companies. Researcher clusters have also formed in areas where interests might be different, but subjects are interconnected.

This type of collaboration maximizes resources and expertise, while generating solutions to some of society's more perplexing challenges. The university's vision is to prepare students with an education that doesn't just teach what to think, but how to think. Together, as a campus community, we create engaged learning experiences that broaden the scope of imagination, creativity and problem solving.

We invite you to read this publication for more examples of the amazing ways we are working together and encourage you to envision ways that you can participate in this success story."

ABOUT REPORT

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

RUTH WATKINS
Senior V.P. Academic Affairs

"If colleges and universities aim to lead the drive to solve the problems the world faces — complex, urgent challenges in areas such as water, climate, behavior and health, and biodiversity — we must create environments that encourage and enable faculty and students to cross disciplinary boundaries and work together in new ways. At the U, we strive to optimize innovative partnerships across department and college boundaries and reduce barriers to creative collaboration, in scholarship and in educational efforts. Examples of our success abound, in path-breaking science resulting from startling combinations of partners and in new cross-departmental educational offerings in a range of areas. The Transformative Excellence Program, a cross-campus faculty hiring initiative targeting areas of national prominence and regional significance, is designed to facilitate targeted recruitment of scholars whose interdisciplinary strength will enhance impact. The U environment prizes inter- and transdisciplinary work as a tool for the acceleration of transformative innovation."

"The University of Utah recognizes our success as well as the future of health care is rooted in our culture of collaboration. Researchers, educators, clinicians and students must all work together to advance patient care and our nation's health system. We support a culture of collaboration on an institutional level with entities like NCI-funded Huntsman Cancer Institute, the Utah Genome Project, the Neurosciences Initiative and the newly created Diabetes and Metabolism Center, which coordinate multidisciplinary efforts across the health sciences around a single cause. Our office and lab spaces are being reimagined and relocated to promote collaborations that can speed discoveries. We're also taking our culture to the next level by embracing the collision theory of collaboration, which holds that deliberately mixing unlikely groups with each other can lead to the best ideas. … The culture of the university is about collaboration and innovation, and everyone is a part of this. … As we build a new health sciences campus with a new Medical Education and Discovery Complex, our task is to create a home to match our innovation capabilities and potential. Collaboration in an age of technology is a moving target, and we are rising to the challenge."

VIVIAN LEE
Senior V.P. Health Sciences

TOM PARKS
V.P. Research

"Since a growing proportion of the most interesting new research findings are made at the intersection of traditional academic fields, interdisciplinary collaborations are attractive to researchers and increasingly favored by funding agencies. Faculty members arriving at the University of Utah often remark on how open and collegial a place it is and the ease of collaborating. With new resources like the Transformative Excellence Program of cluster hiring of new faculty members, the university is providing added incentives for faculty members to consider interdisciplinary collaborations as they plan their research programs."

Innovation Ecosystem

The University of Utah has a rich ecosystem driving innovation in many forms. Faculty, students and community members are encouraged to participate by contacting one of the ecosystem members or taking advantage of one of their programs or services. Get involved at utah.edu/innovate.

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

Technology & Venture Commercialization

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

TVC.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 all in the health sciences.

BIT.LY/UUCMI

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

V.P. 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

Campus & Community

Innovation, commercialization and entrepreneurship requires countless partners across campus and the community. New partners are constantly joining the network.

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

Corporate Conceirge

The Corporate Concierge Program helps 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

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SPECIAL THANKS

Many more people contributed to this publication in the form of nominations, ideas, photos and information. Thanks to everyone who helped.

PARTNERSHIPS

Lisa Cannon-Albright is one of two winners of this year's Distinguished Innovation and Impact Award.

INNOVATION & IMPACT AWARD

recognizing faculty efforts to change the world

Each year, the U presents the Distinguished Innovation and Impact Award to recognize faculty who create products and initiatives with potential to change the world and improve lives. This year's winners are Lisa Cannon-Albright, a professor and division chief of genetic epidemiology in the Department of Internal Medicine, and William Jenson, a professor of educational psychology.

Lisa Cannon-Albright

Cannon-Albright came to the U in 1979. She first pursued a master's degree in biostatistics and then a Ph.D. in genetic epidemiology and biomedical informatics. Since then, she has been one of the leading researchers behind the U's growing reputation for genetic research and personalized medicine. Her work has helped the U discover many genes connected to disease and create the Utah Population Database, a widely used tool for genetic research that contains 20 million medical and family records.

In addition to her other roles, Cannon-Albright is an investigator at the Huntsman Cancer Institute, where she is a member of the Cancer Control and Population Sciences program.

As a genetic epidemiologist, Cannon-Albright's research interests include computerized genealogy data and the connection between genes, family history and the likelihood someone will contract cancer and other diseases. She has published more than 200 research papers that have improved our understanding of the relationship of genetics and disease. Her contributions include developing new research methods in this area.

William Jenson's "Tough Kid" book series helps teachers and parents improve behavior problems.

William Jenson

Jenson has decades of experience working with children with autism spectrum disorders and related behavioral issues. He has made substantial contributions in research related to these areas and treating these children. Jenson also works with teachers and parents to empower them to help children in their care.

One of the best examples of Jenson's impact is the "Tough Kid" series of books and workbooks. Since the 1990s, Jenson and his co-authors have sold more than 400,000 copies of these materials. They help teachers, parents and children manage and improve behavioral problems by teaching research-based methods in fun and interactive ways. The books exemplify the way Jenson has bridged the gap between his academic and professional experience.

After receiving a Ph.D. in child psychology and behavioral analysis from Utah State University, Jenson began teaching at the University of Utah as an assistant professor in 1983. His academic accomplishments include winning an Outstanding Teaching Award from the College of Education in 2012 and publishing 34 books, 40 chapters, 100 papers and presenting at more than 180 conferences.

ENTREPRENEURIAL FACULTY SCHOLARS

bridging research, industry and impact

"When I conceptualized the EFS program in 2007, I had no idea that it would become a prototype that would be recreated at other universities or that it would become so dynamic and cross-disciplinary on campus. How immensely gratifying this has been to create a truly inclusive culture of impact!" — **Glenn Prestwich**, *Pharmacy, EFS Founder*

"If you are a faculty member with a great idea, just thinking of starting a company, it really helps to have another faculty to talk to who has already done this. It is so rewarding for me to encourage a colleague, just a little, and then watch their idea germinate, take shape and go commercial!" — **Cynthia Furse**, *Electrical Engineering*

"I participate in the EFS to get to know more colleagues across campus, understand the work they are doing, seek novel collaborative opportunities, and as a result, we've developed a variety of scientific and creative partnerships." — **Sarah George**, *Biology*

"This organization is important because it is promoting and encouraging trans-disciplinary collaboration across the campus. In addition, they are advocating for a broader definition of entrepreneurship and the impact that university faculty make." — **Jim Agutter**, *Architecture*

"It has been such a pleasure to work with Glenn Prestwich, a true visionary. Glenn's interdisciplinary and creative vision has brought together many faculty members whose paths most likely would never have crossed. It has been an enriching experience." — **Ellen Bromberg**, *Dance*

"I enjoy being with EFS, because it brings faculty together from all kind of disciplines across campus who feel a strong calling to create something new, to add value, to innovate. 'Entrepreneurial' is understood not only in the risk-taking-for-profit sense, but also in the sense of discovering and creating opportunities." — **Kai Kuck**, *Anesthesiology*

Left to right: Sam Vincent, Stephanie Martin, Hannah Hendrickson and Stephen Goldsmith.

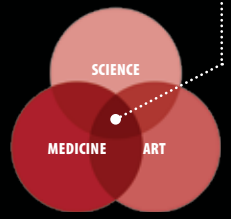
Keeping the Homeless Connected

Imagine being homeless, with no smartphone to connect you to the outside world or remind you of important dates like a doctor's appointment. This reality faces the homeless population in Salt Lake County. But, thanks to one interdisciplinary group at the U, this failure to connect could be rendered obsolete.

The project, tentatively named Tick-Talk, recently received a grant to create mobile devices for people facing homelessness. In conjunction with the 4th Street Clinic, a local clinic that serves the homeless population, students working with professors Stephen Goldsmith and Stacy Bamberg are combating this problem by creating mobile devices with an alert system to remind patients of their upcoming appointments. "This project contributes to the culture of care and exemplifies how the skills of truly listening to the needs of people can invite a creative response," said Goldsmith, an associate professor in the College of Architecture+Planning and director of Capstone Initiatives.

The project team will design the devices and follow users for three months to ensure their effectiveness. The range of possibilities for this device reaches much farther than appointment reminders at the clinic: users can also be reminded to take medications, let them know if a bed is free at a nearby shelter and even allow them to receive notifications after a job interview. More than ensuring that members of the homeless population do not forget to receive life-saving care at the clinic, the device could even help to get them off the streets and into safe housing options. Improved health outcomes are the project's focus, and for clinicians fewer dropped appointments means greater efficiency and cost management for clinic staff.

Shedding Light on Eye Disease

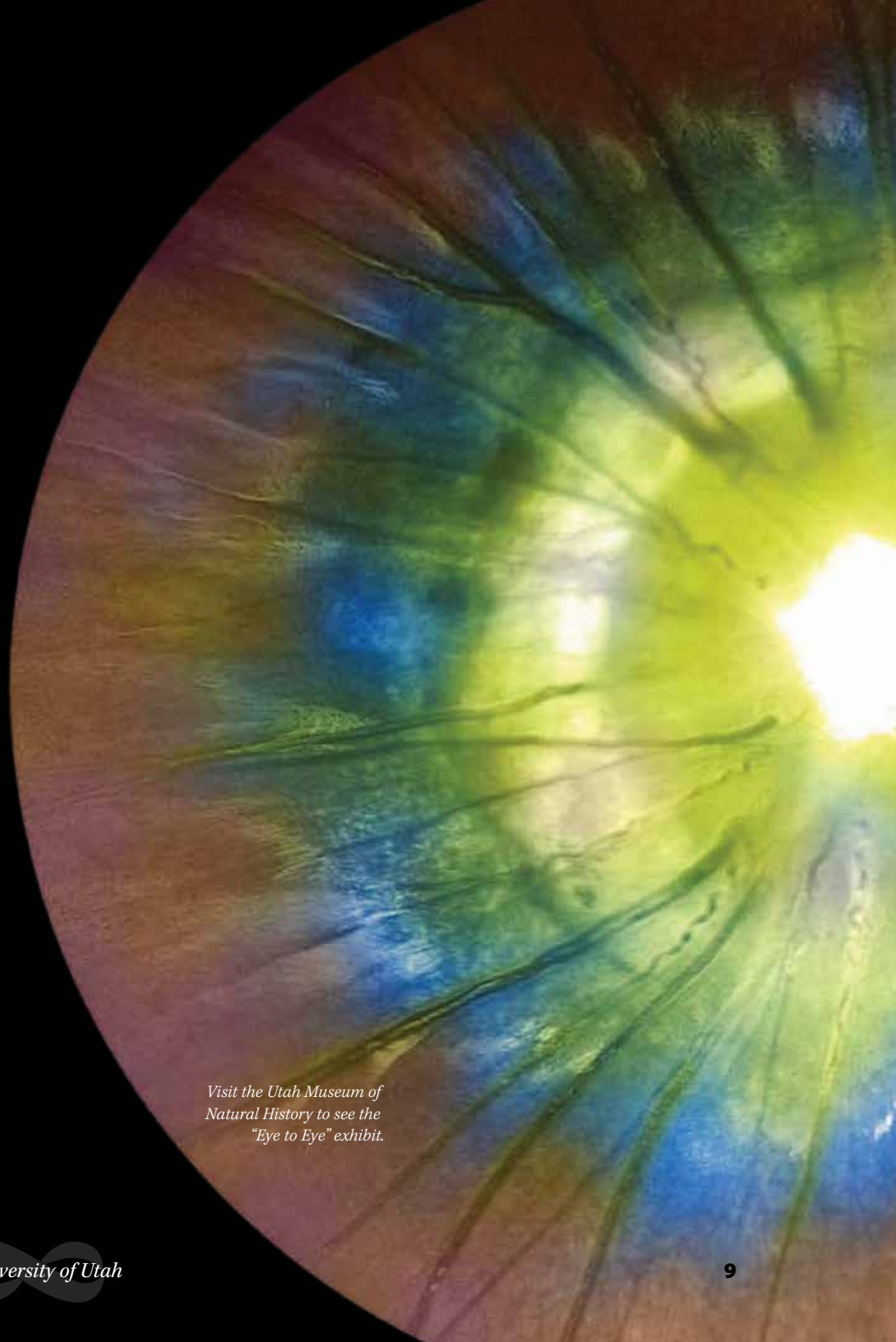


Ranging from poor sight to blindness, eye disease affects a staggering number of people — 39 million are blind worldwide, and many people face the adversity of living without the gift of sight that is so often taken for granted. Ninety percent of the developing world lives in poverty. On average, a child will only live for two more years after going blind, and a blind adult will live only two-thirds as long as sighted peers. For every blind person, 2.5 are lost from the workforce as others must stop work or school to care for their vision-impaired relatives, and lost productivity adds up to $2.7 trillion each year.

To showcase eye disease, research solutions and those who feel its daily affects, the Natural History Museum of Utah is hosting a unique exhibit called "Eye to Eye: Re-visioning Eye Disease." Opened in April 2015, this interactive exhibit is the result of an interdisciplinary collaboration from several departments at the U, including the Entrepreneurial Faculty Scholars, the Moran Eye Center, Jade Therapeutics, Multi-Disciplinary Design and the Natural History Museum of Utah. "Eye to Eye" explores stories of eye disease in Utah and celebrates the many ways that people thrive by using their other senses and technology to adapt to low vision. Patrons visiting this exhibit meet people living with low vision, try activities that require them to use senses other than sight to accomplish daily tasks, and discover how researchers at Jade are developing exciting new treatments for corneal disease.

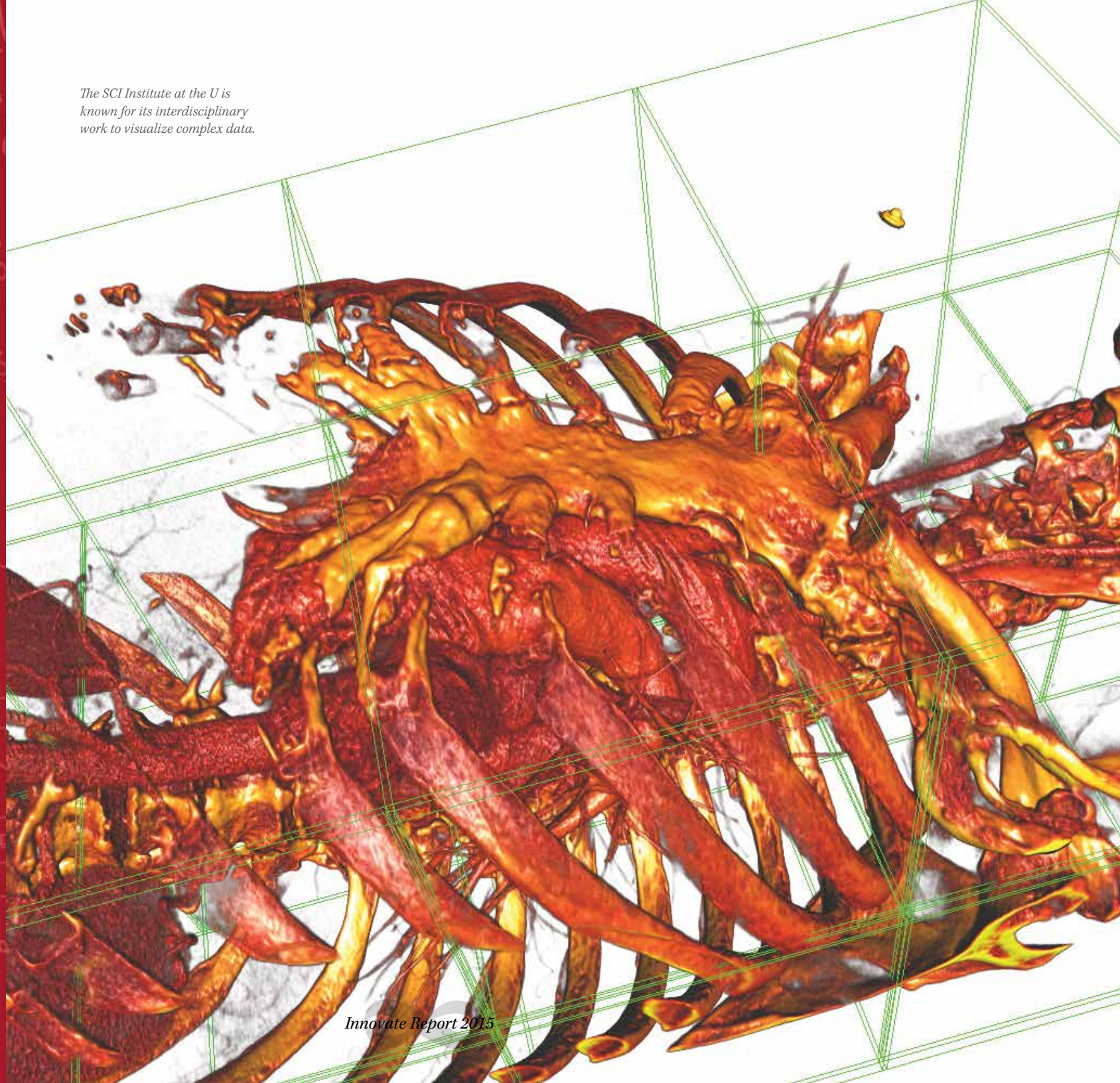
"I was so excited to have this collaborative effort occur, given it allowed science and research to be combined with design and art and made available to the public," said ophthalmologist and co-founder of Jade Therapeutics, Barbara Wirostko, M.D., associate professor at the Moran Eye Center.

Bringing issues surrounding visual impairment to light using art, science and medicine enables community and students to better understand how people with low vision adapt and overcome adversity as well as appreciate the need to improve our therapeutics options.

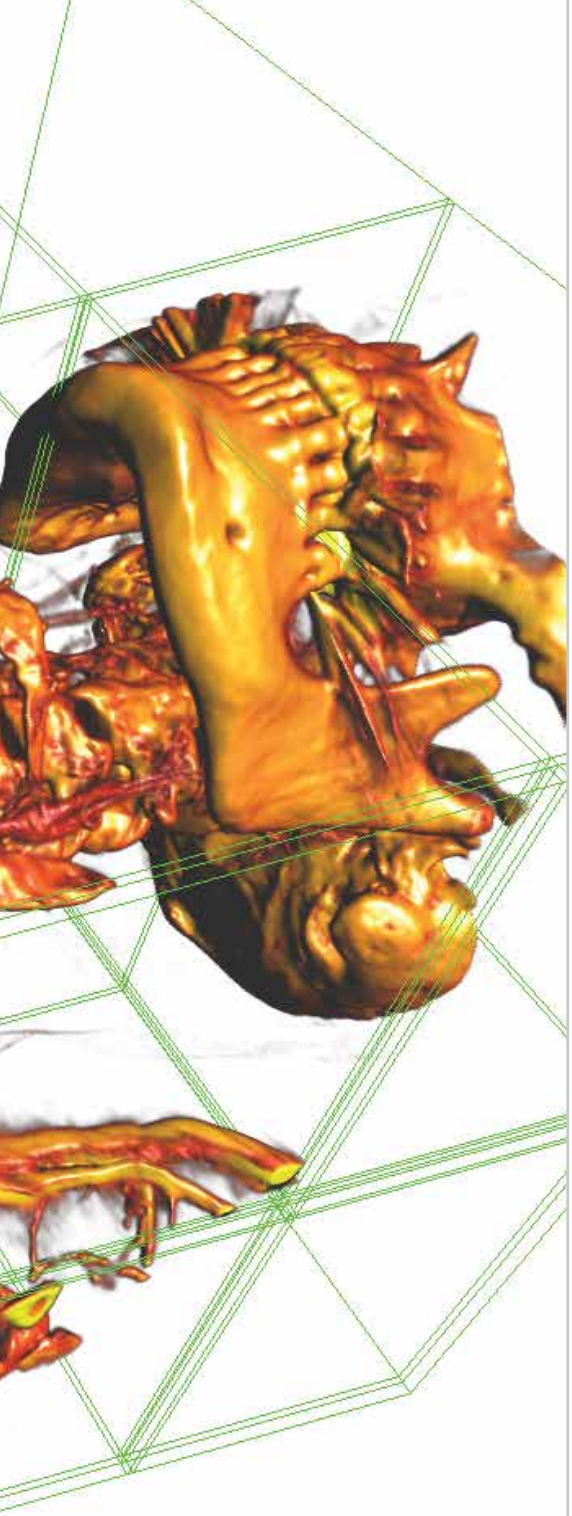


Visit the Utah Museum of Natural History to see the "Eye to Eye" exhibit.

TOOLS & TECH

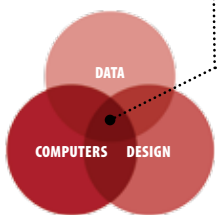


The SCI Institute at the U is known for its interdisciplinary work to visualize complex data.



Beautiful Data

The Scientific Computing and Imaging Institute, or SCI Institute, is changing the way we view the world by creating new ways to visualize, compute and analyze data. From transforming the way we see the human heart to allowing scientists to analyze data virtually anywhere in the world, there is something both strikingly artistic and fundamentally practical about the projects at this internationally recognized institute. Here's a look at two of the projects underway.



ViSOAR

From helping doctors reconstruct neurons to helping cosmologists reconstruct visualizations of the universe, a software called ViSOAR, based on the ViSUS technology, is changing not only how but where scientists can analyze vast amounts of data.

A microscopy scan alone can produce tens of gigabites of raw data — compound this over hundreds of slides, and in the past you would have needed specialized hardware to analyze the data. But ViSOAR makes it possible for large-scale data to be streamed over a network, on the cloud, or off a disc, making data highly mobile.

"I can access data anywhere using just 3G on my phone," said professor Valerio Pascucci, director of the Center for Extreme Data Management, Analysis and Visualization and the core inventor of ViSOAR. "ViSOAR is adaptable and highly scalable. Unlike most programs, which load a large amount of information and data and then throw most of that information away, this is more efficient. It goes straight to the useful data."

This allows ViSOAR to "scale things from a mobile phone all the way to the largest resolution displays and supercomputers in the world," Pascucci said. And ViSOAR has done just that, reaching a broad spectrum of international users on devices from iPads to multi-display walls. But Pascucci is still working towards a wider global distribution in the future, meaning that physicians and researchers all over the world would be able to make diagnoses anytime, from anywhere.

Corview

Corview is an interactive tool that uses information from a cardiac MRI that shows subtle changes in the thin walls of the upper chambers of the heart to help physicians better treat patients with atrial fibrillation.

"Atrial fibrillation is the most common rhythm disturbance of the heart and affects something like three million Americans," said Rob MacLeod, professor of bioengineering and internal medicine. "It is not immediately fatal but dramatically increases the likelihood of stroke — in fact, about 15-20 percent of all strokes are due to atrial fibrillation and the cost of managing these patients lies in the range of $16 billion per year in the U.S."

This tightly integrated software came from the collaboration of groups across the U campus: the Utah Center for Advanced Imaging Research, the Scientific Computing and Imaging Institute and the Division of Cardiologists.

And these researchers have already begun using Corview's combination of MRI and image analysis to study other heart diseases, thus helping transform the way doctors view and treat heart disease in the future.

Gianluca Lazzi specializes in implantable medical devices.

Eye-Opening Science at Work

What seems like science fiction to some is just another day at the office for Gianluca Lazzi, a professor of electrical and computer engineering. He is the principal investigator for the U's Wireless Nanosystems Cluster, where they are developing implantable devices with enormous potential to improve lives.

Lazzi won the 2009 R&D100 Award for an artificial retina. This eye-opening prosthesis is used to treat age-related macular degeneration. Patients in clinical trials could identify objects, experienced increased mobility and could detect movement.

"The ultimate goal is to leave a legacy that impacts the lives of people who have lost sensory capability, vision or movement, so that one day they may feel those things again," Lazzi said.

Lazzi is also a faculty-member of the Utah Science and Technology Research Initiative (USTAR), which drives economic development in Utah through technology research at state research institutions. As a result of this funding, the Wireless Nanosystems Cluster can focus on developing life-improving technologies with fewer distractions.

"You don't just contribute to society through your work, but through the work and dreams of students you help educate," Lazzi said.

How to Steer Skis with a Straw

Pictured above are screen captures from a simulation for virtual skiing.

When your mother told you video games rot your brain, I bet you would have loved to tell her that in just a few years, video games would have the power to expand knowledge, build healthier communities, and even help the paralyzed ski — possibilities students and faculty at the U's Therapeutic Games and Apps Lab (the Gapp Lab) understand all too well.

The Gapp Lab combines the best of the Entertainment Arts & Engineering, the Center for Medical Innovation and the Eccles Health Sciences Library to transform health care using innovative apps and games.

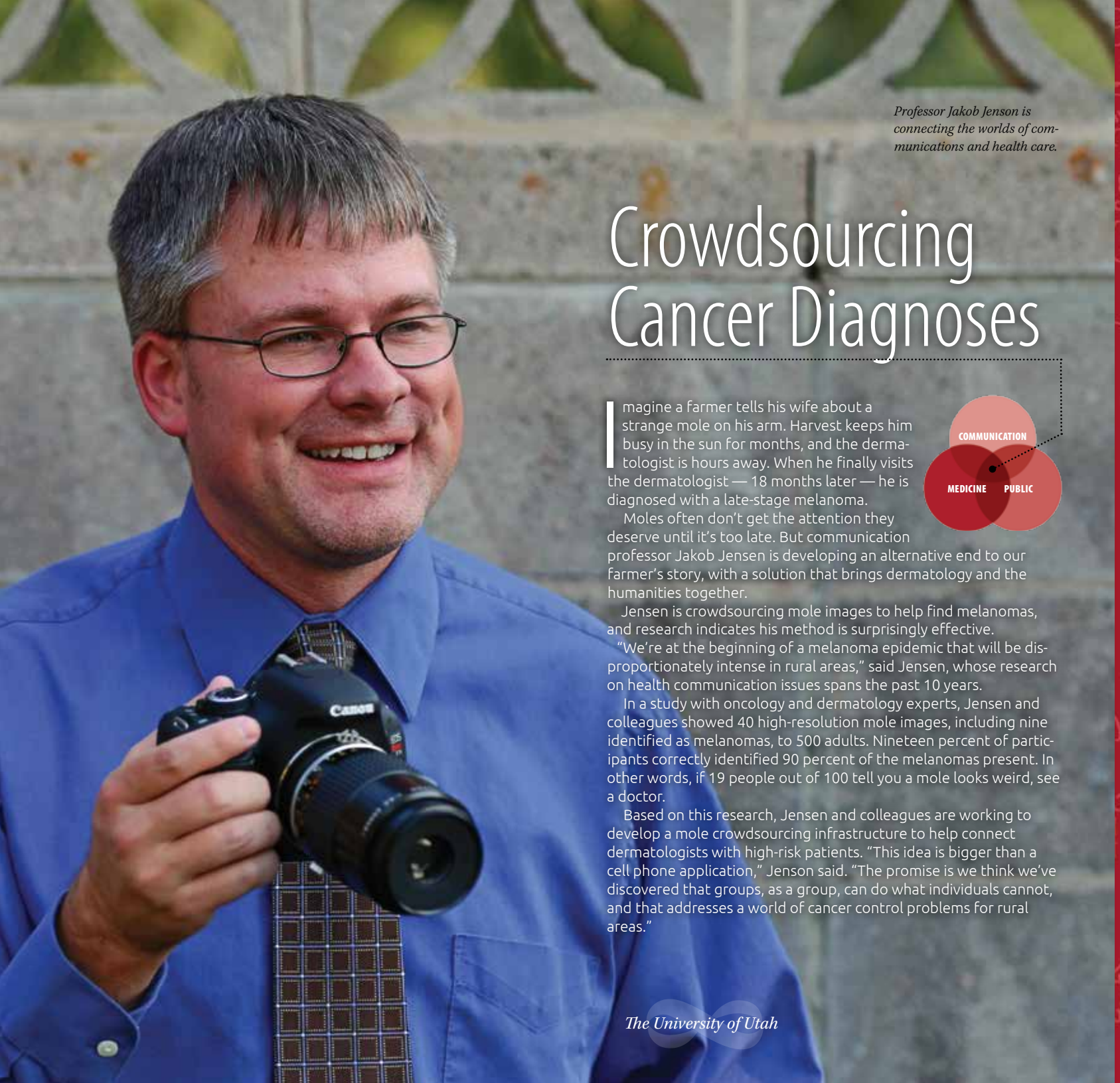
"The Gapp Lab is a unique collaboration. It is one of a kind in the nation," said Roger Altizer, director of the Gapp Lab. "It is health sciences as well as video game folks getting together to solve some of life's most complex problems."

These projects are not only fun but truly visionary. From updating software that helps children explain their medical symptoms to creating interactive maps that send kids on quests throughout the Natural History Museum, the Gapp Lab's projects are already shaping the community.

And now they are working on a project that would make it possible for paraplegic people to ski using a straw they can blow into to steer.

Working in tandem with TRAILS, an outreach program of the U's Rehabilitation Center led by Jeffrey Rosenbluth, the Gapp Lab has found ways to take this technology and mesh it with the customizability of video games to create ski controls that can be adapted to people of all abilities — a technology they plan to expand to boats in the future.

Along with these controls they've created simulations and games that allow people with disabilities to enjoy the ski slopes from the comfort of their home.



Professor Jakob Jenson is connecting the worlds of communications and health care.

Crowdsourcing Cancer Diagnoses

Imagine a farmer tells his wife about a strange mole on his arm. Harvest keeps him busy in the sun for months, and the dermatologist is hours away. When he finally visits the dermatologist — 18 months later — he is diagnosed with a late-stage melanoma.

Moles often don't get the attention they deserve until it's too late. But communication professor Jakob Jensen is developing an alternative end to our farmer's story, with a solution that brings dermatology and the humanities together.

Jensen is crowdsourcing mole images to help find melanomas, and research indicates his method is surprisingly effective.

"We're at the beginning of a melanoma epidemic that will be disproportionately intense in rural areas," said Jensen, whose research on health communication issues spans the past 10 years.

In a study with oncology and dermatology experts, Jensen and colleagues showed 40 high-resolution mole images, including nine identified as melanomas, to 500 adults. Nineteen percent of participants correctly identified 90 percent of the melanomas present. In other words, if 19 people out of 100 tell you a mole looks weird, see a doctor.

Based on this research, Jensen and colleagues are working to develop a mole crowdsourcing infrastructure to help connect dermatologists with high-risk patients. "This idea is bigger than a cell phone application," Jenson said. "The promise is we think we've discovered that groups, as a group, can do what individuals cannot, and that addresses a world of cancer control problems for rural areas."

MEDICAL INNOVATION

personalized care and beyond

The U is thriving as a center for medical innovation, leading the nation in areas including genetics, oncology and medical devices. Much of the research funding and commercial activities at the U involve the School of Medicine. Take a closer look by peeking in on a few current projects.

Breast Cancer in the Crosshairs

UCAIR, the Utah Center for Advanced Imaging Research, is a nationally recognized department at the U that constantly seeks innovative approaches to imaging in medicine. Magnetic resonance imaging (MRI) is a powerful imaging method that can be used in both the diagnosis and treatment of tumors. Focused ultrasound is a non-invasive technology that can target and destroy cancer cells. These two technologies are being combined by a multidisciplinary team lead by Allison Payne, assistant professor of radiology. "Because MRI has excellent real-time visualization of 3-D anatomy and temperature, implementing focused ultrasound with MRI is a powerful new tool in the fight against breast cancer," she said. With new breast cancer diagnoses leading all cancers cases each year, this treatment provides women with a new non-invasive treatment option. This precision technology can also be applied to other organ maladies such as uterine fibroids and diseases of the brain. Clearly, the use of MRI imaging represents a new age in the field of cancer treatment.

Allison Payne is using MRI to treat breast cancer at the Utah Center for Advanced Imaging Research.

Turning Skin Cells into Brain Cells

Can skin cells be turned into neurons for neurobiological research and drug discovery? In the laboratory of Alex Shcheglovitov, assistant professor of neurobiology and anatomy, this is not a fantasy. They convert easily assessable blood and skin cells into induced pluripotent cells (or iPSCs) that, under the right chemical conditions, can be made into any cell of the human body, including neurons. These newly fashioned neurons are put to immediate use to discover the causes of many neurological diseases. "Our goal is to understand the mechanisms underlying the development of brain disorders associated with autism, intellectual disability and epilepsy to fuel the discovery of new drugs for patients," Alex said. This personalized medicine approach, using reverse engineering to turn blood and skin cells from real patients into their own neurons, is a gamer-changer for understanding neurological and psychiatric disorders.

Reversing Obesity's Effects

Can weight loss reverse the painful effects of neuropathy? According to multidisciplinary research underway by the U's Neuromuscular Division and others, the answer could be yes. With more than one third of adult Americans suffering from obesity, the impact of this work could be huge. A team led by Gordon Smith is investigating how obesity may be linked to nerve damage, improving how we think of this common disease. Neuropathy is the culprit behind the persistent numbness and pain that can occur when the longest nerves in the body are damaged. Perhaps the greatest discovery of this work is in the potential reversal of nerve damage, through regeneration, following exercise and dietary counseling. "We are particularly excited by the potential to link moderate, sustainable exercise with strategies to reduce sedentary or sitting time," Smith said. "You may have heard that 'sitting is the new smoking.' It is estimated that merely reducing sitting time 10 percent could save half a million lives annually. In our collaborative research with Robin Marcus from physical therapy, we hope to determine if this approach can prevent the devastating effects of neuropathy in patients with diabetes."

Q&A: Utah Population Database

Since 2007, Ken Smith has been the director of one of the U's most fascinating scientific resources: the Utah Population Database (UPDB). As a researcher, he has a passion for human longevity and healthy aging. We caught up with him to learn more.

WHAT'S THE UTAH POPULATION DATABASE?

The UPDB is one of the world's richest sources of linked population-based information for demographic, genetic and epidemiological studies. The UPDB contains data on over 8 million individuals spanning the last 200 years. UPDB data are being updated continuously and include statewide birth and death certificates, cancer records, hospitalizations, ambulatory surgeries and driver licenses. UPDB creates and maintain links between the database and the medical records held by the two largest health care providers in Utah as well as Medicare claims. These have been organized into multigenerational pedigrees.

HOW WAS THE DATABASE CREATED, AND HOW IS IT MAINTAINED?

The UPDB was conceived in the mid-1970s by a set of visionaries and institutions that saw the value of linking demographic and medical records for studying populations and genetic origins of disease. The UPDB is a University of Utah resource that is managed by the Huntsman Cancer Institute through support from the Huntsman Cancer Foundation, the U of Utah Health Sciences Center (and its Utah Genome Project) and the U's office of the V.P. for Research as well as numerous research grants.

WHO USES THE DATABASE?

The UPDB data are extensive and cover many types of records, variables, multigenerational families and decades. Accordingly, investigators who rely on UPDB span numerous disciplines (often on the same project) including clinicians (e.g., from pediatricians to geriatricians), geneticists, epidemiologists, statisticians, demographers, economists, health service researchers and historians. My observation is that the UPDB facilitates the development of these interdisciplinary collaborations.

Ken Smith

WHAT MOTIVATES YOU TO DO THE WORK YOU DO?

The UPDB is an amazing resource that is unparalleled in the world. The ideas and questions that can be answered with the UPDB are seemingly endless. As I meet investigators on campus, throughout the country and many places around the world, I continue to be amazed by the novel uses to which scientists can put to our data. As a scientist, this is terribly exciting. To be part of a national treasure such as the UPDB is motivation plenty.

WHAT ARE SOME EXAMPLES OF HOW THE DATABASE IS USED TODAY?

The reputation of the UPDB began with early studies of the genetics of cancer as well as the historical demography of Utah. From these beginnings, scientists are examining the genetic bases of numerous cancers as well as other important public health challenges, such as heart disease and diabetes, that all may run in families. Since the UPDB holds geographic data about individuals, studies of environmental exposures comprise an important fraction of work conducted with UPDB.

WHAT DOES THE FUTURE OF THE DATABASE LOOK LIKE?

We continue to examine strategies for growing the UPDB to increase its power and its utility to the research community. A current project is to expand the genealogical basis of UPDB so that we can see how Utah families are connected to other individuals around the country. This will help us better understand disease risk in families outside our borders when this development is completed.

Gretchen Case, Heather Canary and Sydney Cheek-O'Donnell (left to right) are using theater to train medical students.

Theater Meets Medical Training

Talking to patients is one of the hardest skills for medical students to master. But a faculty team at the U is working to make it easier using a theater-based approach.

The effort is lead by Gretchen Case, a professor of medical ethics and humanities; Sydney Cheek-O'Donnell, theater; and Heather Canary, communication.

They are developing the Coached Rehearsal Training Techniques for Interpersonal Skills (CRiTICS) to help medical-students develop "a quiver of adaptable skills for difficult settings," Case said. Rehearsal, observation, practice and reflection are key components.

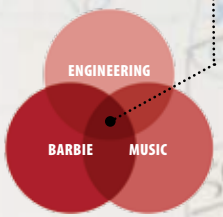
"Most MDs never had opportunity to practice in a real, non-high-stakes setting," Cheek-O'Donnell said.

Canary added: "This is medical-student training innovation never done on this scale before."

The faculty members wrote a related study titled "Communicating Genetic Test Results: Rehearsing and Performing Disclosure." The study's sample size, training scenarios and the level of evaluation have not been applied to similar efforts.

Explaining the importance of the study, Case said: "Mothers remember how a doctor says 'your child has Down's,' even 30-years later."

Tech Fluency through Music



Professor Erik Brunvand is helping move students past feelings of technological intimidation through a new course called "Making Noise: Sound Art and Digital Media." This course was developed as part of his University Professorship, sponsored by the College of Undergraduate Studies.

Brunvand plays upright bass with a bluegrass band, the Lab Dogs, which explains his emphasis on making experimental noise.

In this class, students explore how things work by making artful noise from electronic components. After learning to use an inductive pickup to record electromagnetic noise, students progress to writing short compositions using a basic programming language.

They generate still more unique sound by converting old sound-capable toys like a Barbie keyboard into new instruments. Final projects are designed, built and programmed by students to perform an electronic musical, or otherwise noise-making "gizmo" that never previously existed.

Brunvand described the level of comfort students achieve in the process as "technological fluency," which means understanding enough to diagnose, predict or modify things.

By learning enough about technology to modify electrical circuits into instruments that make strange and unexpected noises, students achieve insights into a world filled with electronic technology.

Art major Kayla Sudweeks' final project used transducers (devices that translate physical quantity like pressure or brightness into electrical signals) to transform her paintings into wall-mounted speakers that emanate a caterwaul of noises created as part of the class.

Mechanical engineering student Alex Jensen built rubber ducks to be set free in a pond. He fitted the ducks with sensors that respond to changing daylight with a variety of curious electronic noises that sound like an effects track from inspired science fiction.

"When you actually take it apart, and do the modifications yourself," Brunvand said, "there's a huge increase in what you've learned."

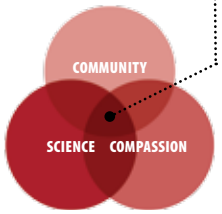
Erik Brunvard, a professor and bluegrass musician, teaches "technological fluency" through music experiments.

SOCIETY

Marilyn Luptak, left, is one of many social work faculty members tackling complex problems through interdisciplinary teams.

Social Work

Researchers at the College of Social Work are addressing some of the most entrenched personal and societal issues today. From veterans' affairs to refugee services, they are working on interdisciplinary teams and making progress improving lives for countless people across Utah and the world. Get a better understanding by hearing what a few standout faculty members say about their current projects.



Health Care Delivery for Veterans

"In 2006, colleagues and I established an interdisciplinary research work group at the Salt Lake City V.A. to address the unique health-care delivery challenges experienced by older veterans and their family caregivers. Because caregivers of aging veterans are twice as likely to be in high-burden, care-giving situations, our team of researchers, educators, practitioners and policy advocates developed and implemented an in-home technology intervention with clinical social workers to support family caregivers of veterans with dementia. We delivered program content digitally to participants, including education about dementia and caregiver difficulties and video dramatization of a couple across the course of dementia that modeled caregiver skills. Our 'Information and Support for In-Home Dementia Caregivers Video Series' [available online at bit.ly/dementia-caregivers] has averaged over a thousand page views a month since July 2013." – **Marilyn Luptak**

Improving Lives for African Refugees

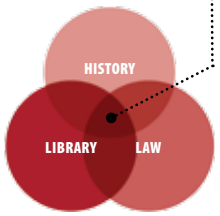
"Our project is a three-year, interdisciplinary, community-based pilot program funded in 2014 by the Belle S. Spafford Endowed Chair of the College of Social Work. As an African, for me this project is about my families, my life and my everyday experience in the U.S. The project seeks to provide support and information for African refugee pregnant women to address their poorer pregnancy conditions when compared to other Utah women. Addressing cultural gaps in perinatal health care between African pregnant refugee women and service providers is key, and we are doing it by training perinatal community health workers from the refugee communities — Somalis and South Sudanese. Cultural and service gaps in this project include refugee women's perceptions of Western health care systems and practices; barriers to accessing health care; differences in what it means to be healthy; how traditional health care practices are sustained and/or transformed in migration and resettlement; and daily responsibilities such as attending to doctors' appointments, follow-ups and knowing what to ask a doctor." – **Aster Solomon Tecle**

Better Eyewitness Procedures

"In late 2013, I was appointed by the National Academies of Science, Engineering and Medicine to evaluate current research on eyewitness identification procedures and develop recommendations about their use in law enforcement and the courts. Comprised of legal scholars, law professionals and biopsychosocial scientists, the ad hoc committee heard expert testimony, examined recent research concerning the validity of eyewitness identification and then synthesized what is known and what is uncertain about factors affecting its accuracy. We learned very quickly that members of the biopsychosocial science and legal communities interpret 'evidence' in fundamentally different ways, and it was necessary to identify and explain our assumptions in order to collaborate productively. Our deliberations resulted in the late 2014 publication of 'Identifying the Culprit: Assessing Eyewitness Identification,' which has already prompted reconsideration and revision of eyewitness identification procedures in several jurisdictions." – **Joanne Yaffe**

Professor Elizabeth Clement (left) is leading a team of researchers building a history of AIDS in Utah. Also pictured are Kristen Ries (middle) and Maggie Snyder.

Chronicling AIDS in Utah



The history of AIDS is one of fear and tragedy. But it is also a history of heroes.

Professor of history Elizabeth Clement has taken the challenge of chronicling that history here in Utah — a project that has unique and exciting implications.

"Most of the stories we have about HIV and AIDS come from cities that are very liberal like New York," Clement said.

Clement's research would show a side to AIDS rarely seen — that of those living in conservative areas and under ingrained social stigmas.

The size and connectedness of Utah also provides Clement the rare opportunity of creating a comprehensive collection impossible with most AIDS research — a collection soon to be hosted in a new archive at the Marriott Library.

But Clement's research didn't begin with this grandiose goal. It started as a history of one woman: Kristen Ries.

"For almost 15 years, Dr. Ries was one of the only people in Utah who was treating people with HIV, because no one else wanted to deal with the stigmatization and problems," Clement said. "So it is an interesting story and a heroic story."

Clement's research soon expanded beyond Ries' story, incorporating the College of Law, Marriott Library and history department at the U as well as the Utah AIDS Foundation and LGBT community.

"An interesting thing about AIDS is that it crosses boundaries of sexuality and race, and it crosses a variety of communities," Clements said. "This project gives the U a chance to reach out to a number of different disadvantaged communities and create a dialogue."

Clement's activism and passion for her research has earned her a spot in the list of heroes shaping the history of AIDS in Utah.

Kem C. Gardner (right of center) and family at the Policy Institute kickoff event.

Introducing the Kem C. Gardner Policy Institute

The generosity of local businessman and philanthropist Kem C. Gardner has helped the University of Utah establish a new policy institute. The Kem C. Gardner Policy Institute will serve as a vital gathering place for economic, demography and public policy research and thought leadership.

The institute brings together the Bureau of Economic and Business Research and the Center for Public Policy & Administration, under the David Eccles School of Business. Its mission is to support informed decision making that strengthens the Utah economy.

"There are a lot of needs around us, and Utah has big decisions ahead," Gardner said. "I love this state and want to make a difference. I look at the Policy Institute and know it will help our community and business leaders make better decisions."

This institute embodies Gardner's values of hard work, civic engagement and a love for the state of Utah. He worked his way out of poverty, after arriving by way of cattle truck from rural Wyoming. He has since become one of the Intermountain West's most successful real-estate developers. Not satisfied with business alone, Gardner devotes a significant amount of time toward the betterment of Utah.

The Kem C. Gardner Policy Institute will support a storied tradition of prudent and thoughtful decision-making, exemplified by Gardner himself. In 2016, the institute will move into the iconic Wall Mansion on South Temple and will serve as a prestigious gathering place for the community.

The 'Doctor of Innovation' Will See You Now

Christopher Wasden is a bike-riding California native who lives and breathes innovation and jokingly describes himself as an "innovation doctor."

"I'm trying to turn students into innovators," said Wasden, the executive director of the Sorensen Center for Discovery and Innovation at the David Eccles School of Business, where Wasden also teaches innovation and technology strategy.

Christopher Wasden

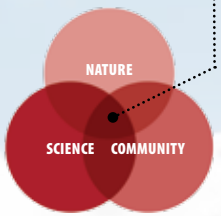
"Our innovation center has a five-fold mission," he said, "We educate, coach, help invent, provide challenges and do consulting."

Wasden explains the principles that drive that mission in his upcoming book, "Tension, The Energy of Innovation: How Harnessing Tension Fuels Your Creative Genius."

Those ideals produced a Wasden brainchild, Games4Health, a global competition where students develop and test new apps and games that will leverage digital technologies to improve physical, mental, emotional and social health.

CLEARING THE AIR

Air pollution is a growing problem across the world. Not only is it linked to extended bouts of depression, increased asthma and heart attacks, and lower IQs and cognitive function, it may also take two years off your life. Utah is not immune to these issues, as periodic air inversions trap smog in the valleys. To help clear the air, many U professors are working together in creative ways to better understand the causes of air pollution and possible solutions.



The First Air-Quality 'Exposome'

Among the U professors working on these topics is Ram Gouripeddi, professor of biomedical informatics. Gouripeddi is working on mapping a personalized air-quality exposome — a complementary concept to the human genome that looks at all the environmental factors that influence a person through their life.

"This work has multiple levels of impact," Gouripeddi said. "The defining focus of this research is to help medical professionals know how to manage patients with conditions affected by air quality." By combining the expertise of on-campus departments from meteorology, atmospheric science and engineering to medical specialties from pediatrics and pulmonology to public health, this research aims to create and integrate models of Utah's air quality with clinical data that would help in predicting, preventing and developing new treatment strategies in the future.

"The final outcome of this project would be to advance the science of the impact of the environment on our health," Gouripeddi said. "By understanding air quality at a granular level, that can change the way we address it in the future." ▶

Ram Gouripeddi is among the many U faculty researching ways to understand and improve air quality.

Ozone and Weather in the West

Another professor with his eye on the future of Utah's air quality is John Horel, professor of atmospheric science. As part of the MesoWest research group, Horel investigates how Utah's weather affects air quality. Most recently, Horel worked on a 2015 summer ozone project composed of researchers from the Utah Division of Air Quality, University of Utah, Utah State University and Weber State University.

"High levels of ozone near the ground are common throughout the West during the summer," Horel said. "Breathing ozone can trigger a wide range of health problems, particularly for children, the elderly and those susceptible to asthma."

The team developed novel ways to retrieve the data for this study, such as using sensors on a news helicopter, paraglider, balloons and even the biology department's "Nerdmobile."

By creating a better understanding of the way ozone is formed, these researchers are helping the Utah Division of Air Quality better predict air quality along the Wasatch Front. Yet predicting air quality is only the beginning.

Video Games and Wood Burning

A new video game created by the U's Gapp Lab attempts to prevent problems by teaching kids how their actions impact air quality. The game, "Bad Air Day," is already being used by teachers across the state.

The concept for this game came from professor Kerry Kelly, co-founder of the Air Quality Program. This program supports students and faculty from across campus as they work together on projects from studying the effects of air quality on pneumonia to creating wristwatches that gauge the level of poisonous gases in the air.

In addition to video games that combat Utah's winter inversions, Kelly's research has also sparked some lively debate that is changing state policy.

In studying the effects of wood burning on Salt Lake City's inversions, Kelly found that wood burning contributed a far higher percent (between 5 to 10) of fine particulate matter than was previously thought. "This led to some very lively discussion about wood burning," Kelly said. "And that, in turn, has led to new legislation, increased education, and it has changed the way Utah calls 'no burn days.'"

That makes this just one more way U professors are helping clear Utah's air.

Dave Bowling and Andrea Brunelle launched the Society, Water and Climate research cluster.

New Research Group Searching for Sustainable Solutions

The U is building the Society Water and Climate cluster to connect research on hydrology, air quality, climate change, societal response and policy.

This cluster of new faculty hires seeks to meld multiple scientific perspectives that will lead society towards sustainable water solutions in a changing world.

Faculty search committee co-chairs Andrea Brunelle (geography) and Dave Bowling (biology) helped organize 12 interviews that resulted in three successful hires, supported by five colleges across campus.

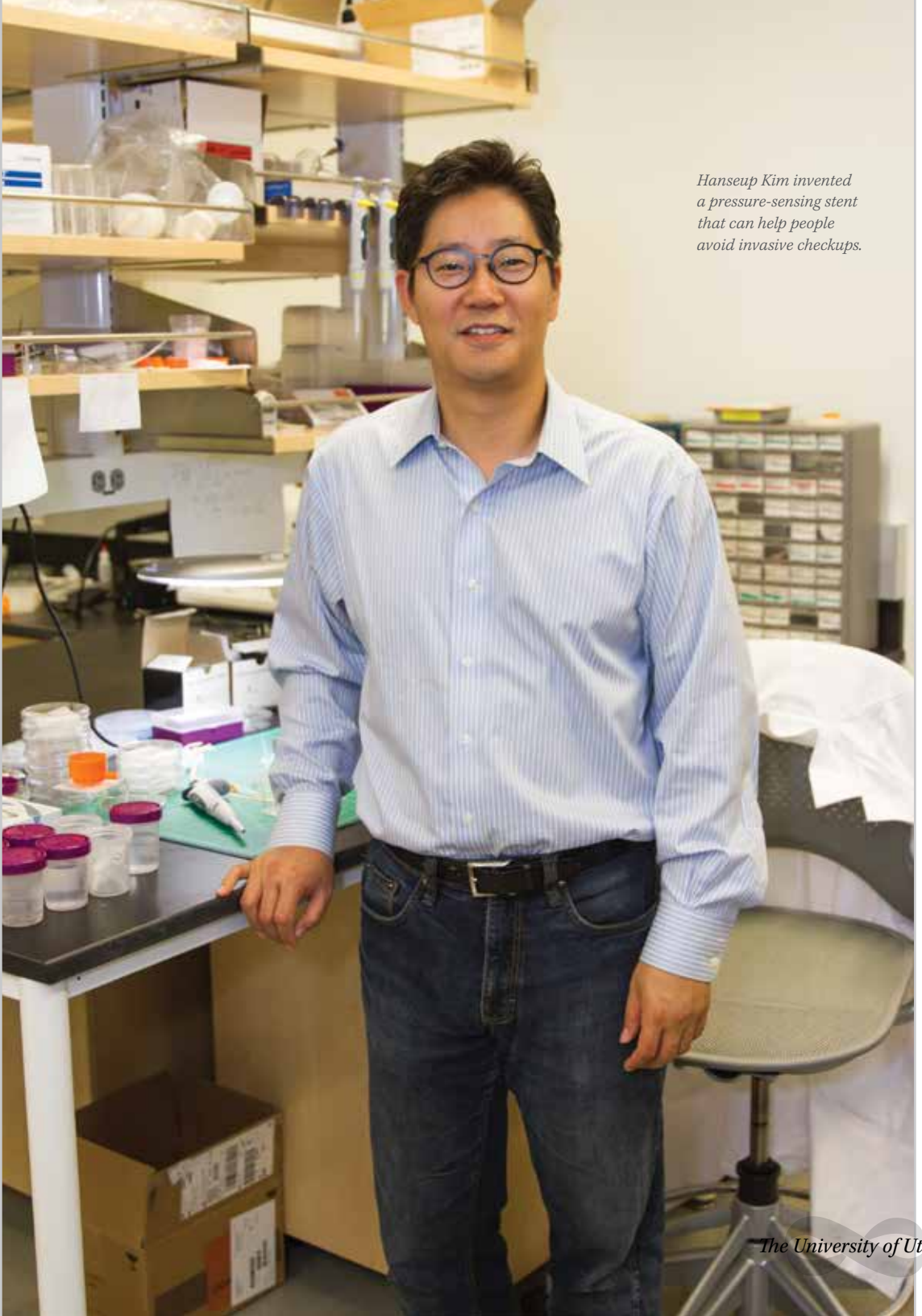
New faculty members include Summer Burton Rupper (snow-ice hydrology, geography), who started in July 2015, and Bill Anderegg (eco-hydrology, biology), beginning in July 2016.

"The whole idea is to breakdown the traditional discipline silos," said Brunelle, who teaches climate and environmental change. "There's only so much you can do by yourself."

Brunelle and the SWC team applied to create the cluster through the Transformative Excellence Program launched by Ruth Watkins, the U's senior vice president of academic affairs.

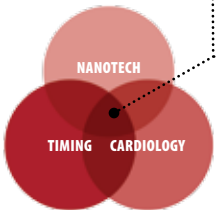
"The societal part is extremely important — climate change means we need to change the way we do things as it happens," Bowling said. "This is very much a global perspective."

"The future depends on the decisions people make," Brunelle added, "and strategic cluster hires could make us a powerhouse."



Hanseup Kim invented a pressure-sensing stent that can help people avoid invasive checkups.

Reinventing the Stent



Not long ago, Hanseup Kim, a professor of electrical engineering, got an itch to apply his expertise in nano technologies to develop an implantable, medical device. But he wasn't sure where to start.

Then, through the matchmaking work of James Thompson — a manager at the U's Technology and Venture Commercialization office — Kim met cardiologists Amit Patel and Anwar Tandar. They gathered for an intense discussion; at the end, they had the essence of a new type of stent that could monitor blood-flow remotely.

"It was the right moment, the right timing, and it was amazing that within three hours of the first meeting we came up with the basic idea for our patent," Kim said, noting the production through a multidisciplinary team.

Their pressure-sensing stent works like any other. It's surgically implanted to help blood flow through a clogged artery. But, unlike anything else available, their device can wirelessly monitor the effectiveness of the stent without any embedded batteries or electronic processes.

The biggest benefit of the device is for patients with restenosis, a disease that causes plaque buildup and narrowing of blood vessels. Millions of people suffer from this and are recommended to have invasive checkups on a regular basis.

The Lassonde Studios will be the new home for student entrepreneurs.

Student 'Garage' Coming in Fall 2016

Student entrepreneurs will have a new home when the Lassonde Studios opens in fall 2016. Four hundred students will live in the facility, and all students will be welcome to use the 20,000-square-foot innovation garage on the main floor. The garage will feature co-working space, startup offices, and piles of prototyping and tinkering equipment. Learn more and apply to live in the building at lassonde.utah.edu/studios.

"There is no way that doctors can know whether restenosis is happening or not," Kim said. "They must do surgery, opening up a corner of your belly and inserting a long wire."

Their device attempts to solve this problem, and they have aggressive plans to develop their prototype. Kim is on sabbatical to work on this with his graduate student Ashrafuzzaman Bulbul and another commercial project. They have proven the technology in a lab and are raising funds for a better prototype and testing.

Watch for the device for sale within a couple years, and don't be surprised to see other applications of their technology to monitor pressure in the brain and other parts of the body.

Tracking People on the Move

On the lookout for his next startup idea and sitting impatiently in his car at a traffic light, Mark Pittman put two and two together — "there has got to be a better way to do this," he thought.

A graduate student studying business and law at the U, Pittman initially wanted to coordinate traffic lights and create a phone app so people could drive without stopping. But the deeper he dug into the problem, the more his solution evolved.

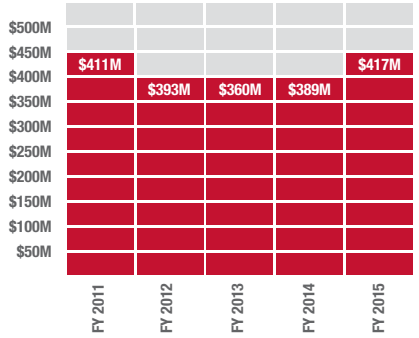
"Initially we tried to sync all traffic lights, and we talked to traffic employees," Pittman said. "We learned it's not possible — not because of the lights, but because of the software. There's no software that gets data on the movement of people."

That realization laid the groundwork for his startup, Blyncsy, which has a first-generation beacon that records whenever a signal-emittingn electronic device passes. The beacons, called Blyncs, can be placed anywhere to monitor the movement of people — on sidewalks, streetlights or even ski lifts.

Since most people carry a connected device in their pocket, Blyncsy can monitor the movement of the majority of the population. The company tracks people using the unique number assigned to each device — performing a real-time traffic study, every second of every day.

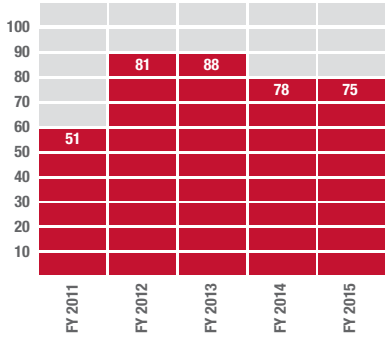
Blyncy uses small devices (like the one pictured) to track people using signals from mobile devices.

TOTAL RESEARCH FUNDING



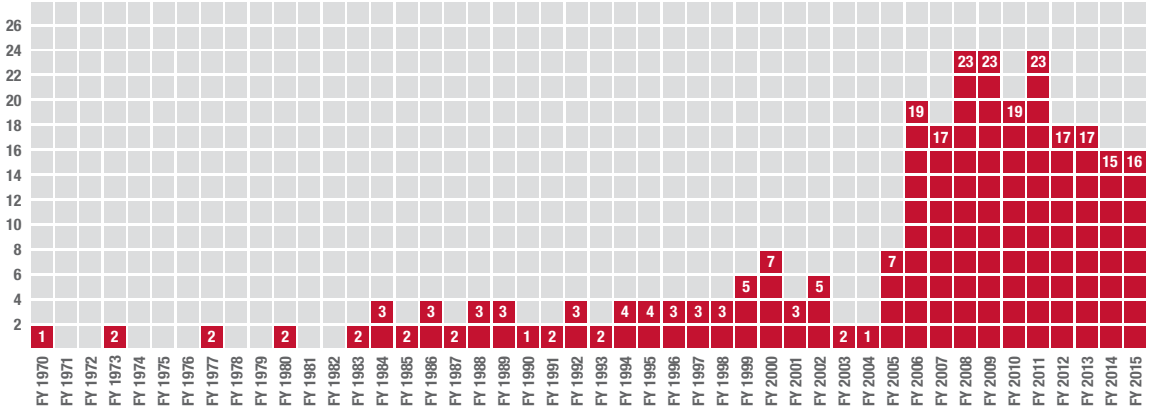
The U is the leading research institution in the state, receiving $417 million in research awards in FY 2015. ***SOURCE:*** *Office of Sponsored Projects.*

U.S. PATENTS



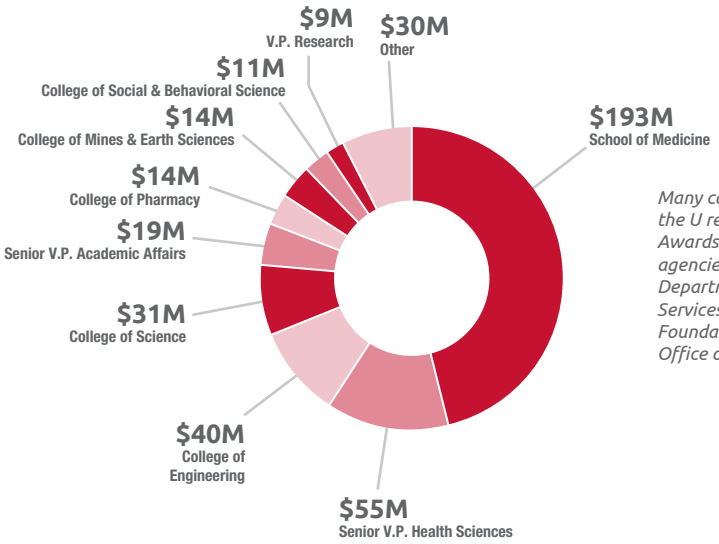
The U has received a steady stream of issued U.S. patents in the last five years. ***SOURCE:*** *Technology and Venture Commercialization.*

STARTUPS OVER TIME



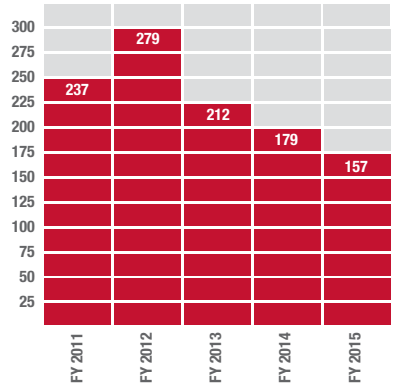
The U has launched more than 200 startup companies since 1970. The number of startups has spiked since 2006. The startups are as diverse as the faculty and students that make up the university. ***SOURCE:*** *Technology and Venture Commercialization.*

RESEARCH FUNDING BY UNIT



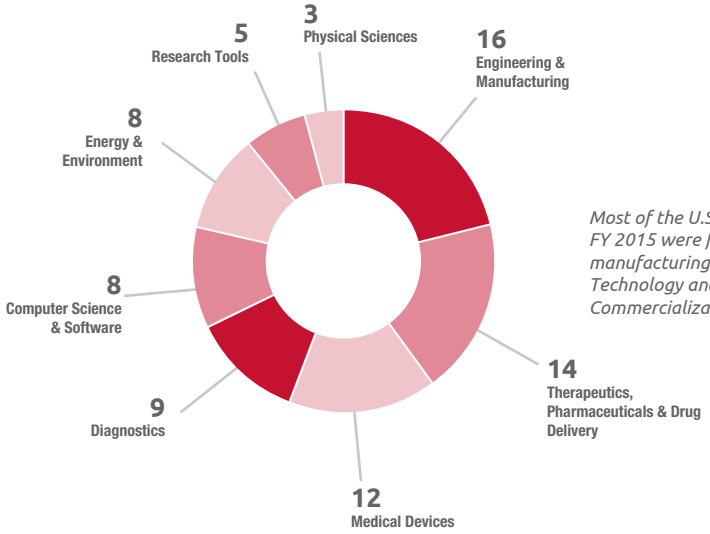
Many colleges and departments at the U receive research awards. Awards in FY 2015 came from agencies including the U.S. Department of Health and Human Services, the National Science Foundation and others. ***SOURCE:*** *Office of Sponsored Projects.*

INVENTION DISCLOSURES



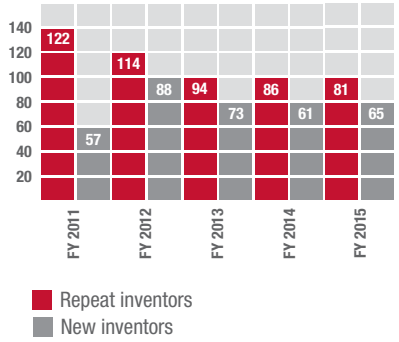
Invention disclosures occur when a faculty member informs Technology and Venture Commercialization of a discovery. ***SOURCE:*** *Technology and Venture Commercialization.*

U.S. PATENTS BY TYPE



Most of the U.S. patents issued for FY 2015 were for engineering and manufacturing. ***SOURCE:*** *Technology and Venture Commercialization.*

NEW & REPEAT INVENTORS



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

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