

RESEARCH AND SCHOLARSHIP *MOVING KNOWLEDGE FORWARD*

The University of Iowa is a leader in research in the areas of medicine and bioengineering, but new discoveries are also being made in the areas of computer modeling, autonomous vehicles, space and weather, and humanities scholarship.

Safeguarding Soldiers

On the battlefield, every second and every ounce of energy counts. It can mean the difference between success and failure, life and death. So it's essential that the equipment members of the armed forces depend on—from the packs they wear, to the vehicles they ride in—work as intended. To help make sure that happens, Karim Abdel-Malek and his team at the UI Center for Computer Aided Design created SANTOS. **This biomechanically accurate “virtual soldier” can be used to test computer renderings of equipment and gear** as a preliminary step toward—and at a fraction of the cost of—direct field testing, checking things like freedom of movement and load levels. Abdel-Malek presented his simulations to the North Atlantic Treaty Organization as a U.S. Delegate, where he shared the results of his GruntSim research funded by a five-year, \$8.6 million project awarded to the Virtual Soldier Research program by the U.S. Navy.

Preserving Texts

Timothy Barrett's research on paper quality, stability, and aesthetics has helped determine how some of the longest-lasting historical papers were made. He and his student co-workers make papers for use in the preservation and conservation of rare books that have a similar look and feel to the historical papers and are designed to last for hundreds if not thousands of years. Barrett and his team made the **special paper that now sits beneath the Charters of Freedom (The Declaration of Independence, The Bill of Rights, and The Constitution)** in their encasements at the National Archives Rotunda in Washington, D.C.

Fighting Cyberbullying

Cyberbullying is the fastest-growing form of youth violence, which is why Marizen Ramirez in the College of Public Health researches ways to stop it. Ramirez and her team have developed a **smartphone app to track cyber communications of schoolchildren** in order to gain a better understanding of the language that constitutes cyberbullying and where online it occurs, so they can help schools do a better job preventing bullying and its adverse impacts on youth. A study co-authored by Ramirez showed that while policies alone cannot completely eradicate bullying, legislation does represent an important part of a comprehensive strategy to prevent bullying.

Studying Storms

Extreme hydrometeorological events—from hurricanes to heavy rains and flooding—frequently affect the continental United States and can have extensive negative social and economic impact. Gabriele Villarini, Assistant Professor of Civil and Environmental Engineering, studies the **physical processes responsible for these events**, including precipitation patterns, high and low temperature extremes, and tropical and extratropical storms. With a prestigious NSF CAREER award, Villarini hopes to uncover whether these extreme events occur in clusters, with periods of enhanced activity alternating to quieter periods, and if they do cluster, what physical processes are responsible for their behavior. By better understanding past events, it's possible to be better prepared to predict future ones.

Regenerating Bones

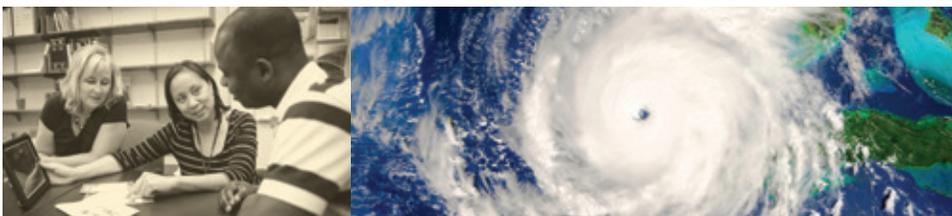
Aliasger Salem, Bighley Professor and Division Head, Pharmaceuticals and Translational Therapeutics, in the College of Pharmacy and his research team have developed a **bio patch to help generate and grow damaged bone** by delivering the DNA blueprints to surrounding cells. In experiments, the bio patch regrew 44 times more bone tissue in damaged animal skulls than similar implants with no genetic information. It has also stimulated growth in human bone marrow stromal cells. Next, Salem hopes to create a bio platform that promotes new blood vessel growth.

Advancing Aviation

Tom Schnell (on cover), an Associate Professor in Industrial Engineering and director of the UI Operator Performance Laboratory, researches sensor fusion systems, pilot spatial orientation capability, assessment of operator performance in flight, airwarfare systems, and surface transportation. His most recent work involves a partnership with Rockwell Collins to study how unmanned aircraft systems—more commonly known as drones—**might behave autonomously should they lose radio contact with their operators.**

Supporting Veterans

One in eight new mothers may suffer from postpartum depression, which in turn can negatively affect the lives of their babies and families. That is why Michael O'Hara, founder and co-director of the Iowa Depression and Clinical Research Center, started the VA MomMoodBooster Program, which provides a **free online treatment program to veteran women suffering from postpartum depression.** The six-week program includes sessions on managing mood, increasing pleasant activities, managing negative thoughts, increasing positive thoughts, and planning for the future.



TECH TRANSFER TRANSLATING IDEAS INTO SOLUTIONS

Over the past three years, the University of Iowa Office of the Vice President for Research and Economic Development has expanded investment for researchers across all disciplines. These resources are intended to help researchers be more competitive and successful in securing funding, to think beyond their disciplines and institutions and join major initiatives to address emerging challenges more creatively, and to shepherd investors toward a successful launch of their ideas into the marketplace.

Curing Blindness

Spark Therapeutics Inc., whose leadership team includes scientific co-founder and advisor Beverly Davidson, former University of Iowa Roy J. Carver Chair in Biomedical Research, is on the cusp of getting FDA approval to conduct human subjects studies using a virus injected directly into the eye to **deliver a correct gene to a patient whose original gene is mutated**. For its final-stage trial, Spark measured the amount of light a participant needed to navigate a mobility course, which entails following arrows on the floor and avoiding obstacles. After a year, patients treated in both eyes improved by 1.9 light levels, compared with an improvement of 0.2 levels in subjects who hadn't been treated, according to University of Iowa principal investigator Stephen Russell.

Diagnosing Faster

Emergency room staff need as much information as they can get as they prepare for incoming traffic accident victims. One novel approach gives first responders digital tools to capture and send photographs of the vehicles back to the ER, images that can provide vital clues about the patient's injuries. TraumaHawk is a pilot project developed by Chris Buresh, Clinical Associate Professor of Emergency Medicine, and project principal investigator Daniel McGehee, director of the Human Factors and Vehicle Safety Research Division at the UI Public Policy Center. The mobile phone app allows state troopers on the scene of a crash to **send photos of the damaged vehicle to the University of Iowa Hospitals and Clinics**. This faster relay of information allows ER physicians and nurses to gain a better sense of the severity of patients' injuries so they have proper rooms, equipment, and personnel available even before the ambulance makes a preliminary medical report. The research is funded by the Iowa Department of Transportation, and the app was developed by Denise Szecsei of the UI Department of Computer Science.

Fighting Cystic Fibrosis

In 2016, the University of Iowa Research Foundation finalized a license and sponsored research agreement with Pfizer Inc. to support the development of **potential gene therapies for cystic fibrosis (CF)** by University of Iowa laboratories. Pfizer, through its Genetic Medicines Institute, will collaborate with the labs to develop a potential unique gene therapy for cystic fibrosis, an inherited disease that causes severe damage to the lungs and digestive system. Cystic fibrosis is caused by a defect in a single gene, making gene therapy an attractive approach for attempting to find a potential cure for CF patients.

Targeting Cancer

How do you outsmart cancer? One way being explored by University of Iowa cancer researcher Kristina Thiel is to target it more accurately using personalized treatments. Thiel is a co-founder of Immortagen, a company that is **enhancing personalized cancer treatment for each patient**. Thiel and her team are developing an exhaustive genetic sequencing tool so doctors can determine which drugs would be the most effective based on genetic mutations in each individual patient's tumor.

Improving Hearing

Cochlear implants have revolutionized the treatment of hearing loss, but more than 50% of implant recipients experience additional hearing deterioration after surgery. Currently, implants cannot be repositioned to compensate as hearing loss worsens, which limits the quality and range of sounds patients can hear—from music to children's voices—and negatively impacts their quality of life. An accessory created by iotaMotion, a company co-founded by University of Iowa otolaryngologist Marlan Hansen and otolaryngology resident Chris Kaufmann with the help of UI Ventures, seeks to solve this problem by **remotely moving the cochlear implant where it needs to be** when it needs to be adjusted to improve hearing quality.



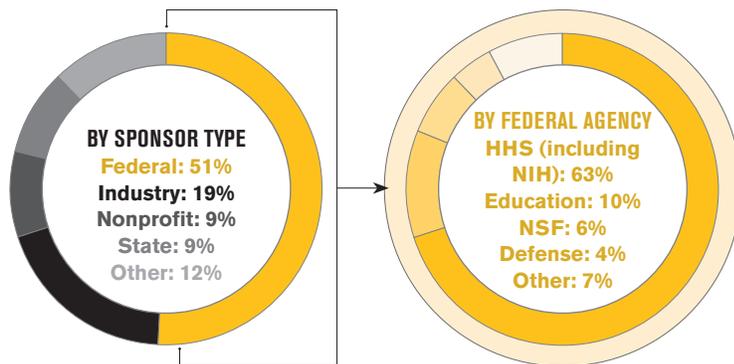
UNIVERSITY OF IOWA RESEARCH

The University of Iowa is Iowa's largest comprehensive research university, with a balanced commitment to the arts, sciences, and humanities. It's home to one of the nation's largest academic medical centers and the pioneering Iowa Writers' Workshop.

TOTAL FEDERAL AND NON-FEDERAL RESEARCH FUNDING FY17 (MILLIONS OF DOLLARS)



FY17 SPONSORED RESEARCH



TECHNOLOGY TRANSFER

Through the University of Iowa Research Foundation and UI Ventures programs, the University of Iowa helps faculty, student, and staff researchers translate their work into commercial products, services, and businesses; secure patents; and license intellectual property.

FY17 STARTUPS AND BUSINESS SUPPORT

54 STARTUPS sponsored in FY09–FY17

14 COMPANIES located at UI Research Park's BioVentures Center
95% OCCUPANCY

42 COMPANIES at UI Research Park employing more than **1,600 PEOPLE**

With UI John Pappajohn Entrepreneurial Center, faculty/student teams completed **64 BUSINESS CONSULTING PROJECTS** in **15 IOWA COUNTIES** plus **1 IN SOUTH DAKOTA** from FY17

FY17 PATENTS AND LICENSING

93

invention disclosures in FY17

42

patents issued

58

licenses/options

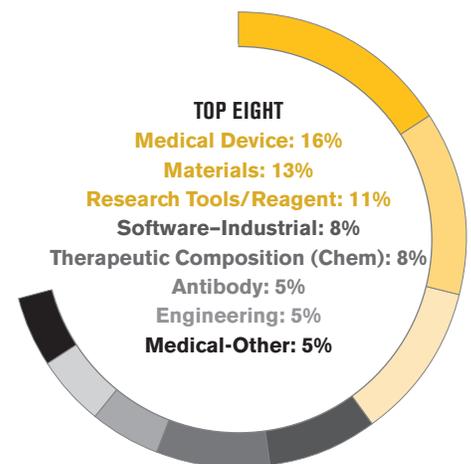
\$1.6 million

in royalties and licensing income

\$12 million

brought in by UI faculty/staff startups

FY17 PRODUCT CATEGORIES



FY17 RESEARCH HIGHLIGHTS

4%

increase in total number of awards granted

7%

increase in new grants (excluding contracts and non-competing renewals)

50%

increase in NASA funding (totaling \$6.3M) over FY16

72%

increase in funding to College of Engineering

95%

increase in DOT funding



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ON THE COVER: IHR's state-of-the-art Wave Basin Facility, completed in 2010, is a clear-span facility for ship hydrodynamics research and related education. Research engineers test radio-controlled scale-model navy ships under a variety of real-life conditions, created by the basin's six wavemakers. The free-moving models maneuver like real ships – straight ahead, zigzag, full circle, and even capsized. Data collected from wave basin experiments support the development of computational codes used to evaluate naval ship design. Here, Yugo Sanada, an IHR Associate Research Scientist with the Ship Hydrodynamics research team, prepares to perform an experimental run on the model ship in the water behind him. Credit: Justin Torner.