



INSPIRED *discoveries*

A Research Report **University of Idaho**



Inspiring Research, Innovation and Creativity

Knowledge discovery and other creative pursuits are vital elements of a dynamic, modern research university. The University of Idaho stands out as a leading land-grant institution in the West. The vast majority of our research funding is competitively derived from sources external to the university, and most is spent within the state.

Our reputation has grown along with our research efforts. The University of Idaho is committed to addressing the needs of the state, the region and the world. Research and Extension stations in 42 of Idaho's 44 counties connect the university to Idaho's citizens through outreach and engagement. Our central campus in Moscow and centers in Coeur d'Alene, Idaho Falls and Boise generate new knowledge and innovations that benefit the people of the state and beyond.

Our research also benefits members of our university community. Opportunities for research and creative activities attract the best and brightest faculty, staff and students to the University of Idaho, and we foster their continued success. Our students experience and explore a spectrum of topics, and our professors and researchers help discover and benefit from the latest advances in their fields.

Scholarly activity at the University of Idaho contributes to people's lives in different ways. It extends from addressing pressing problems such as water use and quality to food production in a variable climate to health and quality of life. It drives economic development. While faculty, staff and students make contributions to the overall body of knowledge in their particular disciplines, they also work in multidisciplinary teams across colleges, institutions and political boundaries to address the problems facing society. Their contributions are many and varied – extending from the basic sciences at one extreme to the fine arts at the other.

In this second edition of our research publication, we have again chosen a range of stories to illustrate the breadth of scholarly activity that is occurring at the University of Idaho. Together they illustrate not only the quality of our faculty, staff and students, but also that a range of topics can be found within our university. Finally, these stories demonstrate the University of Idaho's commitment to addressing some of the challenges facing our state and the region.

The topics in this report represent a small sample of the scholarly activities occurring at the University of Idaho. More will be highlighted in coming editions. In the meantime, we invite you to visit our website (www.uidaho.edu/research) to discover and explore more of the exciting scholarly activities at our university.

John K. McIver
Vice President for Research
and Economic Development



On the Cover: Examining Healthy Habits

An increasing number of young women are at risk of developing cardiovascular disease, which is the leading cause of death for women in the United States. Researchers in the Department of Movement Sciences are examining how women's daily activity levels relate to their disease risk – and whether altering those levels could reduce their chances of facing serious future health problems.

Assistant professors Chantal Vella and David Paul, along with a team of graduate students, are conducting an in-depth study of 50 women. Their objective is to understand whether their subjects' levels of sedentary activity, physical activity and inflammation affect cardiovascular disease risk factors, such as abdominal obesity and elevated blood pressure.

The study focuses in particular on the amount of time the subjects spend in sedentary activities, such as sitting, versus physical activity, whether walking, dancing or rock climbing.

Preliminary results show that women who spend more time in sedentary behaviors may have a higher incidence of cardiovascular disease markers, Paul said. The next steps of the study include analyzing whether intensity or length of exercise relate to disease.

The study is part of Vella's ongoing investigation into the relationships between sedentary behaviors, physical activity and disease indicators. She plans to expand the project and conduct exercise intervention studies with the goal of helping people improve their health before they face major illness.

"Our preliminary results suggest that if you spend the majority of your day doing sedentary activities, such as computer work or watching TV, your chances of developing cardiovascular disease risk factors increase, even if you meet current physical activity guidelines of 30 minutes of physical activity per day," Vella said. "These findings suggest it's important for health to remain active throughout the day, not just part of the day."

www.uidaho.edu/rr-womenshealth

Growing the Tree of Life

University of Idaho scientists are contributing to worldwide efforts to better understand the Earth's species and their evolutionary relationships.

Luke Harmon, an associate professor of biological sciences, is leading a project to create software that helps researchers access and analyze massive amounts of data about the tree of life. A National Science Foundation grant supports the project, called "Arbor: Comparative Analysis Workflows for the Tree of Life."

Harmon coordinates the biologists, computer programmers and students working at U-Idaho and within the labs of project co-investigators. The group's goal is to create a user-friendly software interface that helps scientists

combine, exchange and compare data gathered from labs around the world.

In addition to Harmon's work, College of Natural Resources assistant professor David Tank contributes to the "Angiosperm Tree of Life Project," which maps the evolutionary relationships of flowering plants. Biological sciences professor Jack Sullivan studies methods for developing phylogenies, or evolutionary trees.

The data accessible through Arbor and other projects will not only help evolutionary biologists better understand how life evolved into the diversity we see today, but also will prove useful in fields such as biomedicine, conservation biology, paleontology, anthropology and ecology.

www.uidaho.edu/rr-treeoflife



Tending a Botanical Resource

The University of Idaho's Stillinger Herbarium is providing scientists with new insight into plant evolution and giving the public access to a vast collection of trees, flowers, lichens and more. Founded in 1892 and supported by a trust established by Charles R. and Nettie Mae Stillinger, the herbarium is home to more than 200,000 botanical specimens.

Several scientists use the specimens for research, including herbarium director David Tank, who has received a National Science Foundation Career Award for his work studying plants in the paintbrush family. Tank studies systematics, a discipline that pairs the naming and classifying of organisms with the study of their evolutionary history. The herbarium offers a wealth of data allowing him to examine species-specific traits, as well as work toward a better definition of what constitutes a species – a vital component of conservation policy.

Stillinger Herbarium specimens also are available to people beyond the laboratory. Several Northwest universities have created a digital database of plant collections at www.pnwherbaria.org. The U-Idaho data include 160,000 high-resolution images, making the Stillinger one of only a few collections worldwide with photos of all its vascular plants available online.

www.uidaho.edu/rr-stillingerherbarium



Connecting the World to the Library

Visitors to the University of Idaho Library's digital collections have increased 400 percent in the past year. Library faculty and staff are expanding the online offerings to draw in students, researchers and people from around the world.

The Digital Initiatives department has been producing collections of photos, documents, videos, audio recordings and other items since 2008. Among the popular features are the Gem of the Mountains Digital Yearbook Collection, the Dworshak Dam Collection, the International Jazz Collections and thousands of historical photographs. The library website also hosts tools to help online searchers locate hard-copy items.

Digital initiatives librarian Devin Becker said one of the most challenging aspects of his work is deciding what to digitize – the library has access to so many interesting items. The department focuses on presentation as well as content by creating searchable, user-friendly collections with features like timelines and maps to help people find the items they need.

Bringing the library's resources to the web positions the university to be a colleague in international research pursuits, said Garth Reese, head of the library's special collections and archives. People who may never come to Idaho can now access information housed here.

"The interest in these collections is much broader than the Inland Northwest."

www.uidaho.edu/rr-digitallibrary



Supporting Science with Economics

Eric Stuen, an assistant professor in the College of Business and Economics, studies the economics of science and innovation, including the vital role universities play in enhancing technology.

One of Stuen's recent studies examines the importance of bringing together researchers from around the world. Stuen, along with economists from Yale and the University of Colorado, studied 26 years of data about

doctoral students from 2,300 university science and engineering departments. The resulting paper was the first to definitively quantify the benefits of foreign researchers in American labs. While American and international students publish papers and receive citations at roughly the same rate, a department as a whole is more productive if its researchers come from a variety of countries.

Stuen said their findings imply that limiting the number of international and American doctoral applicants, such as by cutting scholarship opportunities, would sharply reduce the research productivity of science and engineering departments.

The knowledge gained within universities spills over into high-tech industries, keeping them internationally competitive. Economic research like Stuen's helps in understanding whether universities are providing the best possible environment for innovation.

www.uidaho.edu/rr-scienceconomics



Preparing Students for a Future in STEM

Only 24 percent of adults in Idaho have a bachelor's degree or more. But more than 60 percent of Idaho's jobs will soon require higher education, and those that pay the best will require a college degree in science, technology, engineering or math (STEM) fields. How can the state fill the gap?

University of Idaho researchers are tackling the problem from a new angle by studying the attitudes, barriers and opportunities related to STEM education.

The Micron Foundation awarded the university a five-year, \$1.2 million leadership gift in 2010 to gather information in 12 randomly selected communities representing Idaho's geographic and demographic diversity.

Researchers have conducted surveys to examine issues such as how Idaho residents view public schools and scientists, whether parents feel confident preparing their children for college and whether students are considering science careers.

The results show statewide support for increased public education funding and STEM education efforts. However, results also reveal math and science interest declines as students progress through school – less than a quarter of 10th graders report they would like a science- or math-related job.

Survey results also showed that girls' attitudes about science and math declined sharply between seventh and 10th grade, and Hispanic students were less likely to have positive attitudes about science and math. The results also showed differences in math and science family support for students in rural and urban communities.

This research will form the basis of programs designed to meet the needs of individual communities, said Debbie Storrs, associate dean of the College of Letters, Arts and Social Sciences who leads the project with Corrine Mantle-Bromley, College of Education dean.

"This is not a simple problem. Teachers aren't to blame, parents aren't to blame, kids aren't to blame," Storrs said. "This is a complex statewide problem. It's going to require a statewide response."

www.uidaho.edu/rr-stem

Securing Transportation in the Cyberworld

As the nation's transportation systems become increasingly wired, they are also becoming bigger targets for hackers. Researchers with the National Institute for Advanced Transportation Technology (NIATT) at the University of Idaho are developing ways to keep transportation systems safe, efficient and dependable moving into the 21st century.

"Most of our transportation systems are now evolving, relying on a complex network of computers and communication devices," said Ahmed Abdel-Rahim, an associate professor of civil engineering who works on cybersecurity issues as part of his NIATT research activities.

The engineers who design these new networks must consider cybersecurity measures as vital parts of their research. For example, Abdel-Rahim is developing a traffic signal control system that can respond to weather conditions and react in real time, giving drivers increased stopping time on icy or wet roads. Part of his work involves ensuring the controls resist hacking attempts.

Abdel-Rahim is part of a multidisciplinary team at U-Idaho that focuses on cybersecurity for critical transportation, computing and power infrastructure. In 2012, the Idaho Legislature created the Idaho Global Entrepreneurial Mission (IGEM) which has awarded U-Idaho grants to support the Center for Secure and Dependable Systems and to hire five new faculty members to focus on cybersecurity issues.

www.uidaho.edu/rr-cybersecurity



Monitoring Wolf Populations

The U.S. Fish and Wildlife Service removed Idaho's gray wolves from protection under the Endangered Species Act in 2011. State officials are now in charge of managing the wolf population, and University of Idaho researchers are helping monitor the animals.

Department of Fish and Wildlife Sciences professor Lisette Waits and her students, in collaboration with Idaho Fish and Game, the Nez Perce Tribe and the Montana Cooperative Wildlife Research Unit, extract genetic information from hair and scat found at gray wolf rendezvous sites. They use this data to document wolf presence and population, evaluate the genetic health of pups, determine breeding pairs and track pack movements.

The noninvasive technique pioneered and expanded by Waits and her team is more complete and cost-effective than traditional tracking methods, such as fitting wolves with radio collars. It decreases the crash risk associated with observing wolves from helicopters or small planes and reduces human-wolf contact, which is dangerous for both species.

Accurate information on wolf populations is critical for managing the species. State officials use Waits' data to set policies, including the annual wolf harvest quota, to ensure the population remains stable and the gray wolf does not again become endangered.

The technique also is gaining popularity in neighboring states and across the world, where Waits and other scientists use noninvasive genetic sampling to monitor newly introduced pygmy rabbits in Washington, identify carnivores preying on caribou populations in Newfoundland, track tigers in Nepal and more.

www.uidaho.edu/rr-monitoringwolves

Growing Sustainable Jet Fuel

Greener jet fuel is one goal for new canola and oilseed varieties developed by College of Agricultural and Life Sciences plant breeder Jack Brown.

A related biofuel project will task Brown with producing 100,000 pounds of oil from one of his new varieties, the winter rapeseed variety Durola. The oil will be tested for suitability as the base for a biofuel for U.S. Navy jets.

"It goes without saying that if the Navy starts using even a small amount of jet fuel made from rapeseed oil, that's an enormous amount of rapeseed oil," Brown said.

Not just any rapeseed oil. Durola, a newly released variety Brown developed during his 20-year career at the University of Idaho, is a specialty industrial oil plant.

Its oil is high in erucic acids, which render it unpalatable to people but boost its value as a lubricating oil. Durola seed meal left over after pressing, however, is low in glucosinolates, the pungent chemicals that give mustard its bite. This makes Durola a good source of high-protein feed valued by dairies.

Durola's oil is high in mono-unsaturated fats, which was one of Brown's goals in developing the variety because it reduces fuel processing costs.

"Durola is an ideal plant for producing fuel because its oil cannot be used for food, it is easy to process, the meal is valuable livestock feed and it produces high yields," he said.

www.uidaho.edu/rr-biofuel





Bringing Buildings into the Light

An office illuminated by daylight streaming through the windows doesn't just offer comfort – it could save money on energy. Kevin Van Den Wymelenberg, director of the University of Idaho's Boise-based Integrated Design Lab (IDL), hopes to inspire designers to incorporate natural light into energy-efficient buildings.

Van Den Wymelenberg and University of Washington professor Christopher Meek's new book, "Daylighting Design in the Pacific Northwest," highlights buildings that effectively use natural lighting techniques.

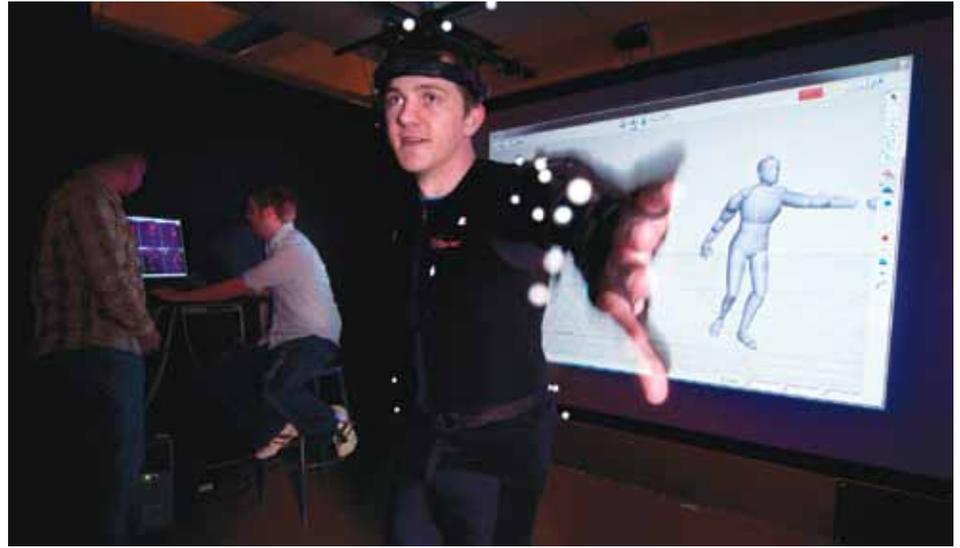
Several Idaho buildings profiled in the book are past projects of the IDL, which has helped more than 200 new and existing structures statewide incorporate energy-efficient elements into their design by working with architects and engineers.

In conjunction with the University of Washington and the New Buildings Institute, the IDL team also developed the Daylighting Pattern Guide, a free, interactive tool that features simulations and real-world examples of effective uses of natural light.

Daylighting can serve as a touchstone for architects, engineers, owners and occupants of buildings to begin discussing overarching energy and comfort design issues.

"We would like to help influence design for both improved comfort as well as improved energy efficiency," Van Den Wymelenberg said.

www.uidaho.edu/rr-daylight



Expanding the World with Technology

A person passing a tree in a meadow may notice its height, the shape of its leaves or a chipmunk scurrying among its branches. But a person passing the same tree in a virtual world could see endlessly more – the tree's age, its molecular makeup, every organism that calls it home, fire vulnerability, the pH of its soil, its timber value, its role in the forest ecosystem and even poems written in its honor.

"In this way a virtual world can be more real than the real world," said John Anderson, an assistant professor in the Virtual Technology and Design Program.

"You can uncover so much information from a single tree. We're interested in revealing everything connected to it."

Anderson and his colleagues have facilitated a variety of interdisciplinary projects at U-Idaho that use virtual technologies to conduct research in biology, engineering, education, history, psychology, theater and more. They've also applied their work to science, technology, engineering and math (STEM) education, helping young students learn concepts by exploring virtual environments.

Another significant part of virtual technology and design researchers' work is investigating new software platforms for building virtual realms that are accessible and useful to multiple disciplines.

Massive amounts of data exist about the physical world. Virtual worlds help unite data and illuminate the novel relationships among disparate information.

www.uidaho.edu/rr-virtualworld

Staging New Work Nationwide

Dramatic Writing Program director Robert Caisley is no stranger to watching his plays come to life onstage, but never before has he seen one produced four times in eight months.

Nonprofit theater group The National New Play Network selected Caisley's play "Happy" – which centers on a man whose contentment with life is uprooted by a skeptical art student – for its Rolling World Premiere program.

Backed by funding from the network, professional theater companies in Montana and Florida staged the play in fall 2012, and companies in California and New Jersey will produce it in spring and summer 2013. The program also helps theaters bring Caisley in to work with actors and directors during rehearsals and to attend opening night.

Caisley said he's written enough plays that he can anticipate what an audience will find funny, but he's been surprised so far seeing how well theatergoers react to the play's awkward silences.

A publishing company has offered Caisley a contract for "Happy," and he plans to refine the script based on his experiences with the Rolling World Premiere.

While seeing a play live gives Caisley insight into his work, his first audience is often his students. He gives early drafts to his playwriting classes and reflects on his own work's faults while critiquing student work.

He's found inspiration in the classroom, too – the idea for "Happy" was born during a discussion of character flaws with his students.

www.uidaho.edu/rr-happy



Photograph by Terry Cyr

Uniting the Environment and the Law

College of Law students who pursue emphases in natural resources and environmental law have the opportunity to study with faculty members who have national and international experience in their fields.

Among this expert faculty is Dale Goble, who conducts research on the Endangered Species Act. Goble and his interdisciplinary co-researchers are organizing two reviews of the Act. The first – to be held in Coeur d'Alene in late October – is intended to be a broad review that will consider how the best current science can be used to shape the Act's administration. The second meeting – to be held in Washington, D.C. – is more narrowly focused on recovery. It is based on both theoretical and on-the-ground work that emphasizes creating conservation management alliances that permit a species to be removed from the list.

Barbara Cosens focuses on another aspect of environmental law: water resource management. Cosens is part of the Universities Consortium on Columbia River Governance – a group of researchers from multiple Pacific Northwest universities – which facilitates a dialogue among cross-border interests as the U.S. and Canada review the Columbia River Treaty; connects university research to the review effort; and uses curriculum and research to engage students in this major water policy process. A provision of the 50-year-old treaty regarding flood control expires in 2024, opening interest in consideration of all aspects of this important water-management agreement.

www.uidaho.edu/rr-environmentallaw



Digging for Cultural Stories

More than 1,000 people visited the Cyrus Jacobs-Uberuaga House dig site in Boise's Basque Block, where in summer 2012 anthropology and archaeology students and professors excavated historical items. The researchers are now taking the project to the next level: analyzing artifacts to understand the lives and habits of some of Idaho's early settlers.

Graduate student Jessica Goodwin, advised by professors Stacey Camp and Mark Warner, is in the process of cataloguing more than 10,000 items – delicate dishes, ceramic dolls' heads, tobacco tins, pharmaceutical bottles and other detritus that together tell stories of Boise life in the 1890s and early 1900s.

Goodwin will study the artifacts to better understand the class and social standings of the Jacobs family, whose patriarch was a prominent business leader. Her clues come from items like a celery dish, which to Victorian minds represented an upper-class ability to buy specialized ceramics, and the toys, tools and food scraps that reveal the lifestyles of the household's children and women.

Department of Chemistry students are contributing to the project as well by analyzing the contents of bottles found at the site. The drugs and beauty products the Jacobs family used demonstrate the access this frontier family had to brands from the East and Europe.

Researchers will soon present their findings in Boise and across the state, continuing the project's public-service focus, Camp said.

"It's been an opportunity to show why the material culture beneath the ground is important."

www.uidaho.edu/rr-jacobsdig

Taking Idaho's Geology Online

The Geologic Map of Idaho released in October 2012 is a beautifully detailed cartographic project featuring colorful depictions of the state's faults, rocks, sediments and geologic history.

Idaho Geological Survey (IGS) employees are now working to make it an even more accessible tool for the general public, as well as governments, industry leaders, contractors, engineers, scientists and more.

Loudon Stanford, digital geologic mapping manager for the Idaho Geological Survey, is in the process of bringing the map to the web. When it's released to the public in summer 2013, this digitized, GIS-enabled map will allow people to search among the layers of

information included in the print map, as well as new data.

The geologic map is among many digital projects at IGS. More than 400 maps and hundreds of publications dating back nearly a century are now available at www.idahogeology.org, with increasingly detailed and searchable maps to come.

The Idaho Geological Survey is a public service and research agency at the University of Idaho that is directed by Idaho statute to collect, interpret and disseminate geologic and mineral data for the state.

www.uidaho.edu/rr-igsonline





Combatting a Bacterial Adversary

Injured troops are often exposed to a hidden enemy: infections that become life-threatening when the bacteria causing them resist treatment with antibiotics. University of Idaho biology professor Eva Top is seeking to better understand how bacteria pass on the genes that code for antibiotic resistance, supported by a nearly \$1 million, two-year grant from the U.S. Department of Defense.

Top directs the university's bioinformatics and computational biology graduate program, and her research falls under the umbrella of the Institute for Bioinformatics and Evolutionary Studies (IBEST). She has studied gene transfer in bacteria for nearly 25 years.

Scientists have found growing evidence that plasmids – pieces of genetic material that exist in most bacterial cells outside of chromosomes – play a major role in antibiotic resistance. Plasmids can rapidly transfer from bacterium to bacterium, even jumping between different species.

Top's research investigates the molecular mechanisms by which drug-resistance plasmids can become more stable in layers of bacteria known as biofilms, even when there are no antibiotics around. Her ultimate goal is to find ways to inhibit the spread of plasmids among bacteria, reducing antibiotic resistance and helping patients, whether soldiers or civilians, fight dangerous infections.

www.uidaho.edu/rr-bacteria

Protecting Range and Habitat

Flocks of sage-grouse darkened the sky on Idaho's prairies years ago, but the birds began declining in recent decades. Researchers with the Rangeland Center are seeking a better understanding of the imperiled bird and the state's vital rangeland with an eye on collaborative solutions.

The center is working with the Idaho Department of Fish and Game to bring together a group of land-management agencies, conservation organizations and landowners to create a 10-year study of the complex relationships among sage-grouse reproduction and survival, habitat characteristics, cattle grazing regimes and rangeland fires in sagebrush.

Karen Launchbaugh, Rangeland Center director, said the team plans to identify study sites and begin habitat assessment in summer 2013. She emphasized the project will be a partnership between the researchers and land managers.

Rangeland surrounds the majority of Idaho's population centers and constitutes nearly 50 percent of the state in total. Data gathered from studies today may help protect the sage-grouse – and Idaho's economy – in the future.

www.uidaho.edu/rr-sagegrouse

Counseling People with Disabilities

Professor Susan Stuntzner injured her spine 28 years ago, and she uses her personal experience to shape her work and research in rehabilitation counseling.

A central focus of rehabilitation counseling

is preparing people who are adapting to disabilities to return to work and acquire independence. But Stuntzner, program coordinator for the Rehabilitation Counseling and Human Services Program at University of Idaho Coeur d'Alene,

emphasizes the need

to include another area: helping people cope emotionally and mentally with their disabilities.

Stuntzner published her book "Living with a Disability: Finding Peace Amidst the Storm" in September 2012. The book is being used primarily to train rehabilitation counselors in India, where the profession is expanding, but is also available to the public.

Stuntzner wanted to create an accessible resource for counselors, as well as people with disabilities and their families. The book includes research combined with personal experience to help make the information meaningful to readers. Much of Stuntzner's research focuses on the importance of forgiveness, resiliency and adaptation strategies when coping with disabilities. Forgiveness has been empirically studied to help reduce anger, depression and anxiety and has been associated as a needed approach in coping with traumatic events such as the sudden acquisition of a disability.

www.uidaho.edu/rr-counseling



Photo by Tatiana Gettelman

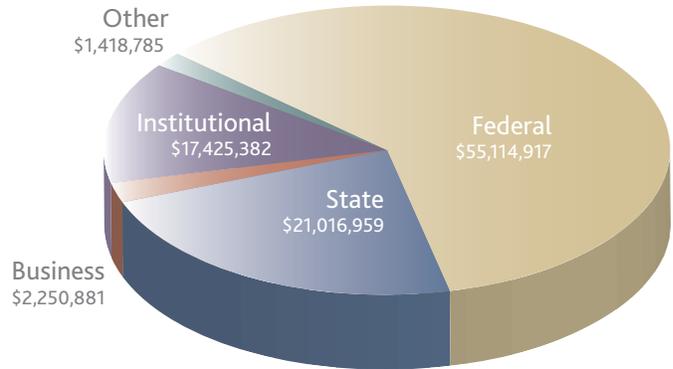
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Fiscal Year summary

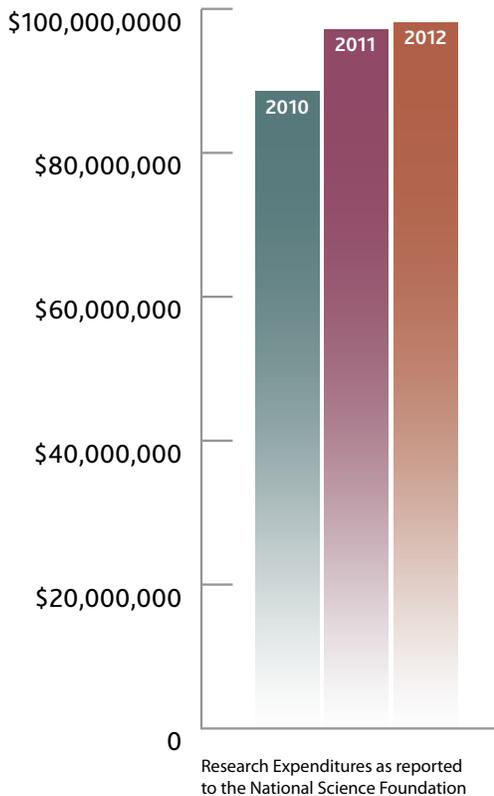
Technology Commercialization

Disclosures **28**
26 Applications
 Issued Patents **2**
8 Licenses
 Start-ups **2**

Research Expenditures by Funding Source



Research Expenditures



Sponsored Project Expenditures by College

Sponsored Projects	Number	Total
College of Agricultural & Life Sciences	592	\$17,211,558
College of Letters, Arts & Social Sciences	33	\$449,501
College of Art & Architecture	30	\$1,081,318
College of Business & Economics	6	\$7,650
College of Education	95	\$9,127,123
College of Engineering	159	\$8,887,511
College of Graduate Studies	6	\$256,442
College of Law	11	\$184,734
College of Natural Resources	295	\$11,504,948
College of Science	140	\$6,332,034
General Library	6	\$15,045
Office of Community Partnerships	3	\$224,245
WWAMI Medical Education Program	24	\$3,717,243
Other Academic Affairs	76	\$6,340,954
University Research	183	\$13,255,455
Other Central Administration	5	\$231,964
Total	1,664	\$78,827,725*

*Figure represents externally funded grants and contracts. The difference between the Research Expenditures in the NSF survey data and this total is additional research funding through internal sources, cost share, HATCH funds, etc.

On the cover: Katie Taylor, a graduate student in the University of Idaho Department of Movement Sciences, runs on a treadmill while attached to equipment that measures her respiration in the department's Exercise Physiology Laboratory. Taylor is part of a team of graduate students working with assistant professors Chantal Vella and David Paul to study connections between physical activity and pre-cardiovascular disease risk factors in young women. For more about this research, read "Examining Healthy Habits" inside this report.