

#### BY PATRICIA PYKE

# LEAP LEARNING

Health-related research takes off at Boise State

eady. Set. Go!" says Boise State mechanical engineering professor Michelle Sabick.

In the brand-new Intermountain Orthopaedics Biomechanics Research Lab in the College of Engineering, 10-year-old soccer player Camille

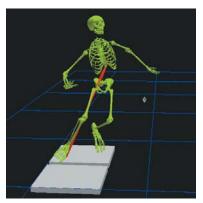
Cooper swings her arms exuberantly as she leaps high into the air and lands with a decisive, flat-footed thud. Her motions are captured by high-speed cameras at 250 frames per second and transmitted to a computer system to create a three-dimensional, animated image of her leap.

Sabick and Boise State kinesiology professor Ron
Pfeiffer monitor the experiment, part of a series of studies
aimed at analyzing the biomechanical factors that affect
how forces are transmitted through bones and joints and at
determining if kids can be trained to jump or run differently
to avoid injuries.



"That was perfect," Sabick says and shows the computer screen to Cooper, one of dozens of Boise-area youth soccer players who have volunteered as research subjects.

"The equipment (display shown below) that we use is the same as



the equipment that's used to create video games and also to create animated

edge

unique

There

doesn't

anywhere.

seem to be

movies like Toy Story," Sabick explains.

Boise State's new Center for Orthopaedic and Biomechanics Research, which was approved by the State Board of Education in June, will help BSU scientists edge further into the national spotlight in the highly competitive field of knee injury research. By focusing on an area that hasn't been extensively studied — preventing injuries of the knee's anterior cruciate ligament (ACL) in youth athletes — researchers are finding success.

"In research, you have to find your niche," says Pfeiffer. "Our research in the area of ACL injuries, particularly in children, is to the best of our knowl"The equipment that we use is the same as some of the equipment that's used to create video games ...."

— Michelle Sabick

chology, from physics to materials science

work together on major medical issues, hoping to see some substantive results.

"I think in the future, great developments in scientific areas will come at the interfaces of these disciplines," says Martin Schimpf, a Boise State chemistry professor and associate dean of the College of Arts and Sciences. "I think Boise State has a strong interdisciplinary research community in which everyone knows each other and there's a lot of collaboration going on all over campus."

For example, biology professor Julia Oxford has joined forces with electrical engineering professor Bill Knowlton to use an atomic force microscope, commonly used for imaging atomic or molecular level structures in semiconductor devices, for a medical research application. A

\$234,000 grant from the National Science Foundation enabled the university to upgrade the microscope in 2001.

"With the atomic force microscope, they're getting wonderful pictures of collagen molecules," says

pursuing that line of inquiry."

It's not only the biomechanics researchers who are breaking into the major leagues of medical research at Boise State. Biomedical and health-related research has taken off in the past five years and comprises a significant portion of Boise State's total research grants, which amounted to \$22 million for externally funded

grants and programs in fiscal year

2003 (see Page 11).

any other research group, certainly in

North American labs, that is actively

While the research projects vary greatly in scope and direction, they share many similarities. Instead of competing head to head with major research institutions, Boise State departments have built research clout by successfully leveraging their assets — collaborating with other research institutions and universities, addressing issues that bigger research centers may overlook, capitalizing on Boise State's location in Idaho's capital city, and procuring grants to obtain new equipment that allow them to head out in pioneering directions.

An entrepreneurial spirit is emerging as researchers from nursing to psy-



## Medical research from A to Z

Here's a small sampling of some of the health-related research projects at Boise State:

**ALCOHOLISM** — Henry Charlier, chemistry, studies enzymes involved in alcohol metabolism. How alcohol is metabolized may be an important determinant in the development of alcoholism and fetal alcohol syndrome. He also works with the Veterans Affairs Medical Center (VA) to study the role enzymes may play in causing heart damage in patients using chemotherapeutic drugs called anthracy-

clines. Funding: Mountain States Tumor and Medical Research Institute (MSTMRI), National Institutes of Health BRIN program, NIH, Research Corp.

**ALZHEIMER'S DISEASE** — Troy Rohn, biology, investigates whether a small protein, Beta Amyloid, is the trigger that causes critical brain cells called neurons to self destruct as part of a process called apoptosis. Apoptosis is widely believed to be what causes the destruction of neurons in Alzheimer's victims. He collaborates with researchers at University of California-Irvine.

Oxford. She studies the molecular level function of collagen in tissues such as bone, cartilage and the vitreous humor in the eye. Defects in collagen processes can result in degenerative conditions such as osteoarthritis or thickening of the vitreous humor leading to a detached retina.

Understanding the processes, says Oxford, could potentially enable scientists to intervene and prevent those conditions. After all, this research isn't merely an academic endeavor; its ultimate goal is to fight disease and improve human health.

Like the ACL researchers, biology professor Cheryl Jorcyk says she too has carved out a niche by researching a cell factor that, for now, seems below the radar of major medical labs. In collaboration with Dr. Randy Ryan at the Veterans Affairs Medical Center, she's studying the effects of a cell factor, Oncostatin M, on breast cancer tumor progression and metastasis.

"It's not a super famous cell factor, so the competition isn't as great," she says. "We're not going to compete with major cancer centers ... [that] have entire buildings with 100 professors dedicated to one topic; here we have only one person [in the biology department] working on cancer.

# Biomedical researchers benefit from \$9.89 million grant

A new high-speed, fiber-based telecommunications system, funded with a \$9.89 million grant from the National Institutes of Health, will provide Boise State's biomedical researchers with powerful new tools to access the latest research studies via the Internet and collaborate in real time with their counterparts in six Western states.

The new NIH grant funds the formation of a telecommunications network for biomedical researchers in Montana, Wyoming, Idaho, Alaska, Hawaii and Nevada. Called Lariat, the network will enable scientists and educators to take advantage of the wealth of remote research resources, collaborations, and expertise that are routinely available to scientists in more populated areas of the country.

Boise State biology professor Julia Oxford, who coordinates the university's Biomedical Research Infrastructure Network (BRIN), says the NIH grant brings many benefits to Boise State's growing biomedical research community, including the ability to access such technology sites as the San Diego Supercomputing Center. In addition, the new system will make communication much easier by enabling researchers at different institutions to meet "face to face" in virtual meetings in real time.

The Lariat project is led by biomedical researchers at Montana State University and the University of Washington. The network is expected to take two to three years to complete and is intended to be a model for future projects elsewhere.

"We know we're competitive, we know we're doing a good job here. Everybody here is a competitive researcher." Quality, not quantity, is the focus of this small cadre of scientists who emphasize well-chosen areas of inquiry in which they can make scholarly contributions and publish in peer reviewed science journals.

When it comes to biomedical research, another factor in Boise State's favor is its location. "We're in the metropolitan area of Idaho, and we are in close proximity to several hospitals that have active research programs that are focused on human health," says Oxford.

From applied research on hospital practices to molecular level studies of disease processes, Boise State professors and students are collaborating with area medical centers and health-care providers. (See "Medical Research from A-Z," below.)

Boise State's location in the medical hub of Idaho has created numerous research opportunities even though Boise State's primary role and mission is not in the field of health sciences. That's Idaho State University's role. Boise State's primary academic emphases designated by the State Board of Education are business and economics, engineering, social sci-

ences, public affairs, performing arts and teacher preparation.

However, Boise State's strengths in medical research areas, from basic sci-



**ANTICANCER AGENTS** — Don Warner, chemistry, studies a class of anticancer agents (aziridinomitosenes) that fight cancer by binding to DNA. Specifically, he wants to understand the order of events required for DNA interactions. Funding: MSTMRI, NIH-BRIN.

**ASTHMA** — Denise Wingett, biology, studies how a regulatory protein expressed on the surface of T cells contributes to the development and progression of asthma. Funding: VA, MSTMRI.

**BRAIN INJURIES** — Pennie Seibert, psychology, examines stroke and other traumatic brain injuries, looking for ways to continually improve outcomes and support systems for patients. She collaborates with the Idaho Neurological Institute at Saint Alphonsus Regional Medical Center.

**BRONCHIAL CONSTRICTION** — Lonny Ashworth, respiratory care, and Nirmal Charan, chief of pulmonary/critical care medicine at the VA Medical Center, evaluate the effect of bronchial blood flow on airway resistance and the delivery of aerosolized medications used to treat bronchoconstriction.

ence to public policy, do not interfere with Idaho State's mission of health science education, says James Girvan, dean of the College of Health Sciences at Boise State.

"I happen to think that the more universities do research, the more all of Idaho will benefit," he says. "I don't see Boise State as stepping on any toes in the area of research because we have many very qualified, very interested, dynamic individuals [at all Idaho institutions] who have not only a capacity but a willingness to study in these areas."

Girvan points out that collaborations among Idaho's three universities have brought opportunities that one individual university might not have been able to obtain on its own.

One successful effort joining Idaho's sister universities began in 2001 with the National Institutes of Health Biomedical Research Infrastructure Network (BRIN), a program to boost research at Idaho universities. BRIN funded the three universities in a shared \$6 million grant focusing on medical genomics, the practical application of the Human Genome Project. This October, a proposal for another \$12.5 million, five-year grant was submitted.

"The camaraderie and partnership that's developed among researchers at the three universities is unprecedented," says University of Idaho principal

# Team seeks 'cure' for knee injuries

hink of it as you would an inoculation to prevent a disease. The "medication" that
Intermountain Orthopaedics surgeon
Kevin Shea and Boise State kinesiology
professor Ron Pfeiffer would like to
administer to youth sports participants is a training program to immunize them against severe and debilitating knee injuries.

Shea and Pfeiffer haven't succeeded yet, but their efforts have earned them an invitation to present their research, and that of BSU graduate students Sara Grandstand and Dana Roberts (MS, exercise and sports studies, '03), in March 2004 at the American Orthopaedic Society for Sports Medicine (AOSSM) conference in San Francisco. That elite invitation places them at the forefront of knee injury prevention research.

"What we're seeing clinically is a growing number of children and adolescents with serious knee injuries, including ACL [anterior cruciate ligament] tears," says Shea.

With help from the Idaho Sports Medicine Institute and funding from the Saint Alphonsus Orthopaedic Institute, the research team designed a program of strengthening, controlled jumping maneuvers and stretching exercises to see if they could reduce kids' injury rates. The program is called KLIP — knee ligament injury prevention.

Because non-contact injuries often occur when kids are running and make quick direction changes, scientists have postulated that improving specific motor skills through an intervention program would reduce the injury rate.

From Twin Falls to Boise, 112 high school girls volleyball, soccer and basketball teams participated and were assigned to one of two groups — those that did the KLIP program and those that did not.

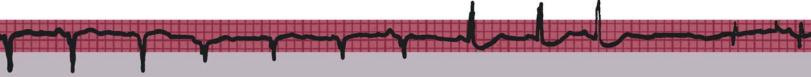
Girls teams were chosen as subjects

investigator and research professor of biology Michael Laskowski. "Everyone has eliminated their parochial interest and just works for the common good."

Idaho institutions have also experienced dramatic growth in major NIH grants and contracts. Between fiscal 2000 and fiscal 2002, awards to Idaho's universities more than dou-

bled, growing from \$4.2 million to \$11.7 million. Idaho's rate of growth for NIH funding is among the highest in the nation.

Boise State has also gained stature as an up-and-coming competitor for other major grants. Both private and public funding sources enabled the College of Arts and Sciences to acquire



**CELL GENETICS** — Cheryl Jorcyk, biology, investigates the function of a cellular factor, Oncostatin M (OSM), produced by certain cells of the human immune system, and the role it may play in breast cancer progression and metastasis. Her lab also conducts genetic experiments using mammary and prostate cell lines from different stages of cancer progression. She collaborates with VA. Funding: MSTMRI.

**CHEMOTHERAPY** — Susan Shadle, chemistry, studies molecular level causes of cardiotoxic (heart damage) side effects in a class of chemotherapeutic drugs called anthracyclines. She collaborates with the VA. Funding: NIH, MSTMRI.

**CULTURAL ISSUES** — Sharon Stoffels and Pam Springer, nursing, and Eric Landrum, psychology, explore elements related to cultural competency while developing a tool to measure cultural sensitivity in nurses. Funding: U.S. Department of Health Resources and Services Administration through the La Buena Salud project.

**THE ECONOMICS OF ORGAN TRANSPLANTS** — R. Larry Reynolds, economics, and Dwayne Barney, marketing and finance, authored several articles on the economics of organ transplants that are frequently cited. Reynolds has also published several articles on health care expenditures and the institutional structure of health economics.



Intermountain Orthopaedics surgeon Kevin Shea discusses knee injury research at a recent biomechanics lab open house while fellow physicians Alex Homaechevarria (left) and Steven E. Roser look on.

because female athletes suffer ACL tears at a rate five to eight times greater than males, Shea says. The reasons for the higher injury rate are somewhat of a mystery and could involve numerous physiological factors. Another study aimed at understanding this gender difference is under way in the new Boise State Center for Orthopaedics and Biomechanics Research.

After two years, says Pfeiffer, "we found that there wasn't a statistical difference in the incidence of ACL injuries at the schools that did our

KLIP program. We were the first research group that found that an intervention program didn't...reduce the incidence of ACL injury."

The Boise State study was more scientifically rigorous than any done so far, says Pfeiffer, hence the top tier recognition by the AOSSM.

The researchers are planning to finetune the training program and try again. "I'd love to be able to have the cure for ACL injuries," says Pfeiffer.

Even Jonas Salk probably didn't succeed on the first try.

-Patricia Pyke

key research equipment this fall. An analytical ultracentrifuge to characterize individual molecules was funded as part of a \$327,500 grant from the private M.J. Murdock Charitable Trust; and an electron magnetic resonance spectrometer, with plans for use by scientists from MIT to Washington State, was funded by a \$338,000

National Science Foundation grant. (See stories, Page 21.)

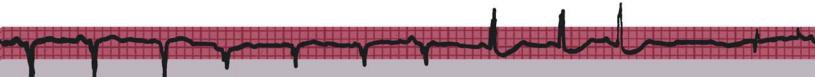
"As Boise State evolves into a research institution that pursues more external funding, we need to build infrastructure and support that are currently lacking," says Daryl Jones, Boise State's provost and vice president for academic affairs.

He also says that developing biomedical research infrastructure is a relatively new task at Boise State since the university's primary role and mission has historically been in areas in which external funding has been scarce.

Boise State's lean infrastructure means researchers often wash their own test tubes, order their own supplies, run their own equipment, pay their bills and manage bookkeeping records on multiple grants, all with minimal administrative and technical staff support. Those tasks come in addition to hefty teaching loads and other research responsibilities such as preparing manuscripts, writing grants and traveling to conferences in order to exchange ideas with other scientists.

The researchers "who are here are under a strain, and they're doing a magnificent job, but at some point they're going to need additional support," says Jones. "If the state will make that investment, we can repay it many fold. We can turn around and multiply every dollar they invest here."

Pfeiffer, a 24-year veteran at Boise State, is representative of the many researchers who wholeheartedly enjoy teaching and research. "One of the things we take pride in is we are always providing students the opportunity to be involved with the research," he says.



**ENVIRONMENTAL HEALTH** — Dale Stephenson, environmental health, probes health effects associated with transient exposure to high concentrations of particulate matter and carbon monoxide in the U.S./Mexico border region. He collaborates with University of Utah, Southwest Center for Environmental Research and Policy. Funding: EPA.

**HEALTH POLICY** — Center for Health Policy researcher Helen Stroebel led a three-year evaluation of the state's Millennium Tobacco Cessation, services provided to seven health districts in Idaho. Bonnie Lind, the center's assistant director, conducted a statewide

survey of seat-belt use and attitudes for the Office of Highway Safety of the Idaho Transportation Department.

**HEALTH POLICY** — Sarah E. Toevs, health science, and Bonnie Lind, Center for Health Policy, completed A Statewide Evaluation of Change in Youth Asset Awareness in Idaho. Funding: Association of Idaho Cities.

**MENTAL HEALTH/CODEPENDENCY** — Daniel Harkness, social work, studies how codependent attitude and behavior affect the relationship between parental substance abuse and offspring medical and psychological problems.

He prefaces further remarks by saying, "Please don't think I'm anti-teaching. I love to teach, but you can only do so many things in a 24-hour time period. And unfortunately, research, certainly in these areas of inquiry, demands huge amounts of time to plan, implement and do something with the results."

Even so, the biomedical researchers across campus seem remarkably upbeat, and their goals are nothing if not lofty. Jump-starting a biotech industry in the Treasure Valley is their ambition.

"The medical area is a hot area of research right now," says Sabick. "It's reasonably well funded and it would be a good diversification for [the university] as well as for the economy of the valley."

In terms of economic development, health-related industry is a driving force, says Girvan. "Health care takes about 15 percent of [U.S gross domestic product and also employs about 15 percent of our work force," not including additional amounts for research and public health expenditures, he says, citing statistics from a national policy conference held at Boise State in September.

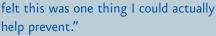
Like electronics companies 30 years ago, perhaps medical industry visionaries will find a fertile environment to grow in Boise's biomedical research climate.

### Parents' influence can shield kids from

oise State psychology professor Rob Turrisi still remembers the day he became dedicated to skin cancer prevention research. It was the same day he realized that at least three of his son's 19 first-grade classmates were likely to develop skin cancer sometime during their lifetimes. That number seemed unfairly high, and it bothered him.

"Despite it being the most curable form of cancer, it is also the riskiest,"

he says. "It's the cancer most likely to spread to other organs, and it's only curable if it's diagnosed early. The more I talked to people, the more I realized they didn't know that. I



And thus was born a crusade to educate parents and children about the dangers of tanning, the importance of sun screen and the need to get regular checkups from a dermatologist.

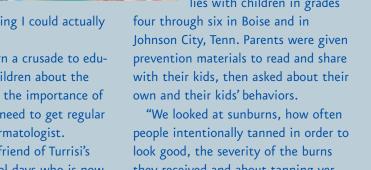
Joel Hillhouse, a friend of Turrisi's from graduate school days who is now a psychology professor in Tennessee, originally recruited Turrisi for the project. Hillhouse had done the basic research on prevention and Turrisi had experience in parent and child communication. All they needed now was a cancer expert, so they went after one of the best.

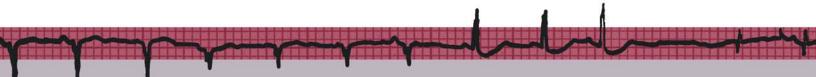
"June Robinson is an M.D. at Loyola and an expert in the field of cancer prevention and treatment,"Turrisi says. "She's it." Although Robinson orig-

> inally declined the invitation to join the team, after reading through the background material Turrisi sent her she called to say she was in.

In 1999, the American Cancer Society funded the trio's three-year study to track the efficacy of parentchild communication in skin cancer prevention. Over the course of that study, the group talked with 600 families with children in grades

"We looked at sunburns, how often look good, the severity of the burns they received and about tanning ver-





MICRO-BLADES FOR OPHTHALMIC SCALPEL — Jeff Jessing, electrical engineering, evaluates micro-machined silicon processing techniques to form ultra-sharp, durable micro-surgical blades for LASIK and cataract surgery. He collaborates with physicians at Doheny Retina Institute at the University of Southern California.

MUSCLE ELECTRICAL ACTIVITY — Elisa Barney Smith, electrical engineering, and Michelle Sabick, mechanical engineering, are working with students to develop software to analyze electromyographic (EMG or muscle electrical activity) data from muscles.

PAIN MANAGEMENT — Cynthia Clark, nursing, and senior nursing leadership students, in conjunction with the Rural Connection, study and establish practice guidelines for effective pain management in addicted and recovering clients.

PATIENT CARE — Ingrid Brudenell and Judy Farnsworth, nursing, conduct evidence-based research of clinical practices, such as the effectiveness of patient care practices to reduce pressure ulcers and falls, through a joint appointment at St. Luke's Regional Medical Center.