

# TEAM PLAYERS

## How Mentorship Strengthens Boise State's Research Culture

Teamwork isn't just found on the famous blue turf. It's also a core value of Boise State's growing research programs. Undergraduate and graduate students are the beneficiaries of collaborations with faculty who are pursuing a broad range of funded projects. By interacting with faculty and with their peers, student researchers gain skills, knowledge and insight. Faculty also benefit from sharing ideas and expertise with their colleagues. Here's a look at several of the university's many research groups.

### KNOWLTON: INDUSTRY MODEL SUPPORTS GROUP'S SUCCESS

“Without the passing on of knowledge, there wouldn't be any progress,” said Chris Buu, a graduate student in electrical and computer engineering at Boise State. While his statement qualifies as basic wisdom, he was referring to the crucial role mentoring plays in research.

Buu is one of more than a dozen graduate and undergraduate students working with engineering and science faculty in an interdisciplinary collective on the cutting edge of materials research. Housed in the College of Engineering, the group currently is pursuing projects ranging from creating DNA nanostructures that support novel electronics to testing next-generation semiconductor materials to developing chemical amplifiers that may someday help detect cancer.



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While the work is exciting and beneficial to young researchers such as Buu, the interaction with other students and faculty advisers is equally valuable. “It has definitely enhanced my academic experience,” he said.

The group was founded by Bill Knowlton, a jointly appointed professor in materials science and engineering and electrical and computer engineering. He worked for Hewlett-Packard Labs and Insight Analytical Labs before joining Boise State's faculty in 2000, and the lessons he learned as a professional informed the operation of his research group from day one.

“Coming from industry, I know that teamwork and collaboration are important,” Knowlton said. “I modeled the group structure with this in mind.”

The core of that structure includes faculty members William Hughes and Bernard Yurke in materials science and engineering, Wan Kuang in electrical and computer engineering, and Jeunghoon Lee in chemistry. And the group frequently collaborates with materials science and



**Engineering professors Bill Knowlton, left foreground, and Will Hughes are part of an interdisciplinary research group that includes other faculty and undergraduate and graduate students.**

engineering professor Peter Müller.

"It's a distributed load, everyone contributing and benefitting, which provides students an opportunity to have a stake and ownership in the direction of the group," said Hughes. "We share space, resources, ideas and management, so cohesiveness is extremely important."

Hughes came to Boise State in 2008 from a faculty position at California Polytechnic State University in San Luis Obispo. While he is a seasoned researcher and the recipient of prestigious awards and fellowships, he said the most valuable aspect of his transition to Boise State was learning the ropes from his new colleagues.

"In many ways, our relationship is much greater than a collaboration," Hughes said. "It's very much a unified effort."

An emphasis on extensive communication among all faculty and students in the group has been integral to its growth and accomplishments, according to Knowlton. He defines research success as a combination of great results, dissemination through publication, collaboration with

outside groups, and the ability to secure grant funding to support students and further work.

"The students are mentored in each of these aspects. The more they know about the process, the more they can contribute," Knowlton said.

Borrowing from Knowlton's industry experience, students work in sub-groups on particular projects that contribute to overall research goals. Student leaders manage regular meetings to discuss progress, setbacks and ideas. While faculty researchers are deeply involved, they know when to step back.

"Their management style is hands-off in the lab, which provides opportunities for students to come into their own and run the day-to-day show," said Dave Schenker, a sophomore mechanical engineering major who conducts microscopy research for both Knowlton and Müller. "All of the professors are very active in guiding the work, and the more experienced students are responsible for training fresh recruits. I'm still on the receiving

end, which has been indispensable.”

Some of that leadership comes from doctoral student Richard Southwick III, who got involved in the group as an undergraduate in electrical and computer engineering and now is one of its most senior members. He credited his long-term investment to the seeds planted by hands-on undergraduate research and opportunities to present it, from Boise State’s Undergraduate Research Conference to the Institute of Electrical and Electronics Engineers International Integrated Reliability Workshop in Lake Tahoe, Calif.

“Thanks to Dr. Knowlton, I was introduced to leading researchers in my field and had the opportunity to interact with them and share my results,” Southwick said. “He and the other faculty have always been very supportive and genuinely interested in my research interests and future career, always willing to take time to provide direction.”

Providing direction falls just as much to the students, who consult and depend on each other daily. Junior materials science major Stephanie Barnes has been the leader of the fabrication sub-group since June 2009, and she still is learning from her teammates – especially those with less experience.

“New members are extremely eager to learn, which renews my interest and keeps me sharp, and the fresh, focused perspective of nontraditional students reminds me to think more about the material than the grade,” Barnes said, adding that her research training has taught her to appreciate even the smallest victories, the subtlest steps forward. “For me it has involved a perspective shift where every detail involves you educating yourself. I look at the world differently now. Being in this group has made learning itself more interesting.”

Whether analyzing esoteric data or beating the faculty at

pingpong, the students in this dynamic Boise State research group are exceptionally engaged and prepared for whatever futures they choose.

“The idea is that students will leave our institution and make a positive impact on society,” said Knowlton. “I derive more satisfaction from seeing a student progressing in this manner than I do from performing good research.” – **Erin Ryan** ◆

## OXFORD: HANDS-ON RESEARCH HELPS STUDENTS THRIVE

**L**uke Woodbury, a senior biochemistry major from Boise, had his sights set on becoming a medical doctor. But four years of working various jobs in Julia Oxford’s laboratory at Boise State helped put his life on a different course.

“Now, I think I would be much happier doing research,” Woodbury said. With plans to graduate soon, Woodbury is exploring his options for graduate school and eventually a doctorate. He thinks his hands-on lab experience – an unusual opportunity often available to Boise State undergraduates – will make his graduate school application stand out.

Oxford, director of Boise State’s Biomolecular Research Center and a professor of biology, agrees, noting that experience also gives undergraduates a leg up in their classes, where static lectures can leave students with little perspective on the applications of their lessons.

“I think people learn so much better by doing,” Oxford said. “By offering undergraduates the opportunity to carry out guided independent research, they can understand everything that goes into a funded research project from start to finish. It’s a very valuable experience.”

Woodbury started out cleaning up and doing inventory around the lab. But under the careful supervision of Oxford and her staff of post-doctorate researchers, graduate students and undergraduates, he worked his way up to being a biochemistry technician making proteins for Oxford’s efforts to understand how cartilage functions as a tissue. Arthritis or joint pain sufferers could one day benefit from her work, which is funded by the National Institutes of Health and the Idaho State Board of Education, among others.

“It’s an incredible experience and opportunity that I don’t think I would have ever had otherwise,” Woodbury said.

Faculty members appreciate the opportunity to open doors students might not have considered, Oxford said. “I think most faculty members enjoy mentoring because they can think back to mentors that influenced the choices that they made as young people. They know it really makes a difference.” – **Mike Journee** ◆

**Biology professor Julia Oxford** discusses a lab experiment with senior **Luke Woodbury**.



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CARRIE QUINNEY PHOTO



Business professor Rob Anson coaches students who work directly with Idaho business clients.

## ANSON: CONSULTANT APPROACH ENCOURAGES STUDENT INNOVATION

Textbooks and coursework can teach budding programmers to write code. But they won't teach them how to work through detailed negotiations with clients, how to recognize nuanced differences between projects, or a whole host of other skills that will help them succeed in the workplace.

Boise State business professor Rob Anson uses an innovative approach to bridge the gap.

"There are things that just don't come from a book and knowledge that is difficult to impart in a full classroom," he said. "If I can model processes and behaviors for my students, they can learn so much more."

As a doctoral student, Anson first learned about "cognitive apprenticeship," the theory that people best learn to think by observing others more skilled than themselves think and act out loud through a situation. He's been using it ever since.

In his capstone class for information technology majors, Anson acts as consultant for teams of students who do everything from system development to cost benefit analysis for real clients. He believes in the mentoring concept so strongly that he and his wife moved into the business residential college for a year where they could interact with students outside of class. He also advises and supervises students.

When Vincent Lukasavich returned to school for a second degree, Anson helped him understand the information technology field and what types of jobs it might help him attain. Now a senior, Lukasavich works under Anson as a peer adviser to other students.

"Dr. Anson has a wealth of knowledge in the field and I've often sought his advice," Lukasavich said. "His demeanor and personality are really open, and he takes a genuine interest in students."

The relationships he's built with students are equally rewarding for Anson. "Most faculty crave seeing that spark, that moment when the student grasps something. It's why we are drawn to teaching in the first place," he said. "When you work with a student one-on-one, you see it." — Sherry Squires



## Mentorship plays a vital role in university's research success

One of the most rewarding parts of publishing a university research magazine is the opportunity it provides to showcase the excellent work of our faculty and students. This issue of *Explore* literally explores the world, with articles that highlight Boise State research pursuits in locations ranging from the Arctic to Africa, as well as here in the Treasure Valley and throughout Idaho.

These diverse projects provide many benefits to our state and region, not all of which are quantifiable. In some cases, there are no dollar amounts or hard statistics to determine what benefit our students ultimately derive from working alongside faculty on funded research projects. But the benefits are substantial, and many of the articles in this issue of *Explore* underscore that fact.

Mentorship – the process by which a more experienced person helps a less experienced person – is a theme that runs through this issue of our magazine. It is overtly explored in "Team Players," the article preceding this column that focuses on several of our outstanding research groups. But mentorship also is an underlying theme in a number of other articles, as students discuss how hands-on research under the guidance of faculty enhances their education and prepares them for future careers, school teachers describe how our faculty are helping them develop new classroom skills, and new faculty relate the benefits of working with established faculty researchers.

The research culture of our university is grounded in collaboration, as the stories in this issue of *Explore* attest. It's exciting, and gratifying, to see the creative ways our faculty and students are driving this dynamic forward. As our university continues along the path of research excellence, our commitment to mentorship will help guide the way.

— MARK RUDIN, VICE PRESIDENT FOR RESEARCH