



William Wood, Portland State engineering professor, understands the kind of stress metal is subjected to in Portland's bridges.

Photos by KELLY JAMES

## PSU RESEARCH: REGIONAL FOCUS, GLOBAL RELEVANCE

**From high tech and hard science to business and society, PSU researchers play a critical role in shaping Oregon's future.**

Research at Portland State has more than doubled in the past decade as the University has added new faculty, programs, and advanced degrees. Funding this expansion are larger awards coming to a wider array of disciplines. Last year, faculty secured nearly \$50 million in new research grants.

This rapid rise in funded research is adding to Portland State's reputation as a University engaged in timely, applied research that is both regionally focused and globally relevant.

From high tech and hard science to business and society, PSU researchers — and students — play a critical role in shaping

the future of Oregon and beyond.

### REGIONAL FOCUS

Whether fighting invasive species in our lakes and rivers, testing how well "green" roofs function in different climates, or finding innovative ways to help troubled teenagers break the cycle of drugs and violence, PSU researchers take on the greatest challenges facing citizens and industry of the Pacific Northwest today.

At PSU, William Wood, mechanical and materials engineering professor in the Maseeh College of Engineering and Computer Science, puts metals through extreme stress in order to find out what

these materials can withstand — limits that are best discovered through testing prior to application.

Wood's projects range from developing better bridge-fabrication techniques to testing ultra-strong, corrosion-resistant alloys for companies like Boeing, American Bridge Company, and ESCO. The work is a marriage of engineering, chemistry, physics, and advanced instrumentation conducted in PSU facilities that include a cutting-edge electron microscopy center and a Gleeble dynamic-test system, one of only two such systems at a U.S. university.

As a partner in the state-funded Oregon Metals Initiative, researchers like Wood



The successful use of local produce by Hot Lips Pizza is studied by Mellie Pullman, a Portland State professor of supply chain management and logistics.

help to ensure the continued competitiveness of the metals industry, a vital asset to the Oregon economy, comprising some 55,000 jobs across 1,700 companies.

The rising demand for locally produced goods, coupled with heightened awareness of sustainable business practices, stands to benefit Oregon wineries, dairies, and meat producers — if they can find ways to get their wares to market.

To help manage these food supply chain issues, many processors turn to Madeleine “Mellie” Pullman, the Willamette Industries Professor of Supply Chain Management and Logistics. She’s studying success stories of organizations like Country Natural Beef, a cooperative of family businesses committed to environmentally responsible practices. Pullman is also looking at enterprises that have been slow to adapt, in order to better understand their impediments to change.

This expertise makes Pullman a researcher in demand, both by industry and by students eager to learn more about this emerging field of study. It’s also one of many ways that sustainability study and



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research has been integrated into PSU programs as varied as architecture, engineering, environmental studies, and education.

Few American cities can claim transportation options as diverse as Portland’s. And when it comes to bicycling, the City of Roses has set the pace for accommodating this environmentally friendly mode of transportation.

Despite Portland’s comparatively high number of transit cyclists, little research has been conducted to understand why people opt for pedal power.

That’s where transportation studies professors like Jennifer Dill come in. By using GPS devices strapped to bike commuters,

coupled with rider surveys, Dill’s team has generated a wealth of data about the routes cyclists take, differences in riding between men and women, and other information that can help cities better understand what infrastructure cyclists really need to get from point A to point B.

As cities around the world look to Portland as a lab for innovative transportation solutions, Portland looks to PSU to investigate how well these different options function. It’s this reputation that helped PSU, collaborating with other Oregon universities, land \$16 million in federal funds to launch the Oregon Transportation and Research Education Consortium, based at Portland State.

### **SOCIAL PURPOSE**

Some researchers seek ways to build a better widget. Others work to improve the lives of the widget-makers.

Since 1972, the Regional Research Institute for Human Services in PSU’s School of Social Work has tackled tough issues that society is too often willing to overlook: disabilities, drug addiction, mental health,



Jennifer Dill, a cyclist and Portland State transportation studies professor, is researching bicycling behavior on Portland's streets.

and criminal justice. This research is regularly conducted in close collaboration with the populations being served.

Currently, Institute Director Laurie Powers is heading up a project sponsored by the National Science Foundation and partnering with the Oregon Business Leadership Network that looks for ways to draw high school students with disabilities into the fields of engineering, science, and math. One potential solution: pairing these students with mentors in the field — perhaps even mentors who themselves have overcome disabilities. The project, beginning this fall, will involve students from Portland Public Schools.

Though not technically a disability, a lack of education can prove limiting for adults. Many adults trying to learn English, earn a GED, or prepare for college have the will to learn but are unsure how to achieve their goals.

Steve Reder, a professor of applied linguistics, has spent years studying adult education. He believes that lifelong learning is critical in order for people to take their place as part of the workforce, as

informed consumers, and as healthy and contributing members of society.

To that end, Reder has launched Learner Web, a Web application that enables cities and employers to better meet educational and training needs: from GED preparation to improving computer skill sets, and from understanding what it takes to succeed in college to obtaining the right skills for the job. Eight regions, including Boston, Washington, D.C., and Portland are set to implement Learner Web by early 2009. The program is one of numerous real-world applications for research at Portland State and showcases the potential for shared academic inquiry.

#### GLOBAL RELEVANCE

A growing number of PSU researchers are making global contributions from their offices and laboratories in downtown Portland's South Park Blocks.

For example, geographer and geologist Andrew Fountain has a glacier named for him in Antarctica, but it's his research into massive ice sheets of the western United States that's revealing some of the most

tangible examples yet of global warming — glaciers losing one-third to one-half their size over the past century. In Montana's Glacier National Park, researchers found a 66% decrease in glacier size.

These melting glaciers are the largest contributor of "new water" to oceans that are already rising due to global temperature increases. Fountain plans to begin developing computer simulations that will anticipate rates of future change — a critical environmental and economic issue for Western states struggling with water and ice issues that affect their natural resources and recreation areas.

Also of global significance is professor David Peyton's discovery of a potential cure for malaria. While drugs exist to combat this deadly disease, virtually none are safe, affordable, and effective for pregnant women and children — leading to hundreds of deaths every day.

Peyton is modifying Chloroquine, a drug that was initially safe and effective when introduced decades ago until resistant strains of malaria evolved. With the assistance of Portland State's Innovation



David Peyton, Portland State chemistry professor, has developed a potential cure for malaria.

and Industry Alliances program, Peyton is patenting the process and establishing DesignMedix, a startup company seeking a second round of funding from the National Institute of Health. Peyton hopes that recent successes with mice will lead to FDA-approved human trials in two or three years.

Peyton's research demonstrates the value of basic research for professors, students, and the public. It also shows the unique role that a university can play. Peyton's plan to develop the drug and distribute it as cheaply as possible would never prove viable for major drug companies. But the social incentive — a chance to save millions of lives — makes it an ideal fit for Portland State's mission.

### **GROWING CAPACITY**

The growth in research activities at Portland State can be attributed to both faculty and facilities. Over the past decade, PSU has developed the Center for Electron Microscopy and Nanofabrication — a standard-bearer for West Coast universities in terms of characterizing and

fabricating materials at the nano level, and a signature research center of the Oregon Nanoscience and Microtechnologies Institute (ONAMI).

The center is used by engineering and science faculty at PSU as well as researchers from other universities throughout the region. It also provides top-notch training opportunities for students, while supporting industry testing and collaboration.

A boom in building across campus has also created new venues for teaching and research, including a new engineering building that opened in 2006, greenhouses for environmental sciences, and a business accelerator complex housing two dozen start-up companies.

The University is currently working on a multimillion-dollar transformation of its science buildings into a cutting-edge Science Teaching and Research Complex; discussions are also underway with Oregon Health & Science University, Oregon Institute of Technology, and Oregon State University for a life sciences complex in the South Waterfront district.

Much of this growth at the University

can be attributed to new faculty, who have brought to PSU funded research programs, graduate students, and — in at least a dozen cases — dual appointments with Oregon Health & Science University. This fall, those ranks will expand to include two ONAMI Signature Faculty Fellows.

Over the past few years, Portland State's curriculum has expanded with new doctoral programs in research-dependent fields like biology, chemistry, math, physics, psychology, and sociology, and civil and mechanical engineering.

PSU has also been an active participant in new multi-institution partnerships, such as the Oregon Nanoscience and Microtechnologies Institute — with some three-dozen faculty engaged in ONAMI-affiliated research — the Oregon Built Environment and Sustainable Technologies Center (BEST), and Oregon Transportation Research and Education Consortium (OTREC). By pooling the expertise of the leading researchers at Oregon universities, these entities are better positioned to attract the major funding needed to convert innovation into economic opportunity.