Inquiry

Information from the frontiers of knowledge.

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Office of Research and Graduate Studies

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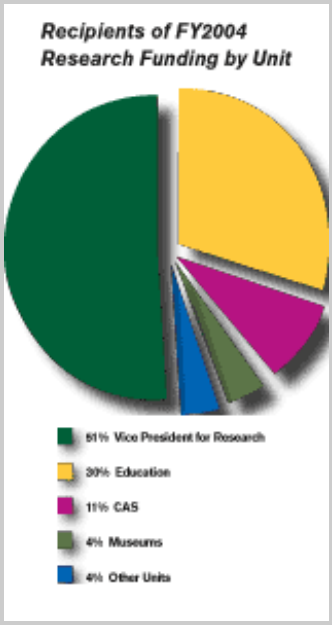
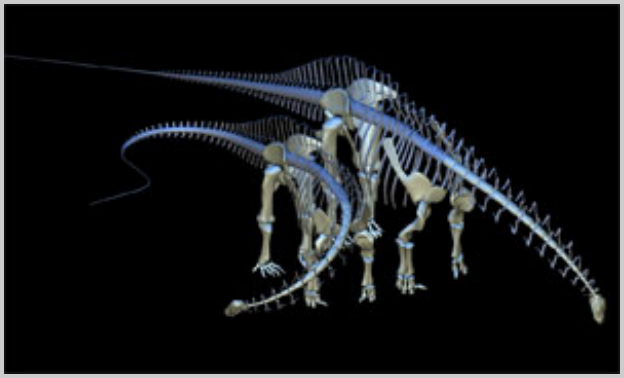
Technology Transfer

Record Research Dollars Benefit Oregon



A record-breaking $90.2 million in contracts and grants earned by University of Oregon researchers in 2004 promises innovative solutions to health, social and other concerns and, as an attractive side benefit, expanded job opportunities for Oregonians. **read more >>**

UO Connects Research, Innovation, Jobs



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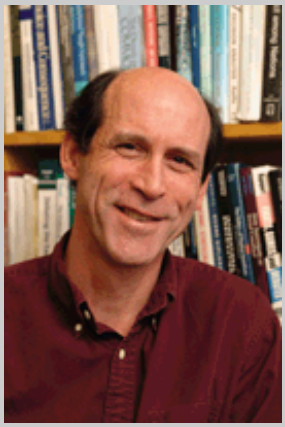

Associate Professor of Political Science Ron Mitchell

negotiating environmental treaties could be eliminated. **read more >>**

Oregon Stakes claim on 'Next Industrial Revolution'

U.S. Senator Ron Wyden and Congressman Peter DeFazio look on as Skip Rung, Director of ONAMI, acknowledges the research funding secured by OregonÕs congressional delegation.

Unprecedented collaboration, breakthrough innovations and major research funding are strengthening Oregon's claim-to-fame on nanotechnology--a field that the National Science Foundation leadership has said represents "the next industrial revolution." **read more >>**

Assaying Discoveries

The UO's Center for Advanced Materials Characterization in Oregon (CAMCOR) houses an array of sophisticated instruments that are as vital to the nanotechnology "gold rush" as assayers were to the miners of California. **read more >>**

Innovation Leads to Understanding

Researchers at the UO who are seeking ways to help people recover from strokes and brain trauma or to overcome behavior disorders reached another important milestone in research technology this year. **read more >>**

Partnership Addresses Heart Disease

A new UO partnership is taking aim at America's number one killer: cardiovascular disease. The Oregon Heart & Vascular Institute (OHVI) combines more than eight decades of research and expertise in human physiology at the UO with Sacred Heart Medical Center's reputation as one of the nation's top 100 hospitals for cardiac services. **read more >>**

John Halliwill's (standing, in back) research on the relationship of blood pressure and exercise will benefit from the UO's partnership in the Oregon Heart and Vascular Institute. Also pictured are assistant professor Christopher Minson and doctoral student Britta Torgrimson.

Gifts and Grants Enhance Learning, Scholarship

Paul Elstone, director of corporate and foundation relations in the UO Office of Development.

Donations to the University of Oregon from foundations and corporations topped $8.5 million last year, helping to make college affordable and enriching the university experience. **read more >>**

Innovative New Institute Tackles Policy Issues

UO President Dave Frohnmayer (seated, on left) speaks with stakeholders at the Institute for Policy Research and Innovation's Urban Rural Dialogue.

As its first project, the UO's newly created Institute for Policy Research and Innovation (IPRI) hopes to bridge Oregon's urban-rural divide. IPRI's approach will be to rely on Oregon's rich tradition of innovative public policy, emphasizing policy-relevant research, and to create and disseminate knowledge about classes of problems or issues. **read more >>**

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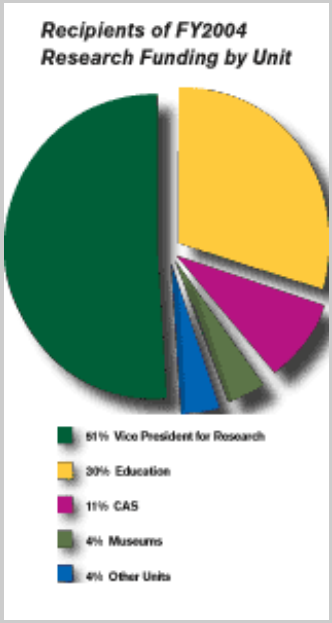
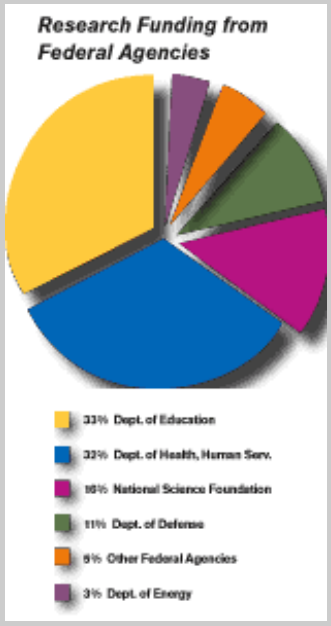


A record-breaking $90.2 million in contracts and grants earned by University of Oregon researchers in 2004 promises innovative solutions to health, social and other concerns and, as an attractive side benefit, expanded job opportunities for Oregonians.

Awards earned by UO faculty members last year mark a 56 percent increase in sponsored research at the university in just three years. The funding supports hundreds of scholarly projects, many that impact Oregon and the nation, such as **political scientist Ron Mitchell's study on the effectiveness of environmental treaties**, **psychology assistant professor Ed Vogel's work on attention deficit hyperactivity disorder**, and **human physiology assistant professor John Halliwill's research on heart health**.

U.S. News and World Report again ranked UO College of Education faculty members the most productive educational researchers in the nation, with nearly $1.5 million in competitive grants per tenured or tenure-track member in 2003-4. **One project by faculty researchers Rob Horner and George Sugai** is improving safety in schools across the country.



More than 85 percent of the UO's research funding in 2003-4 came directly or indirectly from federal agencies, such as the departments of Education (33 percent) and of Health and Human Services (32 percent), and the National Science Foundation (16 percent).

UO research funding makes a direct contribution to Oregon's economy, supporting 40 jobs per $1 million in funding, according to the U.S. Department of Commerce; drawing top graduate students to Oregon; and, in the long term, resulting in new inventions, spin-off companies and new or enhanced industries in the state.

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Read more: **http://orsa.uoregon.edu/**

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Announcements

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02/09/2005	DGA Travel Award Program Spring 2005
02/02/2005	Winter Seminars and Workshops on Research Administration
01/04/2005	2005 Video Workshops on Research Administration
12/16/2004	FY04 Annual Report on Grants and Contracts

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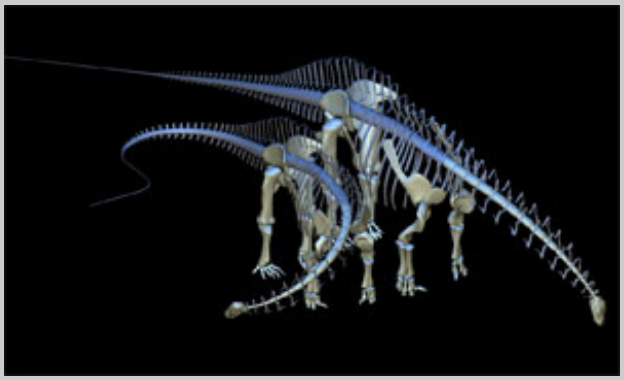
UO Connects Research, Innovation, Jobs



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The Riverfront Research Park, a cooperative effort of the University of Oregon and private developers, landed seven new tenants during fiscal year 2003-4. The companies are dedicated to research-and-development activities in the fields of neuroscience, biotechnology, behavioral science, early reading preparation, artificial intelligence, healthcare, alternative fuel sources, software, and language learning.

In total, the park now has twenty-one tenants with approximately 300 employees, helping to further diversify and expand the region's economic base.

Licensing of UO inventions and creative works was also active, bringing in nearly $1.93 million in licensing income during fiscal year 2003-4, a pace that ranks the UO among the nation's top research institutions per research dollar expended. In all, university researchers spun off three new companies in the fiscal year, disclosed a record forty new inventions, and produced an all-time high twenty-eight license and option agreements.

"These indicators illustrate that, per research dollar, the UO's ability to connect to economic development, and to translate research discoveries into practical applications, is running at a level that is competitive with top research universities nationally," said Richard Linton, vice president for research and graduate studies. "The results for our citizens are educational, medical and scientific accomplishments that improve lives and support Oregon's knowledge-based economy."

The UO produced about five inventions and $200,000 in licensing income per $10 million in research during the last fiscal year. The numbers compare favorably to a 2002 report by the Chronicle of Higher Education that showed U.S. research institutions produced a median of four inventions and $100,000 of licensing income per $10 million of research during the technology boom in the latter half of the 1990s.

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Read more: **http://www.uoregon.edu/newscenter/techtran04.html**

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September 29, 2004 - Today's Other News Items

Technology Transfer Income Sets Record

Licensing income from University of Oregon inventions grew to nearly $2 million in fiscal year 2003-4, ranking the UO among the top tier of the nation's research institutions per research dollar expended.

The university disclosed a record 40 new inventions last year, up from 36 in fiscal year 2002-03. The number of new UO license and option agreements also climbed to an unprecedented 28, compared to 25 the previous year.

"These **technology transfer** indicators illustrate that, per research dollar, UO research scholars translate basic discoveries into practical applications at a level that is competitive with top research universities nationally," said **Richard Linton**, vice president for research and graduate studies. "The results are educational, biomedical and scientific accomplishments that improve lives and support Oregon's knowledge-based economy."

Income from inventions licensed to the UO topped $1.92 million in FY 2004, up from $1.78 million in 2002-03. A record-setting $1.75 million, or more than 90 percent of the licensing income, was reinvested in UO research by distributing it to faculty inventors and academic programs. Research resulted in the creation of three new spin-off companies in the fiscal year that ended June 30, 2004. Those companies are:

-MitoScience, LLC, is a spin-off of research by Roderick Capaldi, professor of biology, and Michael Marusich, the director of the Monoclonal Antibody Facility that is part of the UO's Neuroscience Institute. In their university research, **Capaldi and Marusich** study the energy production powerhouses in cells called "mitochondria" and search for mutations of the DNA inside mitochondria that are believed to cause common late on-set human ailments such as Parkinson's and Alzheimer's diseases, as well as non-insulin-dependent diabetes. Their research led to the creation of scores of monoclonal antibodies (mAbs) that recognize specific mitochondrial structures. The UO has licensed certain commercialization rights for the mAbs to MitoScience.

-Kaibridge, Inc., is a spin-off based on the **DinoMorph** software developed by Kent Stevens, professor of computer and information science. Kaibridge markets engaging and authentic three-dimensional digital animals. Commercialized products in development, according to Kaibridge co-founder Dan Mayhew, are "virtual" pet dinosaurs, and other animals made available over the Internet, as well as educational kiosks for museums.

-**Eugene Software Solutions**, Inc.'s GradWeb is fully customizable web-based education software that was developed at the UO by Graduate School Associate Dean Toby Deemer and software consultant Asif Suria. By providing a medium for electronic interaction by the graduate school, departments, students, faculty members and the registrar's office, GradWeb eliminates the need for dozens of paper forms and hundreds of hours of administrative work.

UO innovations singled out for special recognition during 2003-4 include UO biology professor Eric Selker's discovery of the anti-cancer properties of "Zebularine," a potential new anti-cancer drug that was heralded in a National Institute of General Medical Sciences report to Congress as one of the 10 most significant innovations arising nation-wide from NIGMS-funded research in 2003. Chemistry professor James Hutchison and collaborators in the UO's Materials Science Institute received a U.S. patent for their "green" synthesis of metallic nanoparticles with the potential to enable construction of nanometer-sized structures using frameworks of DNA. The UO is exploring the creation of new start-up companies around both of these innovations.

During the technology boom in the latter half of the 1990s, U.S. research institutions produced a median of four inventions and $100,000 of licensing income per $10 million of research, according to a 2002 study by the Chronicle of Higher Education. In 2003-4, the UO produced about five inventions and $200,000 in licensing income per $10 million in research expenditures.

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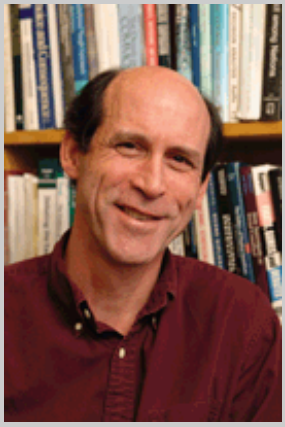
Technology Transfer

Making Treaties More Effective



Associate Professor of Political Science Ron Mitchell

If Ron Mitchell's research is successful, some of the "guesswork" of negotiating environmental treaties could be eliminated.

An associate professor of political science at the UO, Mitchell knows he'll never eliminate the politics of international negotiations, but more realistically, he does hope his research will give politicians better insight into how to protect the global environment. He has a three-year, $280,000 grant from the National Science Foundation to identify specific characteristics common to successful treaties.

"If there are initially 100 possible options," Mitchell says, "politics may preclude the acceptance of 97 of them, but I hope my research can help the parties choose which one of the remaining three is most likely to be successful for them."

Mitchell has spent ten years studying the influence of environmental law on the behavior of states and people. He's creating a systematic and comprehensive catalog of some 2,500 treaties. It will provide negotiators, scholars, students, and interested citizens with a reliable list of all historic and current international environmental treaties and begin to help identify the common characteristics of those that performed well.

Mitchell's work could make both existing and future agreements more effective. With fifteen to twenty organizations entering into new treaties every month, his research has prompted interest from scholars worldwide.

Read more: **http://iea.uoregon.edu**

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This website provides information related to the IEA Database, a project dedicated to creating a comprehensive database of international environmental agreements.

Creating and maintaining the IEA Database involves considerable time and effort and I therefore ask that those who use the information in their research, please cite the information as follows:

> Data derived from Ronald B. Mitchell. 2003. *International Environmental Agreements Website*. Available at: http://www.uoregon.edu/~iea/ and described in Ronald B. Mitchell. 2003. "International Environmental Agreements: A Survey of Their Features, Formation, and Effects." *Annual Review of Environment and Resources* 28 (November).

Major navigation links, available here and in the banner at the top of every page, are:

- Overview of project
- Personnel and Advisory Board for project
- Definitions and operationalization of terms used in constructing the database
- IEA Database: a database of all multilateral IEAs, bilateral IEAs, and secretariats
  - Multilateral Environmental Agreements (MEA): over 700 MEAs (using the definitions above) which attempts to be both comprehensive and current.
  - Bilateral Environmental Agreements (BEA) Lists: initial list of BEAs (using the definitions above) which is *explicitly recognized as incomplete* due to the difficulties of identifying all bilateral agreements. The page provides access to the dataset of BEAs already identified as well as an additional list of sites that contain one or more bilateral environmental agreements that have not yet been incorporated into this listing.
  - Secretariats: A list of over 200 intergovernmental secretariats that address environmental agreements with links to their websites, where available.
- Annual Review Article related links
  - A description and initial analysis of the database is forthcoming in "International Environmental Agreements: A Survey of Their Features, Formation, and Effects" *Annual Review of Environment and Resources* 28 (November 2003) and a link to that article will be available as soon as it is published.
  - PDF version of the article
  - Web-links identified in the article
  - Time Trends in IEAs - graphs not included in the article
    - Time Trends of Multilaterals by Agreement Type (1879-present)
    - Time Trends of Multilaterals by Subject of Agreement (1879-present)
- Sources used in identifying the list of agreements in the database

- Acknowledgements of people, organizations, institutions, and funding agencies (American Philosophical Society, University of Oregon, and National Science Foundation) that have generously helped support creation of this database
- Disclaimer regarding responsibilities for quality of database
- Data sets: websites with data that can be used to identify the impacts, consequences, and effectiveness of some of the IEAs listed here. This is a preliminary set of links - please contact me if you know of additional data sets that may be useful for analysis.

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Oregon Stakes claim on 'Next Industrial Revolution'

U.S. Senator Ron Wyden and Congressman Peter DeFazio look on as Skip Rung, Director of ONAMI, acknowledges the research funding secured by OregonÕs congressional delegation.

Unprecedented collaboration, breakthrough innovations and major research funding are strengthening Oregon's claim-to-fame on nanotechnology--a field that the National Science Foundation leadership has said represents "the next industrial revolution."

The accomplishments are part of the Oregon Nanoscience and Microtechnologies Institute (ONAMI) that is focused on capturing part of the nanotechnology industry--development of materials and devices measuring billionths of a meter long--that is estimated to reach $1 trillion by 2015.

ONAMI unites the University of Oregon, Oregon State University and Portland State University with the Pacific Northwest National Laboratory, the state of Oregon, private industry and Oregon's congressional delegation.

Among the ONAMI breakthroughs announced this year were two by Jim Hutchison, a UO chemistry professor, who developed an environmentally benign nanofabrication method and discovered a key step in the manufacture of a new type of nano-electronic devices.

Oregon's congressional delegation gave ONAMI a boost by securing $5 million in federal research funding, bringing the statewide total for nanotechnology research awards in the past five years to $60 million.

Signature research facilities backed by $20 million allocated by the state legislature moved forward in 2004. ONAMI-OSU opened in May at a building donated by Hewlett-Packard, while the UO began planning its ONAMI facility to focus on university-industry relationships and services to prepare and characterize materials at the nano-scale. PSU is renovating and expanding lab facilities in two buildings.

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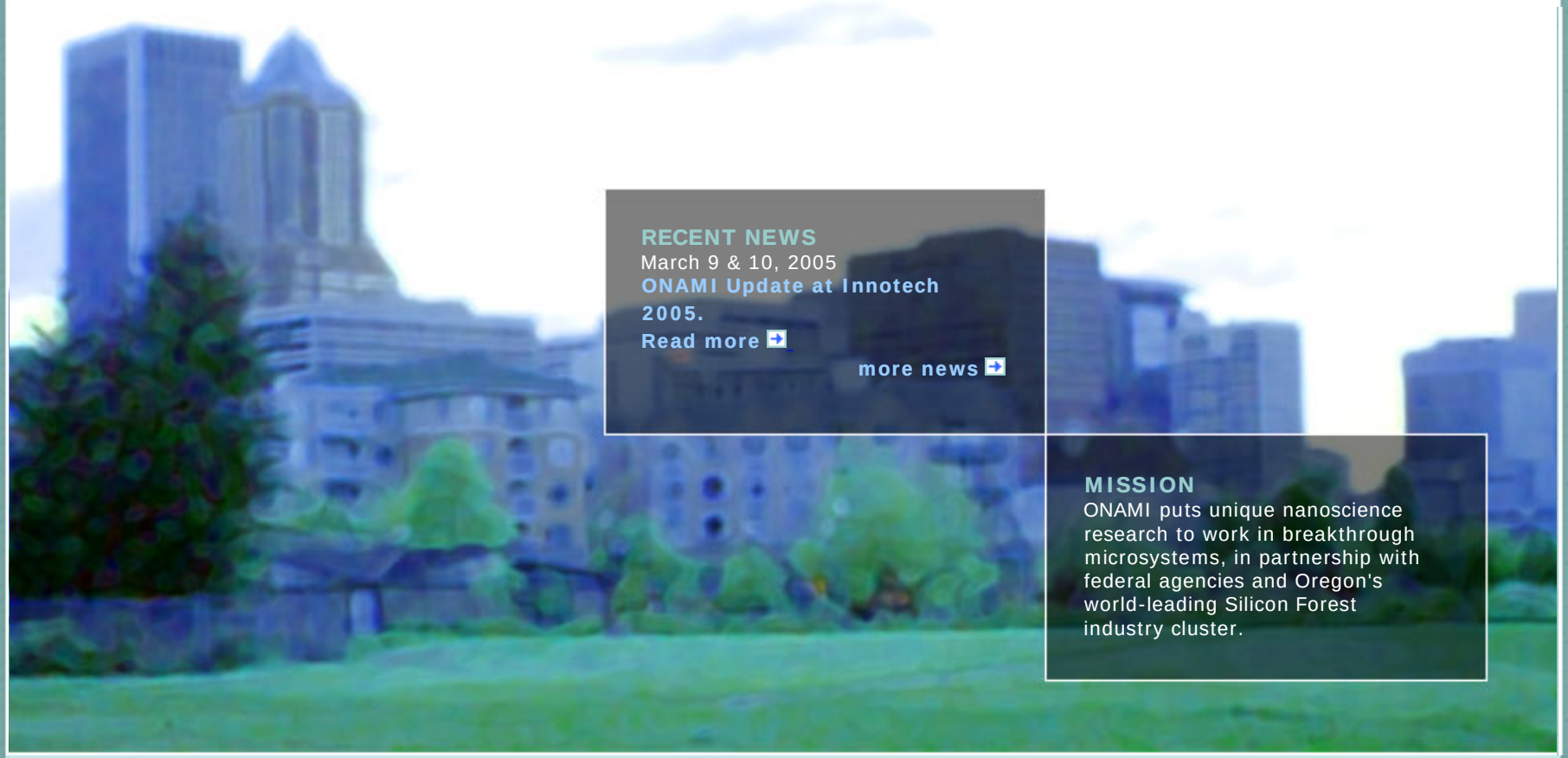
Read more: **http://www.onami.us/**

ONAMI

OREGON NANOSCIENCE AND MICROTECHNOLOGIES INSTITUTE



RECENT NEWS
March 9 & 10, 2005
ONAMI Update at Innotech 2005.
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MISSION
ONAMI puts unique nanoscience research to work in breakthrough microsystems, in partnership with federal agencies and Oregon's world-leading Silicon Forest industry cluster.

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The UO's Center for Advanced Materials Characterization in Oregon (CAMCOR) houses an array of sophisticated instruments that are as vital to the nanotechnology "gold rush" as assayers were to the miners of California.

CAMCOR's state-of-the-art equipment is used to validate discoveries in many fields, and is available to faculty and industry researchers throughout the Northwest.

"We think of CAMCOR as a high tech 'extension service' that provides dividends," says Dave Johnson, center director who is a UO professor of chemistry. "Providing access to our sophisticated equipment and expertise helps others, makes efficient use of the equipment and creates an atmosphere of collaboration and a cross-pollinating of ideas."

Five laboratories and more than twenty instruments measure physical and chemical properties, such as purity, size, uniformity, composition, crystal structure and shape of materials to nanometer specifications.

In 2000, a $550,000 grant from the M.J. Murdock Charitable Trust funded four devices for surface and microscopic analysis. The latest grant, from the National Science Foundation, provided $402,000 for an electron beam lithography system that will be a cornerstone of the UO's nanofabrication research.

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Innovation Leads to Understanding

Researchers at the UO who are seeking ways to help people recover from strokes and brain trauma or to overcome behavior disorders reached another important milestone in research technology this year.

The Brain, Biology, and Machine Initiative (BBMI) combines interdisciplinary research with sophisticated imaging equipment and high performance computing. Faculty members from the fields of biology, chemistry, psychology, and human physiology have collaborated on projects.

A combination of $14.3 million in congressional interest funding, $20 million in competitive federal awards and $10 million pledged by UO alumni Robert and Beverly Lewis have been instrumental in advancing BBMI by establishing the Lewis Center for Neuroimaging, the Center for Mammalian Genetics, and the Neuroinformatics Center.

This year, Congress appropriated another $3 million in federal funding to investigate genetic factors that influence human behavior and cognitive processes.

The evolution of BBMI has placed the UO at the forefront of brain research nationally. The following is a sampling of BBMI projects and technological achievements this year.

Memory Affects Attention

Research at the UO has demonstrated for the first time a direct relationship between brain activity and memory capacity that could have implications for sufferers of Attention Deficit and Hyperactivity Disorder.

A study by researchers Edward Vogel, a UO assistant professor of psychology, and graduate student Maro Machizawa, recently published in Nature magazine, observed subjects in a visual awareness task and found brain activity that was specifically related to holding items "in mind."

Some people are capable of being aware of more objects than others, Vogel says, "and this greatly influences how good we are at performing many complex tasks such as reasoning, mathematics and following directions."

Read more: **http://duckhenge.uoregon.edu/hparchive/display.php?q=memcapacitynature-1.html**

Stroke Recovery Examined

An American Heart Association-funded project now underway by Paul van Donkelaar is studying how stroke victims recover function. An associate professor of human physiology, van Donkelaar is examining the effects of an intensive form of physical therapy called "constraint

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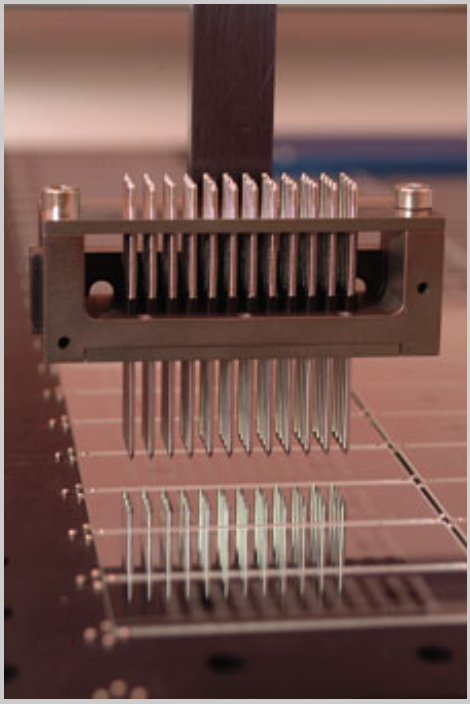
induced therapy."

The researchers will use brain imaging to discover how this functional recovery program correlates to alterations in brain activation patterns. They hypothesize that there is some relation to the degree of "handedness" (or the amount of dependency individuals have on their favored side) that determines the capacity for both functional recovery and brain activation alterations.

Read more: **http://www.uoregon.edu/~paulvd/lab/eye_research.html**

New Tool Aids Cancer Research



Researchers can analyze 20,000 DNA samples with the DNA micro-array designed UO assistant biology professor Eric Johnson.

An innovative tool developed at the UO is helping researchers determine how oxygen supply, or lack of it, affects cancer cells in humans. With support from the National Science Foundation and the American Cancer Society, researchers in the lab of Eric Johnson, a biology assistant professor, designed a DNA micro-array, which allows analysis of complex assemblages of DNA.

The micro-array is a grid of 20,000 miniscule spots of DNA, each about the size of a human hair, printed onto glass slides. This allows researchers to compare efficiently the effects of low oxygen on thousands of fruit fly genes. Since genes involved in oxygen responses in flies are virtually identical to human genes, researchers' findings hold potential for an easy transfer of discoveries from fly biology to human medical research.

Read more: **http://www.molbio.uoregon.edu/facres/johnson.html**

Technology Improves Research

New supercomputing technology is providing researchers in the Brain, Biology, and Machine Initiative with enhanced tools to visualize and interpret complex data generated at the UO Neuroinformatics Center and the Lewis Center for Neuro-imaging.

Projects such as the computational modeling of the electrical properties

of the human brain, including both electrical and optical transmission, are benefiting from the Integrated Cognitive Neuroscience, Informatics and Computation (ICONIC) grid installed last year.

Made possible by a $1 million grant from the National Science Foundation, the ICONIC grid integrates three advanced IBM computing architectures. It helps researchers gain better access to and use of the large volume of data generated during diagnostic imaging work by harnessing the collective processing power of the school's computing systems.

Read more: **http://duckhenge.uoregon.edu/hparchive/display.php?q=iconicgrid-1.html**

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Homepage News Archive

UNIVERSITY OF OREGON

Psychologist Predicts Memory Capacity

A new tool developed at the University of Oregon is opening a window on how the brain stores visual information. An article to be published April 15 in Nature magazine by Edward Vogel, a UO assistant professor of psychology, describes how his lab is able to predict an individual's memory capacity. "Despite our feeling of having a detailed perception of our immediate environment, we are aware of only about three objects at any given time," Vogel explains. "Some people are capable of being aware of more objects than others, and this ability greatly influences how good we are at performing many complex tasks such as reasoning, mathematics and following directions." Vogel and Maro G. Machizawa observed subjects performing a visual awareness task and found brain activity that was specifically related to holding items "in mind." This activity reveals the limitations of awareness for each person, and provides a window into how the brain controls our awareness. This is the first time researchers have been able to demonstrate a direct relationship between neural activity and memory capacity. The UO study opens the door to studying a broad range of aspects of how people hold objects in their awareness. Machizawa assisted with Vogel's research while completing his master's degree in psychology and is continuing to work in the lab.

Research in the Eye-Hand Lab is designed to gain a better understanding of how the human brain transforms sensory signals into appropriate motor output and how different perceptual and attentional factors influence this transformation. We address this issue using several different types of movement including oculomotor smooth pursuit, saccades, and manual pointing.

To better define the contribution of different cortical areas to the sensorimotor transformation process we use transcranial magnetic stimulation (TMS). TMS allows one to briefly disrupt the activity in selected regions of the brain while a subject is producing a particular response. By characterizing how TMS perturbs performance we can make inferences about the specific contribution of the cortical area being stimulated to the task under investigation. In addition, we are making use of the fMRI facilities at the Lewis Center for Neuroimaging on campus to gain further insight into the brain mechanisms underlying sensorimotor control during functional recovery following stroke and concussion.

RECENT MEDIA COVERAGE

KVAL 13 TV (July 2004) Stroke research study

Eugene Registar-Guard (Oct. 2004) Concussion study

Eugene Registar-Guard (Feb. 2003) fMRI research on recovery of function following stroke

RECENT PRESENTATIONS

Neural Mechanisms Underlying Attentional Deficits in Concussion (2004 Society for Neuroscience)

Motor Evoked Potentials in Dominant and Nondominant Motor Cortex (2004 Society for Neuroscience)

Frontal Eye Field TMS and Smooth Pursuit (2004 Society for Neuroscience)

Attentional Deficits in Concussion (2004 World Conference on Injury Prevention and Safety Promotion)

RECENT PUBLICATIONS

van Donkelaar, P., Langan, J., Rodriguez, E., Drew, A.S., Halterman, C., Osternig, L.R., & Chou, L.-S. (2005). Attentional deficits in concussion. Brain Injury, in press.

Parker, T.M., Osternig, LR., Lee, H.-J., van Donkelaar, P., & Chou, L.-S. (2005). The effect of divided attention on gait stability following concussion. Clinical Biomechanics, 20, 389-395.

van Donkelaar, P., & Adams, J. (2005). Gaze-dependent deviations in pointing induced by TMS over the human posterior parietal cortex. Journal of Motor Behavior, 37, 157-163.

van Donkelaar, P. (2005). On the virtues of virtal lesions. Cortex, 41, 85-86.

van Donkelaar, P., & Dassonville, P.R. (2004). Further evidence for, and some against, the planning-control dissociation. Behavioral & Brain Sciences, 27, 52-53.

van Donkelaar, P., Siu, K.-C., & Walterschied, J. (2004). Saccadic output is influenced by limb kinetics during eye-hand coordination. Journal of Motor Behavior, 36, 245-252.

van Donkelaar, P., & Drew, A.S. (2002). The role of attention during smooth pursuit eye movements. The Brain's Eyes: Neurobiological and Clinical Aspects of Oculomotor Research. J. Hyönä, D. Munoz, W. Heide, & R. Radach (Eds), 140: 267-277.

van Donkelaar, P., Lee, J.-H., & Drew, A.S. (2002). Cortical frames of reference for eye-hand coordination. The Brain's Eyes: Neurobiological and Clinical Aspects of Oculomotor Research. J. Hyönä, D. Munoz, W. Heide, & R. Radach (Eds), 140: 301-310.

van Donkelaar, P., Lee, J.-H., & Drew, A.S. (2002). Eye-hand interactions differ in the premotor and parietal cortices. Human Movement Science, 21, 65-74.

van Donkelaar, P., & Müri, R. (2002). Craniotopic updating of visual space across saccades in the human posterior parietal cortex. Proceedings of the Royal Society: Biological Sciences, 269, 735-739.

Lee, J.-H., & van Donkelaar, P. (2002). Dorsal and ventral visual stream contributions to perception-action interactions during pointing movements. Experimental Brain Research, 143: 440-446.

CURRENT GRANT SUPPORT

2004-2007: American Heart Association Grant-in-Aid - " Cortical correlates of functional recovery following stroke rehabilitation" Role: Principal Investigator.

2002-2006: Centers for Disease Control Research Grant - "Biomechanical/sensory motor functions after concussion" Role: Co-Principle Investigator.

2003-2008: NIH R01 Research Grant - "Dynamic balance in children with cerebral palsy" Role: Co-Investigator.

Faculty Profile

UNIVERSITY OF OREGON
INSTITUTE OF MOLECULAR BIOLOGY

Eric Johnson

Assistant Professor of Biology

B.A., Grinnell College; Ph.D., University of Iowa

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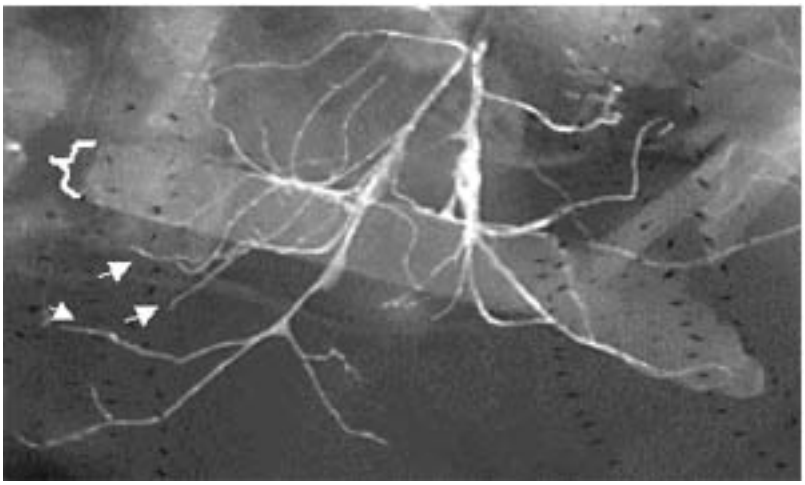
Research Interests

We are interested in how an organism adapts to the physiological challenges of daily life and what this tells us about the physiological and developmental responses to disease in humans. The particular challenge we study is the response to low oxygen. When faced with inadequate oxygen (hypoxia), animals undergo a series of transient and longer-term changes to increase their access to oxygen and decrease their need for it. If oxygen homeostasis is not restored, death or serious tissue damage can result. In humans, serious pathology can also result when the hypoxic responses are inappropriately activated, as in rapidly proliferating tumors that turn on hypoxia-response programs that promote tumor angiogenesis and growth.

How does a cell sense oxygen?

We are studying the sensing and response to low oxygen in *Drosophila melanogaster*. The key regulator of the hypoxic response is shared between the fly and humans, and we are taking genetic approaches to dissect the molecular pathways that allow a cell to measure oxygen need and quickly respond when the oxygen supply is limiting.

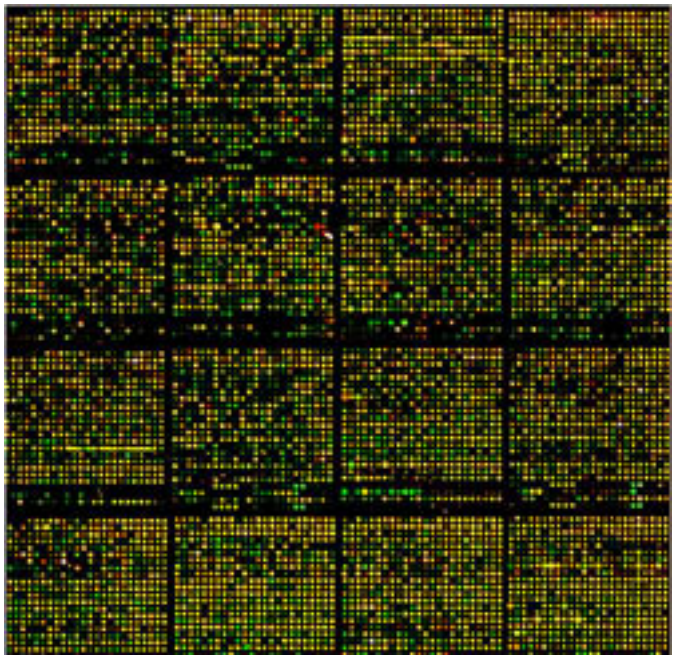


Airway branches (arrows) proliferate on a hypoxic muscle (bracket). Cells experiencing oxygen debt activate a fluorescent reporter gene which can be observed in living animals.

How does an organism respond to low oxygen?

The genetics of *Drosophila* is complemented by the ability to take genomic approaches as well. We have been part of initiating the use of microarray technology, in which the transcriptional activity of every gene in the genome is measured simultaneously, and have used it to assay the rapid and complex changes in response to low oxygen. Other stresses evoke similar patterns of gene expression, so computational approaches are employed to find highly significant response genes and understand the biology of these changes.

A Drosophila microarray reflecting the transcriptional activity of over 6000 genes. Each dot represents a single gene, and the color indicates the amount of that transcript in hypoxic animals.



Cell and developmental biology of the response

Although many responses to low oxygen are at the cellular level, we are also studying longer-term developmental changes. One mechanism for adaptation is the outgrowth of airway branches to hypoxic regions by a fibroblast growth factor signaling pathway. We have also identified a novel cellular response to hypoxia--the formation of long epidermal projections that grow out to nearby airway branches. The signals that control this behavior are unknown.

Hypoxic epidermal cells form filopodia (arrow) that reach out to nearby tracheal cells.

Many developmental pathways have been extensively studied in *Drosophila*. Physiological pathways, which are just as crucial for survival of an organism, are still poorly understood. We use the traditional strength of *Drosophila* (genetic screens) combined with emerging strengths (cell biology and genomics) to learn more about the biologically interesting and medically important question of oxygen sensing and response.

Selected Publications

Johnson, E., P. Estes, S. Crews, and M.A. Krasnow. Conservation and function of the HIF-1 hypoxia response pathway in living Drosophila. Manuscript in preparation.

Cho N.K., L. Keyes, E. Johnson, J. Heller, L. Ryner, F. Karim, and M.A. Krasnow. (2002) Developmental control of blood cell migration by the Drosophila VEGF pathway. Cell **108**:865-76.

Arbeitman, M., E. Furlong, F. Imam, E. Johnson, B. Null, B. Baker, M.A. Krasnow, M. Scott, R. Davis, and K. White. (2002) Gene Expression During the Life Cycle of *Drosophila melanogaster*. Science **297**: 2270-5.

Johnson, E., J. Jarecki, and M.A. Krasnow. (1999) Oxygen regulation of airway branching in Drosophila is mediated by Branchless FGF. Cell **99**:211-20.

Updated: March 2005
Contact: webmaster

'ICONIC Grid' Speeds Brain Wave Analysis

The University of Oregon, Electrical Geodesics, Inc. (EGI), and IBM have announced a new project that uses grid computing, Linux and IBM supercomputer technology to speed and improve the diagnosis of Epilepsy, stroke, depression and other brain conditions.

In 2003, researchers at the University of Oregon Neuroinformatics Center received a $1-million grant from the National Science Foundation to build advanced grid computing infrastructure to apply high-performance computing to diagnosing and treating brain-related conditions.

The Integrated Cognitive Neuroscience, Informatics and Computation (ICONIC) grid facilitates more rapid diagnosis by harnessing the collective processing power of the school's computing systems. In addition, the grid offers the ability to better respond to temporary spikes in demand for computing horsepower and helps researchers gain better access to and control over the large volume of data generated during diagnostic imaging work.

EGI is a private medical device and imaging software developer based in the Riverfront Research Park adjacent to the UO campus. EGI is working with the Neuroinformatics Center to further study the commercial possibilities for using grid and Linux-based systems to speed and improve brain-wave monitoring at hospitals and research centers.

"With the multiple architectures provided by IBM's products, we can conduct research on ways of optimizing the medical informatics demands for high performance computing," said Neuroinformatics Center Director Allen Malony." At the same time, we can evaluate all of these architectures running the Linux operating system, simplifying our system administration and improving our reliability."

"Grid computing technology from IBM will play an important role in helping EGI provide doctors and researchers with on-demand access to critical patient data," said Donald Tucker, CEO, Electrical Geodesics, Inc. "We believe grid computing not only brings performance capacity, but allows the patient security and accountability required for critical medical applications."

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Technology Transfer

Partnership Addresses Heart Disease

John Halliwill's (standing, in back) research on the relationship of blood pressure and exercise will benefit from the UO's partnership in the Oregon Heart and Vascular Institute. Also pictured are assistant professor Christopher Minson and doctoral student Britta Torgrimson.

A new UO partnership is taking aim at America's number one killer: cardiovascular disease. The Oregon Heart & Vascular Institute (OHVI) combines more than eight decades of research and expertise in human physiology at the UO with Sacred Heart Medical Center's reputation as one of the nation's top 100 hospitals for cardiac services.

The partnership will give physicians access to the UO's pioneering research in human physiology, and researchers, in turn, will have the opportunity to conduct joint projects with nationally recognized physicians.

John Halliwill, assistant professor of human physiology, is eager to exploit the new, collaborative opportunities. His research seeks to understand why certain cell receptors turn on following exercise, telling blood vessels to relax and lowering blood pressure.

"Our findings could result in development of medication that turns those receptors on," he says.

So far, Halliwill has been able to study young, healthy individuals using non-invasive methods.

"This partnership will provide the physician oversight needed to conduct clinical research on specific groups of patients, using a variety of research methods. It's the type of research that typically occurs only in a medical school," he says.

The Department of Human Physiology has evolved from the UO's Department of Physical Education, which was the first degree-granting program in the nation to focus on health and exercise. Today, it

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investigates factors and interventions that contribute to cardiac and vascular health, spanning the spectrum from molecular-based research to direct patient care.

Collaborations between the UO and Sacred Heart already result in co-sponsored medical education/research seminars, student clinical/surgery observations and physician engagement in the classrooms.

OHVI will facilitate and expand opportunities by developing and distributing information and supporting educational activities about heart and vascular health that emphasize rehabilitation and disease prevention.

Read more: **http://www.uoregon.edu/~hphy/hphy2.htm**

UO Home Page > **Office of Research and Graduate Studies** > **Inquiry**

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Faculty and Staff
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Louis Osternig
Marjorie Woollacott
Paul van Donkelaar
Christopher Minson
John Halliwill
Li-Shan Chou
Andrew Karduna
Richard Troxel
Susan Verscheure
Jan Brady
Stephanie Swayne
Anni Elling
Emeritus
Adjunct Faculty
Faculty E-Documents

Department of Human Physiology





About The Department

The Department serves its students and society through the creation and transfer of knowledge related to human physiology and anatomy and how these disciplines impact the science surrounding physical activity. The Department is a major contributor in the training of life-sciences undergraduate and graduate students at the University of Oregon who desire careers in academic research, medicine and allied health. Unlike the traditional biological approach to such training, the Department employs a perspective that has as its focus the exploration and understanding of the functional and structural mechanisms underlying human movement across the life-span ranging from fundamental motor skills to the more complex environment of sustained and demanding exercise.

The department is a community of scholars and teachers dedicated to the highest standards of academic inquiry, learning, and service. With the understanding that knowledge is a foundational resource in our society at all academic levels, the department has committed itself to excellence in both undergraduate and graduate education. Preparation of our students for a variety of health-oriented careers forms the heart of the undergraduate curriculum and future researchers/teachers, physicians, physical therapists and other health care providers receive a contemporary perspective on the role of exercise as medicine. In addition to training in the fundamental sciences, the department faculty seeks to challenge students to learn to question critically, think logically, communicate clearly, and participate in quality scientific research and clinical endeavors.

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The goal of the graduate program is to develop scientists and health professionals who are creative thinkers and innovators who generate new knowledge in the physiological and anatomical sciences while participating in the application of this knowledge within the health care system. The department recognizes that integration of basic and applied research is vital to a fundamental understanding of human movement and how it applies to medical settings.

Come Join Us!

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Technology Transfer

Gifts and Grants Enhance Learning, Scholarship

Paul Elstone, director of corporate and foundation relations in the UO Office of Development.

Donations to the University of Oregon from foundations and corporations topped $8.5 million last year, helping to make college affordable and enriching the university experience.

"Corporate funding for scholarships can literally open the door to a college education for some students," said Paul Elstone, director of corporate and foundation relations in the UO Office of Development. "Funding for internships allows students to apply theory to practice, and grants for advanced equipment can provide the means for breakthrough research."

Corporate and foundation giving to the UO is up 78.5 percent since fiscal year 1997-98 and includes gifts and grants from an ever-broadening range of organizations.

Support from national organizations last year included a $600,000 grant from the Robert Wood Johnson Foundation to analyze changes in health care financing and $100,000 from the Korea Foundation for art installation and programming at the Jordan Schnitzer Museum of Art.

Strong links to the corporate world bring additional benefits to UO students and faculty.

In the past year, Intel contributed more than $90,000 to the UO, including grants for curriculum development and an undergraduate "summer boot camp" in the Materials Science Institute (MSI). Intel also sponsored the Lundquist College of Business's (LBC) nationally

Graduate School

renowned New Venture Championship--a business plan competition that attracts students from some of the best business schools in the nation and abroad.

"Intel's relationship with the UO is important in a number of areas, and we continue to see our involvement evolve due to the excellent students and strong programs," said JoZell Johnson, program manager for higher education at Intel.

Corporate investments are often only the beginning of the relationship between businesses and the UO. Intel, for instance, is one of several high tech firms that recruit and hire students from MSI and LBC.

Read more: **http://giving.uoregon.edu/ways/corporate**

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CAMPAIGN NEWS

- **$15-million Gift Announced At UO Gala**
- **Lokey pledges $2 million to School of Music's new building campaign**
- **$600-million fund-raising effort reaches halfway mark**

January's gala event, *Lights, Camera ... Oregon!* kicked off Campaign Oregon with Hollywood star Fred Willard as Emcee, the Duck mascot in a tux and the announcement of two gifts that brought the campaign total to $316 million.

>> See Gala Photos

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Innovative New Institute Tackles Policy Issues

UO President Dave Frohnmayer (seated, on left) speaks with stakeholders at the Institute for Policy Research and Innovation's Urban Rural Dialogue.

As its first project, the UO's newly created Institute for Policy Research and Innovation (IPRI) hopes to bridge Oregon's urban-rural divide. IPRI's approach will be to rely on Oregon's rich tradition of innovative public policy, emphasizing policy-relevant research, and to create and disseminate knowledge about classes of problems or issues.

"Oregon has been a leader in addressing a variety of public issues, from the 'Oregon system' of direct democracy to environmental management to health care to strategic planning," said IPRI's director Michael Hibbard.

The mission of IPRI, he says, is to encourage the long-term health of Oregon's innovative approaches to public policy.

"These are critical to the future of the state and will also benefit other states and nations that look to Oregon as a source of ideas and inspiration," he says.

IPRI is itself taking an innovative approach by using its research to kindle serious, informed public dialogues around policy issues. The new institute organized an Urban Rural Dialogue, bringing together a small group of stakeholders from around the state who spent three days discussing how the issues that divide Oregon can be surmounted for the benefit of the entire state. A second dialogue is scheduled for the spring.

IPRI is associated with the Department of Planning, Public Policy and Management (PPPM) whose faculty members and students study at the junction of public policy, community problem-solving, and nonprofit organizations.

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Read more: **http://utopia.uoregon.edu/IPRI/IPRIindex.htm**

VISION LEADERSHIP COMMUNITY

IPRI

Institute for Policy Research and Innovation

Affiliated with the Department of Planning, Public Policy & Management

Mission Statement

The Institute for Policy Research and Innovation (IPRI) is a source of ideas and energy for supporting and nurturing Oregon's rich tradition of innovation in public policy. The work of IPRI is not purely academic. But neither does IPRI work on solutions to specific problems or issues, a task that is more appropriate for government agencies and consultants. IPRI emphasizes policy-relevant research, creating and disseminating knowledge about classes of problems or issues.

About the Institute

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Founding Faculty Fellows - Profiles

This page updated September 2, 2004

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Points of Pride

Great Education Value. The twenty-first edition of the Fiske Guide to Colleges says the "UO may be the best deal in public education on the West Coast." The UO ranked among the nation's "best buys" in higher education for the seventh consecutive year in the prestigious guide.

Recognition from Peers. The Journal of Financial Economics ranks the UO Lundquist College of Business's finance department tenth based on the frequency with which its research is cited in articles published in that journal over the past twenty-five years.

Making Schools Safer. More than 2,670 schools in thirty states have reduced behavior and discipline referrals by as much as 60 percent using Positive Behavior Supports developed by College of Education professors Rob Horner and George Sugai. Read more: **http://education.uoregon.edu/feature.htm?id=467**

Among the World's Best. A Swiss research center has ranked the University of Oregon 44th among the world's universities in terms of publications impact. The UO earned the ranking based on the scope and citation of published research articles its faculty had placed in top scholarly journals.

Environmental Improvements. Nanotechnology fabrication became "greener" due to a faster, cheaper and environmentally benign method developed by Jim Hutchison, a chemistry professor, and made public earlier this year. Read more: **http://duckhenge.uoregon.edu/hparchive/display.php?q=greennanopatent.html**

Among the Nation's Elite. Peter von Hippel, a UO professor emeritus of chemistry whose research describes how proteins bind to DNA, was elected to the American Philosophical Society in 2004, one the highest academic honors in the nation.

One of the World's Best. In September, the British Royal Society of Chemistry awarded its prestigious Spiers Medal to Geri Richmond, UO professor of chemistry. The Richmond Team's ongoing studies on how water reacts with the surfaces of solids are viewed as essential to a broad range of interests, from building better semiconductors to maintaining a healthy global environment. Read more: **http://RichmondScience.uoregon.edu**

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Federal Grant to Study PBS in High Schools

Brigid Flannery and COEâ€™s **Educational and Community Supports** (**ECS**) will work with four Oregon high schools over the next three years to study positive behavior support in adolescence.

"Many educators in elementary and middle schools have adopted a school-wide **positive behavior support** (**PBS**) approach. They've demonstrated that it is possible to create and sustain positive learning and teaching environments that are safe and promote the social development of all students," says co-principal investigator and COE assistant professor Brigid Flannery.

"Unfortunately, the same level of school-wide PBS implementation has not been demonstrated and validated at the high school level," says Flannery.

And fortunately for Oregon high schools, faculty in the College of Education's **Educational and Community Supports** (ECS) have just been awarded a federally funded grant to do just thatâ€”to study and develop positive behavior support systems for the high school. University of Oregon faculty in ECS along with their colleagues in educational research across the country have developed

and implemented PBS in more than 500 schools in 12 states nationwide. The result is a system of educating both students and staff in the functional processes of making school buildings positive learning environments which has a proven track record of success at the elementary and middle school levels.

OSEP Award Exceeds Half Million

Funded by the Office of Special Education Programs, U.S. Department of Education (OSEP), the new three-year project, *High School Positive Behavior Support: Increasing Success for All Students* will conduct research at the school-wide level as well as at the level of the individual student to identify and study the factors that contribute to and/or inhibit comprehensive school-wide systems of PBS for all students. Because high schools have structural, operational, and philosophical differences from elementary schools, how they view and implement behavior support practices and systems will likely differ from the practices that have been successful for younger students.

"High school students are also going through an important developmental phase, adolescence. So the importance of choices, decision making, autonomy and identification with a peer social group increases dramatically at this level," says Flannery.

"These student factors in combination with the structural and operational influences may significantly affect the way a high school approaches implementing a positive behavior support system," says Flannery.

COE faculty participating in project include co-principal investigators **Brigid Flannery** and **George Sugai**, along with **Jeff Sprague**, **Tary Tobin** and former faculty member **Geoff Colvin**. By establishing and studying several intensive demonstrations of high school level implementations of school-wide PBS, researchers will validate the effective behavior support systems for the high school environment in other school districts.

Photographed at the University of Oregon College of Education

Patent Enhances Green Nanotechnology

A new patent issued to the University of Oregon focuses on an environmentally benign solution to an important challenge in the rapidly developing field of nanotechnology.

A process developed by Chemistry Professor Jim Hutchison eliminates the need to use two highly toxic chemicals in the production of functionalized gold nanoparticles. His innovation is part of the university's effort to develop safer manufacturing processes for nanoscale materials, those measuring less than 100 billionths of a meter.

Nanoscience researchers create new materials through chemical assembly of molecular building blocks. Researchers traditionally use diborane, a highly toxic, odorless and colorless gas that auto-ignites near room temperature, and the toxic solvent benzene to synthesize an important class of metal nanoparticles.

Hutchison and his students developed a new synthetic procedure that eliminates the use of diborane and benzene for that process. In addition to being safer for the chemists and the environment, Hutchison's process takes just a few hours, instead of days, and significantly reduces the cost of making these nanoparticles.

The patented process is a major step toward establishing "green" nanotechnology practices. The pioneering work in the Hutchison labs applies green chemistry principles to the field of nanoscience. Green chemistry principles focus on reducing, recycling or eliminating the use of toxic chemicals in chemistry by finding creative ways to minimize the human and environmental impact without stifling scientific progress.

"UO is a recognized leader in the emerging field of green chemistry that has eliminated the use of many toxic materials in chemistry labs throughout the nation," said Richard Linton, UO's vice president for research and graduate studies. "This innovation demonstrates the UO's capabilities in green nanotechnology and is an enabling step toward making production of nanoscale materials more practical."

Now that the patent has been issued, Linton says, a spin-off company may be created to market the process to nanotechnology researchers worldwide. Potential applications for Hutchison's process include research and development of nano-electronics, including tiny transistors, sensors and diagnostic assays.

The UO is a partner in the Oregon Nanoscience and Microtechnologies Institute (ONAMI), a collaboration involving Portland State University, Oregon State University, the Pacific Northwest National Laboratory and high-tech private industry that is leveraging the state of Oregon's strengths in

nanoscience and microscale engineering.

For more information about Hutchinson and green chemistry, visit **http://www.uoregon.edu/~hutchlab/**.

GERICHMOND
Professor of Chemistry, University of Oregon

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B.S. Chemistry
Kansas State University

PROFESSIONAL APPOINTMENTS

HONORS AND AWARDS

DISTINGUISHED LECTURESHIPS AND ADDRESSES

RESEARCH INTERESTS

Physical chemistry, environmental chemistry, optics and spectroscopy, surface and material science.

Topics include:

Water surfaces: Understanding the molecular properties of water surfaces make them central to so many important environmental, chemical and biological processes.

Surfactants: Determining the molecular structure of molecules

(surfactants) that adsorb to liquid surfaces and developing an understanding for how this molecular structure influences their function.

Environmental processes: Gaining insight into how environmentally important molecules adsorb, transport and react at water surfaces.

Semiconductor, salt, mineral and oxide surfaces: Understanding how molecules adsorb, react and cause physical changes for these surfaces in contact with aqueous solutions.

Membrane and protein surfaces: Understanding the role of water in the structure and the transport of species at these macromolecular surfaces.

Nonlinear optics, lasers and spectroscopy: Developing new optical devices and methods to probe surfaces and interfaces in-situ.

RESEARCH PUBLICATIONS

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TEACHING INTERESTS

Development of courses in science literacy for nonscientists, introductory chemistry courses for undergraduates and general science courses, recruitment and mentoring of women and minorities in science careers, working in the community to educate the public on science and science issues.

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Technology Transfer

UO Research Spans the Spectrum

Rich Linton

James Perkins, a past president of Cornell University, stated, "The acquisition of knowledge is the mission of research, the transmission of knowledge is the mission of teaching and the application of knowledge is the mission of public service."

At the University of Oregon, the scholarly endeavors of our faculty, staff and students span the full cycle of innovation, from basic research, to inspired pedagogy, to applications that improve our quality of life. The importance of discovery and its connection to our broader society are fundamental cornerstones of the UO's strategic vision as a leading research university.

The following pages illustrate our extraordinary progress in attracting external funding for scholarly activities, transferring basic discoveries into the marketplace and sharing expertise in service to the citizens and communities of Oregon.

Our commitment to scholarship spans the spectrum of arts, humanities, sciences, and the professions to create a rich tapestry of discovery, encompassing issues such as human security, public policy, educational practices, the treatment of disease, and technological innovations fueling the knowledge-based economy.

Richard Linton is the vice president for research and graduate studies, and dean of the Graduate School at the University of Oregon

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