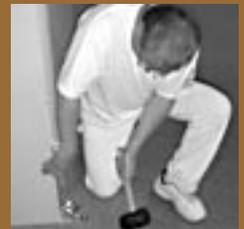


# CROET

Putting science to work for working Oregonians



CROET  
2002  
ANNUAL  
REPORT



*Where Healing, Teaching and Discovery Come Together*



# Mission, Purpose, and Mandate

CROET, the Center for Research on Occupational and Environmental Toxicology at OHSU, is dedicated to the promotion of health and safety in the workforce. Through basic and applied research, education, and outreach, CROET seeks to prevent disease and disability among working Oregonians and their families, during their employment years and throughout retirement.



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# Message from the Director

Dear Fellow Oregonians,

2002 has been another fine year for CROET. Our research has produced important discoveries and other advances; our outreach has touched more Oregonians than ever; our impact and recognition have grown regionally, nationally, and globally; and our federal grant income, leveraged by Workers' Compensation dollars, has continued to grow. We now have two prestigious research center grants funded by the National Institutes of Health. Indeed, CROET is approaching its goal of becoming the finest research institute of its type on the Pacific Rim and throughout the nation.

The human and other resources that CROET brings to Oregonians are directed to disease prevention and health promotion in the workplace and beyond. We target our applied research to develop prevention programs that change the Oregon workplace in positive ways. Our basic research is focused on the underlying causes of virtually all injury and disease found in the Oregon workplace and beyond. We educate Oregon's workplace safety and health experts, and we reach out to all Oregonians through our heavily used website, CROETweb.com. Those with specific concerns acquire detailed information from CROET's Toxicology Information Center, which fields questions about workplace chemicals and other occupational health matters. Industry takes advantage of CROET's unique Chemical Risk Service, a small but vitally important service that has also experienced growth and worldwide operation in 2002.

CROET focuses on specific issues of importance in the Oregon workplace—one of the many examples being soft tissue injuries. Our training programs foster better work practices to reduce those musculoskeletal and ergonomic injuries that account for the largest proportion of Oregon Workers' Compensation claims. We monitor these injuries in the Oregon workplace and we strive to understand the causal factors. Our basic-science researchers are exploring the cellular and molecular basis of nerve, soft tissue, and muscle injury, and are devising novel ways to speed recovery. Taken in concert, these focused interdisciplinary initiatives serve to promote health and safety in the Oregon workplace both in the short and long term.

Respectfully submitted,



Peter S. Spencer, PhD, FRCPath  
CROET Director and Senior Scientist

# CROET

## A Resource for Oregon

CROET conducts research on the basic biology of workplace-related injury and disease as well as research related to workplace performance and occupational exposure. CROET also participates in doctoral and postdoctoral educational programs to train the next generation of scientists, and provides updates for health and safety specialists to ensure that the latest scientific advances are translated into enhanced workplace safety. Finally, through its outreach efforts, CROET serves as an information conduit to Oregon workers, employers, labor, and the general public.

**Applied research** is focused on workplace hazards, often spurred by specific safety issues of immediate concern to Oregon's workers. Research is focused on surveillance of workplace and environmental problems, and prevention-related research is focused on agriculture, service industries, and construction. This research has short-term payoffs. Examples: (1) Surveillance is identifying unrecognized trends in Workers' Compensation claims, suggesting new prevention priorities; (2) computer-based training has been developed for respirator safety, pesticide exposures, ergonomics in drywall finishing, and training effectiveness is under study; (3) agriculture workers are monitored for exposure to pesticides and adverse nervous system health effects, and are given safety training.

**Basic research** is focused on nerve and muscle damage and repair, occupational/environmental exposures and their consequences, and DNA damage and cancer. This research requires a long-term commitment and synergy among investigators, and has a long-term payoff. It is applicable to many diseases and disorders, including those associated with the workplace and those that arise from other causes (e.g., genetic, environmental). While this is important for Oregonians, it obviously has a wider impact. Thus, most of the funding for CROET's research in these areas is supported by grants from the National Institutes of Health and from other federal sources. Examples of what CROET scientists are studying: (1) How nerves grow, how they connect (form synapses) with other nerve cells and with muscles, and how to enhance their regenerative potential—all of which are critical to post-injury recovery; (2) how environmental exposures trigger DNA damage and cancer, and how mutations in specific genes disrupt cell function.

**Core research facilities** In order to support the work of faculty scientists and ensure that CROET takes advantage of contemporary technologies, CROET maintains several shared-use facilities: (1) Toxicogenomics (application of the human genome project to occupational and environmental health); (2) National Center for Nanobiotechnology (exploring the biomedical application of electronics industry techniques for mass fabrication of very small structures—for neural prostheses or tissue engineering); (3) Chemical Analysis, Morphology, Tissue Culture, Live Cell Imaging, Statistics, and Graphics.

**Education** We are teaching the next generation of research scientists in neuroscience, integrated biomedical sciences, cell biology, and toxicology. CROET is updating industry, labor, and government health and safety specialists on topics (e.g., developing effective training, health and safety issues for office workers).

**Outreach** CROET is an information conduit—using our expertise to help provide information to workers and employers that they might have difficulty obtaining or interpreting on their own. We are teaching the difference between junk science and real science. The Toxicology Information Center provides a help line, and CROETweb.com provides a resource directory for safety and health focused on Oregon occupations and industry.

**Community Service** CROET scientists serve on Oregon government boards and work with minority groups including: (1) Oregon's Interagency Hazard Communication Council (IHCC) and State Emergency Response Commission (SERC); (2) Oregon's Pesticide Analytical and Research Committee; (3) Workers' Compensation Fee Advisory Committee; (4) Oregon Department of Environmental Quality's Air Toxics Advisory Committee and Water Quality Standards Review Toxics Technical Committee; (5) Shoshone-Bannock and Yakima Indian Nations; (6) Citizen's Advisory Group (CAG) for the Portland Harbor Superfund Site; (7) Oregon Childhood Development Coalition (migrant Head Start); (8) Labor Education and Research Center; (9) Creating Roads for Empowerment and Advancement Through Education (CREATe); and (10) Oregon Migrant Education Program (MEP).

**Synergy** Together, CROET's resources can tackle any of the broad range of issues facing working Oregonians and the institutions supporting them. CROET has responded, and continues to respond, to requests from the Oregon Legislature, government, industry, labor—all working people of Oregon.

## Advisory Committees — 2002

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### CROET Advisory Committee to OHSU's President

Donald Baird, PhD, *Oregon State University*  
Hon. Alan Bates, DO, *Oregon State Representative*  
Jim Craven, *American Electronics Association*  
John Kirkpatrick, *Painters District Council*  
Hon. Jerry Krummel, *Oregon State Representative*  
Hon. David Nelson, *Oregon State Senator*  
Meg Reinhold, *Department of Consumer & Business Services*  
Marilyn Schuster, *Oregon OSHA*  
Hon. Frank Shields, *Oregon State Senator*  
Bob Shiprack, *Oregon Building Trades*  
Lisa Trussel, *Associated Oregon Industries*  
Sheldon Wagner, MD, *Oregon State University*

### Superfund Basic Research Center (SBRC)

Peter Spencer, PhD, FRCPATH (Principal Investigator), *Oregon Health & Science University*  
Michael Gargas, PhD, *Sapphire Group, Dayton, OH*  
Perry McCarty, PhD, *Stanford University, Stanford, CA*  
Marlys Pierson, *Oregon Health & Science University*

### [Neuro]toxicogenomics and Child Health Research Center

Peter Spencer, PhD, FRCPATH (Principal Investigator), *Oregon Health & Science University*  
Gary Banker, PhD, *Oregon Health & Science University*  
Linda McCauley, RN, PhD, *Oregon Health & Science University*  
John Pintar, PhD, *Robert Wood Johnson School of Medicine, Piscataway, NJ*  
Brian Popko, PhD, *University of North Carolina (Chapel Hill) Neurosciences Center, Chapel Hill, NC*  
Gary Rischitelli, MD, JD, MPH, FACOEM, *Oregon Health & Science University*  
Susan Tolle, MD, *Oregon Health & Science University*  
Mitchell Turker, PhD, *Oregon Health & Science University*

### Community-Based Research Project: Reducing Pesticide Exposure in Minority Families

*Oregon Health & Science University*  
Linda McCauley, RN, PhD (Principal Investigator)  
Kent Anger, PhD  
Bill Lambert, PhD  
Michael Lasarev, MS  
Juan Muñiz, MS  
Marie Napolitano, RN, PhD, FNP  
Diane Rohlman, PhD  
Joan Rothlein, PhD  
*Oregon Childhood Development Coalition, Wilsonville, OR*  
Rachelle Mann-Gaytan  
Jacki Phillips  
Juanita Santana (Director)  
Jennifer Euwer, *Euwer Orchards, Hood River, OR*  
Jeffrey Jenkins, PhD, *Oregon State University, Corvallis, OR*  
Raul Maquez, *Farmworker, Hood River, OR*  
Deborah Profant, PhD, *Environmental and Occupational Epidemiology, Oregon Department of Human Services, Portland, OR*  
Lorena Sprager, *La Clinica del Carino, Hood River, OR*  
Dan Sudakin, MD, *Oregon State University, Corvallis, OR*

### Multidisciplinary Training in Neuroscience (Steering Committee)

Gary Banker, PhD (Principal Investigator), *CROET, Oregon Health & Science University*  
Michael Andresen, PhD, *Physiology and Pharmacology, Oregon Health & Science University*  
Chris Cunningham, PhD, *Behavioral Neuroscience, Oregon Health & Science University*  
Fay Horak, PhD, *Neurological Sciences Institute, Oregon Health & Science University*  
Edwin McCleskey, PhD, *Vollum Institute, Oregon Health & Science University*  
Laurence Trussell, PhD, *Oregon Hearing Research Center, Oregon Health & Science University*

# CROET's

## Areas of Emphasis

### Education and Outreach Programs

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**CROET's Education and Outreach Programs have four goals:**

- Provide scientifically accurate information on Oregon's occupational issues, continuously on the Internet and daily with scientific interpretation for complex issues through the Toxicology Information Center (TIC)
- Offer educational programs on Oregon's occupational needs to medical providers and health and safety specialists
- Train health professionals who will investigate Oregon's occupational safety and health issues in the future
- Provide the scientific expertise to help Oregon industry and labor evaluate occupational health and safety questions

### Research

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**Factors that affect workplace performance**

- Cellular mechanisms that control sleep:wake cycles
- Job performance in shift workers
- Computer-based training methods to enhance worker safety training (e.g., ergonomics, respirator use)

**Damage and repair (e.g., post injury) of the nervous system and muscles**

- Assessing nerve cell protein dynamics using imaging
- Using nanotechnology to enhance nerve growth
- Factors that govern the accuracy of nerve synapse formation
- Pharmacological interventions to enhance (e.g., speed) nerve regeneration
- Genetic models of neural degeneration

**Occupational/environmental exposures and their consequences**

- Effects of pesticide exposures assessed using exposure biomarkers and neurobehavioral testing
- Effects of solvent exposures on aircraft maintenance workers
- Toxicant exposures in Gulf War veterans
- Toxicants that disrupt protein transport in neurons
- Airborne pollutants

**DNA damage, genetic alterations, and disease**

- Role of DNA repair in protecting the nervous system from genotoxin effects
- Gene silencing and cancer
- Mutations induced by ionizing irradiation, oxidative stress, and other genotoxins
- Ion channel mutations that underlie diseases

### Selected 2002 Accomplishments and Awards

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- First-ever surveillance of Oregon's "medical-only" workers' compensation claims suggests new prevention priorities
- Identified neuroprotective drug to reduce nerve degeneration from chemical exposure
- Identified a measure of chemical exposure that can be established prior to injury
- Discovered essential biochemical signal used by muscle to promote recovery from nerve injury
- Nanotechnology research shows guidance proteins can control neuron dendrite and axon growth
- CROET's computer-based training programs on ergonomics and food services safety enter field trials
- Toxicology Information Center broadens scope, responding to occupational health questions
- CROETweb hits increase nearly 80 percent in 2002 to over 190,000, and visitors increase 72 percent to over 50,000
- CROETweb begins electronic newsletter to inform visitors on site updates (subscribe at [www.croetweb.com](http://www.croetweb.com))
- Chemical-Risk Information Service upgrades database management, improving response time
- Grant awards grow above \$7.5 million, leveraging Workers' Compensation income from \$3.2 to \$10.7 million
- Dr. Peter S. Spencer awarded the 2002 Distinguished Scientist Award by the Neurotoxicology Specialty Section of the Society of Toxicology
- Dr. Linda McCauley received the Research Award from the American Association of Occupational Health Nurses
- Dr. Mohammed Sabri received Outreach Award from OHSU for his work with Saturday Academy

# 2002 CROET Highlights

## **Workers' Comp Surveillance: Medical-only Claims Suggest New Prevention Priorities**

Drs. Linda McCauley, Joan Rothlein, and Gary Rischitelli are engaged in a collaborative project with the Oregon Department of Health and Human Services and Oregon Workers' Compensation (WC) insurers to identify injury trends and opportunities for prevention. Currently, Oregon WC data only includes work-related injuries and illnesses that result in more than three days of work loss ("time-loss" injuries). WC insurers, however, also maintain databases of employees who are injured but return to work within three days ("medical-only" cases). This project has now merged WC claims data from multiple insurers and employment information from the Oregon Department of Employment into a single database that contains both "time-loss" and "medical-only" claims involving ergonomic injuries, stress-related claims, neck and spinal injuries, and dermatitis. Ergonomic injuries, often described as "musculoskeletal disorders," include sprains, strains, carpal tunnel and other disorders involving repetitive motion, overexertion, bending, twisting, and related bodily actions. More than one-quarter of the claims from 2000 and 2001 in this database were identified as "ergonomic disorders" and more than 65 percent of these were "medical-only" claims. The industries with the largest numbers and the highest rates of "medical-only" claims differ from those industries with the highest numbers and rates of "time-loss" claims. These findings suggest raising the priority on the development of prevention programs for those industries with high "medical-only" claims. (<http://www.ohsu.edu/croet/outreach/>)

## **Neuroprotection: Protecting Nerves and Skeletal Muscle Function**

Deterioration of skeletal muscle mass and impaired muscle function can occur secondarily following loss of the nerve endings that connect to the muscle. Traumatic injuries and several classes of toxic chemicals (such as nerve gases, certain pesticides, and the industrial chemical acrylamide) target and damage the nerve's axon innervating the muscle, resulting in muscle wasting. Acrylamide is a well-established synthetic neurotoxic chemical agent used in various industries (paper and water purification) since the early 1950s. Repeated exposures to laboratory animals produce a well-established model of axon loss in humans. Acrylamide also forms in carbohydrate-rich foods when cooked to high temperatures, but work performed by CROET Director Dr. Peter Spencer was used by the World Health Organization to demonstrate a low neurotoxic risk among consumers. This was based on studies to determine levels of acrylamide needed to induce axon degeneration. While the levels of human exposure from consumption of these food sources appear to be well below those which cause neurotoxicity, CROET's Dr. Bruce Gold recently found that daily injections of the drug FK506 (tacrolimus) to rats also injected with acrylamide dramatically reduce axon loss. Moreover, FK506-treated animals do not develop the functional signs of neurotoxicity. These results may lead to the development of new drugs to protect against axon loss and preserve skeletal muscle function. (<http://www.ohsu.edu/croet/faculty/gold/>)

## **Reconnecting Severed Nerves to Muscles: Muscle Protein Controls Synapse Formation After Injury**

Neuromuscular injuries typically disconnect motor nerves from the muscles they innervate. Recovery requires reestablishing these connections, which often occurs outside of the central nervous system (e.g., in an arm). This capacity for functional regeneration is all the more impressive when one considers that, in an analogy of scale, the growing tip of the axon is able to find a spot the size of a dime in the middle of a football field, stop precisely on that dime, and "dance" (form a new synapse). However, in the case of injury to the muscle, reinnervation can be impaired by disintegration of the original muscle's synaptic site (or loss of the "dime"). Researchers therefore seek a molecular understanding of what cues muscles employ to control synapse formation by motor nerves. CROET's Dr. Bruce Patton identified a muscle surface protein that contains two components not present in the rest of the muscle, and mice were genetically engineered to lack these components. In the first mutant strain, synapses formed correctly during muscle development in embryos but, after injury in adults, motor nerves were not able to reinnervate synaptic sites in the muscle. In the second strain, synapses were unable to form correctly even in development, leading to an inability to survive after birth. Together, these discoveries pinpoint an essential biochemical signal normally used by muscle to promote its innervation. This information will guide efforts to improve recovery from neuromuscular injury and disease, perhaps by leading to molecular treatments to improve recovery following nerve and muscle injury. (<http://www.ohsu.edu/croet/faculty/patton/>)

### **Nanotechnology: Guidance Proteins Control Growth of Neurons**

Drs. Gary Banker and Bruce Patton are exploring the application of nanotechnology—the technology used in the semiconductor industry to make computer chips—to study how growing nerve fibers interact with physical and chemical features in their environment. The goal is to produce interactions between living nerve cells and silicon chips bearing microelectronic circuits, leading to the development of neural prosthetic devices that could restore function of damaged nerves or damaged brain tissue. One of the key challenges in this work is to adapt nanofabrication methods to allow patterning of proteins, including the proteins that guide growing axons, without destroying their biological activity. In 2002, these investigators developed a novel two-step approach that allows formation of accurate patterns while preserving protein function. They have gone on to show that, by preparing patterns combining two different guidance proteins, the growth of axons and dendrites can be controlled independently. This project, which involves collaborations with scientists at Cornell University, is part of one of ten Science and Technology Centers in the country funded by the National Science Foundation to encourage technology transfer and innovative approaches to interdisciplinary activities. (<http://www.ohsu.edu/croet/faculty/banker/index.html>) (<http://www.ohsu.edu/croet/faculty/patton/>)

### **cTRAIN: Ergonomics Training for Drywall Finishers and Food Service Workers**

CROET's program to develop effective individual training methods for occupational safety and health continued to grow in 2002. Our computer-based training program, cTRAIN, was developed by Dr. Kent Anger, CROET Associate Director, and Dr. Diane Rohlman in collaboration with Mr. John Kirkpatrick of the Painters District Council. Research continued on the basic principles underlying training, an area almost devoid of research in working adults, demonstrating again the superiority of interactive training (quizzing during training with immediate feedback on answer accuracy). Quiz frequency appeared to be important for some material, with accuracy on the post-test declining in a program with up to 17 screens of information prior to a quiz, but not in programs with more frequent quizzes. Interestingly, open-book quizzes during training produced slightly better recall than closed-book quizzes, when evaluated later by a closed-book test. New programs for drywall finishing (ergonomic and other issues), lab safety, and food handling were developed and began field testing. The food services safety and health content program increased knowledge of fire safety and hazards such as those leading to slips and falls. (<http://www.ohsu.edu/croet/faculty/anger/>)

### **Superfund Grant: Findings and Impacts**

Now in its third year, CROET's federally funded Superfund Basic Research Center (SBRC) conducts research important to the health of Oregon workers and their environment. Scientists at CROET, Oregon State University, and Battelle Pacific Northwest are working together on a broad range of biomedical and environmental engineering projects. CROET scientists Dr. Mohamed Sabri and Dr. Peter Spencer are studying chemicals that damage the nervous system. Their work has uncovered a potent nerve axon toxin, 1,2-diacetylbenzene (DAB), which is found as a minor component in a number of organic solvent mixtures, including gasoline. 1,2-DAB reacts with proteins to form a blue pigment that can be found in urine, where it may provide a marker of exposure to this and chemically related solvent chemicals with neurotoxic potential. Dr. Jennifer Field, an SBRC scientist based at Oregon State University, is studying ways to enhance microbial transformation (degradation) of trichloroethylene (TCE), a common toxic contaminant at Superfund sites. Natural degradation of TCE in groundwater can be quite inefficient and slow, and toxic metabolic products including vinyl chloride can accumulate if degradation does not proceed to completion. Dr. Field and her colleagues are developing a technology that can speed degradation rates and help prevent accumulation of toxic metabolites. With further refinement, this technology may one day produce an inexpensive, non-toxic chemical additive mixture that will dramatically speed up the rate of groundwater decontamination in comparison to currently existing remediation strategies. (<http://www.ohsu.edu/croet/sbrc/>)

### **Toxicology Information Center: TIC Focus Expands**

CROET'S Toxicology Information Center (TIC) is a special purpose library with holdings relevant to CROET's mission and with access to the world's electronic resources on the Internet. The TIC, under the directorship of Fred Berman, DVM, PhD, responds to inquiries from professionals and the lay public regarding chemicals encountered in the workplace, home, or other environments. Examples from the more than 250 phone and Internet queries received last year include: health risks from carbon monoxide, chlorine, freon, trichloroethylene (TCE), benzene, diesel and aviation fuel, and childhood lead exposure. The TIC has also been fielding an increasing number of questions about the broad area of occupational health, beyond its initial scope of toxicology. Just as CROET's research, education, and website have expanded over the years to broad areas of occupational safety and health, the TIC now responds to all occupational health inquiries. The resources of the TIC, including computers, are available to the public Monday through Friday from 8 a.m. until 5 p.m. For more information or to join the CROET mailing list, visit our website or contact CROET by phone at 503-494-4273. (<http://www.ohsu.edu/croet/outreach/tic.html>)

### **CROETweb Evolves: Site Redesign, Electronic Newsletter, Movies, Larger Focus Group**

CROETweb is a major source of occupational safety and health information for all Oregonians, as well as a repository of information about the Center's many activities. Designed as a directory, the resource area of CROETweb contains links to hundreds of resources for health and safety professionals. Pages are dedicated to all major Oregon industries and occupations, as well as to a variety of safety and health topics that are updated on a regular basis. CROETweb was redesigned in 2002 to improve the navigation and usability of the website. A monthly email newsletter was begun to provide information about "what's new" on the CROET website, as well as upcoming events. Subscriptions to the newsletter are received daily. Six short movies were created that feature CROET scientists describing their research and how it benefits Oregon. They are available at CROET's home page. Several Oregon safety and health professionals were recruited as new members to CROET's Web Focus Group, which provides feedback about the website and makes content recommendations for the occupation and industry pages. Activity on CROETweb continued to increase. Hits on the site grew to over 190,000 in 2002 (up nearly 80 percent from 2001) with more than 50,000 visitors (up 72 percent from 2001). Oregon safety and health specialists tell us they visit CROETweb frequently. (<http://www.ohsu.edu/croet/>) (<http://www.croetweb.com>)

### **Education: Responding Across the Full Spectrum of Educational Needs**

CROET's education program has a broad scope. The focus of our training programs ranges from occupational safety and health professionals to graduate students and postdoctoral trainees (funded by grants), and from college students in our summer student program to high school students visiting for one or more days in a CROET laboratory. In 2002, we held seminars targeted at the occupational safety and health community: (1) Developing More Effective Training, and (2) Office Workers, the latter as part of our collaboration with Portland State University's Occupational Health Psychology Program. CROET also staffed Brain Awareness Week at OMSI, providing neurobehavioral testing for many attendees, from children to post-retirement adults. CROET continued to participate actively in Oregon's Saturday Academy program, including mentoring young women as part of the Advocates for Women in Science, Engineering and Mathematics (see award for Dr. Mohammed Sabri in Selected 2002 Accomplishments). (<http://www.ohsu.edu/croet/outreach/>)

### **Chemical Risk Information Service: Expanded Services to Oregon Business**

CROET's fee-based Chemical Risk Information Service is a 24/7 toxicological risk information program designed to help business and industrial clients comply with the OSHA Hazard Communication Standard. Directed by Greg Higgins, PhD, the program expanded services during 2002 by adding LaserJet printer products to the family of Hewlett Packard (HP) products already drawing on CROET's unique service. Worldwide access is now provided for customers needing MSDSs for HP inkjet and LaserJet printer cartridges and inks. The chemical risk program also began upgrading database management capabilities this year by converting website operations to Microsoft SQL Server. This change is expected to streamline operations, improve customer response time, and provide the infrastructure necessary for continued growth. (<http://www.ohsu.edu/croet-cris>)

# Financial Summary

## CROET Expenditures: Fiscal Year 2001/2002

Workers' Compensation (WC) Expenditures		Federal and Other Grant Expenditures	
<b>Salaries</b>		<b>Salaries</b>	
Salaries - research (18% of all salaries)	\$864,517	Salaries - research (51% of all salaries)	\$2,423,209
Salaries - outreach (10% of all salaries)	467,080	Salaries - outreach	0
Salaries - education (4% of all salaries)	175,953	Salaries - education (1% of all salaries)	45,487
Salaries - administration (9% of all salaries)	434,799	Salaries - administration (1% of all salaries)	50,245
Salaries - core services <sup>1</sup> (4% of all salaries)	182,258	Salaries - core services (2% of all salaries)	75,853
<b>Supporting Services (includes cores)</b>		<b>Supplies and equipment</b>	
Supplies and equipment	649,170	(Laboratory supplies, animal costs, human subjects, equipment, and other expenses)	2,364,130
Miscellaneous support <sup>2</sup>	162,292		
<b>Outreach and Education</b>		<b>Other Expenses</b>	
Services, supplies, and equipment	188,526	Building operations and maintenance	622,586
<b>Other Expenses</b>			
Bond principal and interest	353,481		
OHSU administrative charges	122,508		
<b>Total</b>	<b>\$3,600,584<sup>3</sup></b>	<b>Total</b>	<b>\$5,581,510<sup>3</sup></b>

## Programs: Fiscal Year 2001/2002

	Amount paid by WC	Amount paid by grants	Total Cost
<b>Outreach and Education</b>			
Information dissemination (e.g., TIC <sup>4</sup> , website, newsletters, and brochures)	\$636,395	\$0	\$636,395
Education and training programs (professional and para-professional)	194,657	271,162	465,819
Chemical Risk Information Service	507	0	507
<b>Basic and Applied Research</b>			
Factors that affect workplace performance	237,003	1,163,190	1,400,193
Damage and repair of the nervous system and muscle	446,656	911,996	1,358,652
Occupational/environmental exposures and their consequences	311,001	1,349,709	1,660,710
DNA damage, genetic alterations, and disease	140,802	1,037,371	1,178,173
Other ongoing projects <sup>5</sup>	27,859	0	27,859
Core services support <sup>1</sup>	274,298	225,496	499,794
<b>Non-Program-Specific Expenses<sup>6</sup></b>	<b>1,331,406</b>	<b>622,586</b>	<b>1,953,992</b>
<b>Total Expenses</b>	<b>\$3,600,584<sup>3</sup></b>	<b>\$5,581,510<sup>3</sup></b>	<b>\$9,182,094</b>

<sup>1</sup> Core services - centralized graphics, statistics, imaging, tissue culture, and morphology (pathology) services

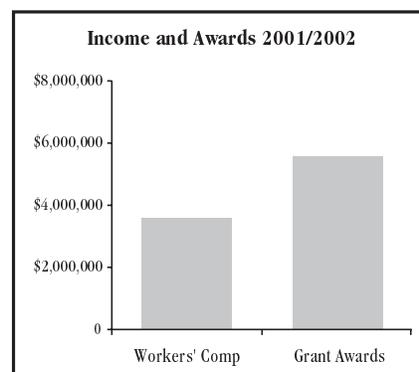
<sup>2</sup> e.g., office supplies, equipment maintenance and repair, phone rental and line charges

<sup>3</sup> Expenditures in top panels reflect expenses incurred during the year. Workers' Compensation income and grant awards shown in the graph to the right are typically expended in the 12 months following the receipt date at CROET. Together, expenditures (above) and income and awards (right) depict CROET's solid financial condition.

<sup>4</sup> Toxicology Information Center

<sup>5</sup> Primarily legislative mandates (e.g., hepatitis research)

<sup>6</sup> Includes supporting services, administrative salaries, bond principal and interest, OHSU administrative charges, building operation and maintenance



# CROET

The Center for Research on Occupational and Environmental Toxicology (CROET) conducts research, trains health professionals, provides consultation, and offers the public information on hazardous chemicals and their health effects. CROET includes more than 85 scientists and research staff exploring a range of questions relating to the prevention of injury and disease — and the promotion of health — in the workforce of Oregon and beyond. CROET's Toxicology Information Center (TIC) is staffed to answer Oregonians' questions about chemical and other occupational exposures, and the Center's website makes health and safety information continuously available.

## How to Contact Us

### Mail Address

CROET  
Oregon Health & Science University  
3181 S.W. Sam Jackson Park Road, L606  
Portland, Oregon 97239-3098

### World Wide Web Address

[www.ohsu.edu/croet](http://www.ohsu.edu/croet) or [www.croetweb.com](http://www.croetweb.com)

### Telephone

Main CROET number: 503-494-4273  
Fax: 503-494-4278  
Toxicology Information Center: 503-494-7366

### E-Mail

General information  
[croetweb@ohsu.edu](mailto:croetweb@ohsu.edu)  
Toxicology Information Center  
[croettic@ohsu.edu](mailto:croettic@ohsu.edu)

For additional copies of this report, call CROET at the numbers listed above, or visit [www.ohsu.edu/croet](http://www.ohsu.edu/croet) and click on "contact CROET".

## Directors and Scientific Staff, 2002

### Director and Senior Scientist

Peter S. Spencer, PhD, FRCPATH

### Associate Director and Senior Scientist

W. Kent Anger, PhD

### Associate Director for Finance and Planning

J. Robert Williams, MBA

### Assistant Director for Operations

Gregory Higgins, PhD

### Assistant Director for Business Affairs

Janice Fisher, BS

### Faculty

Charles Allen, PhD  
Richard Allen, PhD  
Kent Anger, PhD  
Gary Banker, PhD  
Bruce Gold, PhD  
Glen Kisby, PhD  
Doris Kretzschmar, PhD  
William Lambert, PhD  
Linda McCauley, RN, PhD  
Valle Nazar-Stewart, PhD  
Bruce Patton, PhD  
Gary Rischitelli, MD, JD, MPH, FACOEM  
Show-Ling Shyng, PhD  
Peter Spencer, PhD, FRCPATH  
Mitchell Turker, PhD

### Investigators

Gregory Higgins, PhD  
Robert Irwin, MD, PhD  
Stefanie Kaeck Petrie, PhD  
Mohammad Sabri, PhD  
Desiré Tshala, MD, PhD  
Christopher Wallace, PhD  
Ginger Withers, PhD

### Scientific Staff

Daniel Austin, MS  
Frederick Berman, DVM, PhD  
Etienne Cartier, MD  
Lisa Clepper, MS  
Karen Fujimoto, BS  
Sundii Gillespie, RN, BA, CSPI  
Seyed Hashemi, MA, MS  
Taiping Jia, MD  
Robert Kayton, PhD  
Si Hyun Kim, PhD  
Hoa Lam-Lesselroth, MS  
Mike Lasarev, MS  
Elaine Mahoney, MS  
Sarah Michaels, MS  
Mykhaylo Moldavan, PhD

### Front Cover

#### Top Photo

Photomicrograph of nerve synapse with muscle; from research by Bruce Patton, who discovered the key role of laminins in establishing a proper connection between nerve and muscle (described in Highlights).

#### Middle Photo

CROET website, which serves Oregonians with its widely used resource directory for occupational safety and health focused on Oregon industry and occupations.

#### Bottom Photo

Picture of attaching corner bead from CROET's training program on prevention of slips, falls, and ergonomic or musculoskeletal injuries in drywall finishing through work-practice changes. The program is being developed in collaboration with John Kirkpatrick of the International Union of Painters and Allied Trades (IUPAT) and associated contractors, including the Harver Company (described in Highlights).

### Back Cover

CROET engages in research to identify and prevent illnesses and injuries in the workforce. Although we blaze a new trail, we are not the first to walk in these woods. For centuries, workers and physicians have sought to clarify the relationships between various exposures and disease. Listed on the back cover are descriptions of occupational disorders named by those afflicted or by their caregivers.

### *Scientific Staff, continued*

Juan Muñiz, MS  
Anthony Oliva, PhD  
Diane Rohlman, PhD  
Joan Rothlein, PhD  
Bernard Sampo, PhD  
Jennifer Scherer, MPH  
Susan Shapiro, MS  
Holly Sherburne, MS  
Satoko Shimamura, MS  
Michael Silverman, PhD  
Larry Smith, MS  
Diana Sticker, MPH  
Daniel Storzbach, PhD  
Jakob Tschape, PhD  
Kamila Vagnerova, PhD  
Jan Voda, MD  
Feifei Yan, PhD  
Dong Ren Yang, PhD  
Phillip Yates, PhD  
Xialo Lin Yu, MS



Oregon Health & Science University  
Center for Research on Occupational and Environmental Toxicology  
3181 S.W. Sam Jackson Park Road, L606  
Portland, Oregon 97239-3098

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