1997–99
BIENNIAL REPORT



DEPARTMENT OF ENVIRONMENTAL HEALTH

SCHOOL OF PUBLIC HEALTH & COMMUNITY MEDICINE

UNIVERSITY OF WASHINGTON

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Department of Environmental Health faculty, September 1999
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Who we are . . .

People & Programs

31 *full-time faculty members*

50 *undergraduate students*

75 *graduate students*

116 *staff*

11 *centers and institutes*

1,100 *people trained annually through continuing education*

We are a dynamic department whose primary focus is discovering and analyzing the links between human health and the environment.

The faculty is multidisciplinary and includes physicians, engineers, chemists, industrial hygienists, toxicologists, and other public health scientists.

Whatever their focus, these researchers share a common goal—to understand and manage environmental safety and health risks and, in so doing, to protect human health and well-being.

We invite you to explore our programs and activities.

—Dave Kalman, Interim Chair

1947

A HALF-CENTURY OF SERVICE

The biennium opened with a 50th anniversary celebration at the Department of Environmental Health.

In 1947, the University of Washington had just opened its School of Medicine. Within the School's Department of Public Health and Preventive Medicine was a small program to train undergraduate students in sanitary science, one of 14 such programs in the country at that time. That program continues today, 53 years later, as the undergraduate major (BS) in Environmental Health.

The state Legislature in 1963 established an occupational and environmental research facility at UW, with funding from the state industrial insurance Medical Aid and Accident Funds. The Environmental Research Laboratory became the Environmental Health Division and, when the School of Public Health and Community Medicine was formed in 1970, this division became the Department of Environmental Health.

In the 1960s, following the publication of Rachel Carson's *Silent Spring,* concern about toxic pollutants increased, and UW expanded its program in sanitary science to include chemical agents and toxicology.

In the 1970s, the department's focus turned toward research as it added a graduate program and expanded the faculty. Throughout the 1980s, the department developed its graduate and research programs in Occupational and Environmental Medicine, Toxicology, Industrial Hygiene, and Environmental Health Technology.

Today our mission encompasses a range of public health concerns as we face new biological and toxicological threats. Diseases such as asthma and tuberculosis are on the rise; new viruses are emerging, and others are showing multiple drug resistance. Global risk assessment issues regularly make headlines.

The integration of the Department of Environmental Health's research, service, and teaching elements is now more important than ever, as we educate the environmental and occupational health professionals who will provide leadership for the next 50 years.

Marcy Harrington, PNASH program coordinator

Cecile Kresja, doctoral student

Dave Eaton, professor

We are ...

- one of five departments in the University of Washington's School of Public Health and Community Medicine
- four graduate tracks leading to master of science and doctoral degrees
- an undergraduate program offering sought-after job skills
- home to five federally funded research and education centers
- a continuing education program on occupational and environmental health and safety
- a variety of activities and organizations providing services to Washington state employers and workers, such as the Field Research and Consultation Group
- faculty who are nationally recognized leaders in their fields
- a well-trained and motivated staff.

Joel Levin, computer specialist

Tim Larson, adjunct professor

Adrienne Norquist, continuing education program coordinator

Academic programs

Environmental Health Technology trains students to identify major sources of contamination in water, air, soil, and food and take appropriate prevention, control, and communication measures. A master of science degree is offered.

Industrial Hygiene and Safety students study chemicals, noise, and other occupational safety and health hazards; their effects on the human body; and effective control measures. The program offers a doctoral degree and two master of science tracks: industrial hygiene and safety/ergonomics.

Occupational and Environmental Medicine residencies and fellowships train physicians in the clinical practice of occupational and environmental medicine, and in occupational and environ-mental health. These doctors can earn a master's degree in public health.

The **Toxicicology** program focuses on environmental and workplace toxicants and their effects on human health. Master's and doctoral degrees are offered.

The department's **Undergraduate** program offers two bachelor of science degree paths. One focuses on sanitary hazards associated with drinking water, wastewater, food, housing, and insects and rodents. The other focuses on chemical and physical hazards associated with indoor and outdoor air, water, soil, and the workplace.

Other departmental programs

1997–99

See department's organizational chart on page 55

Service programs

The Field Research and Consultation Group conducts field-based research and provides occupational and environmental health and safety consultation to companies that request assistance. Consultants observe work practices; collect samples or other data; perform laboratory analysis and, in some cases, medical examinations; report summary findings and recommendations for controlling workplace exposures; and help companies design and evaluate effective control strategies.

The Environmental Health Laboratory is certified by the American Industrial Hygiene Association. The lab analyzes environmental, industrial, and biological samples to define chemical hazards and quantify exposures.

Centers and institutes

The Northwest Center for Occupational Health and Safety is one of 15 education and research centers funded by the National Institute for Occupational Safety and Health (NIOSH). It supports graduate education in industrial hygiene and safety, occupational medicine, and occupational health nursing. The center serves as an educational resource for Washington, Oregon, Idaho, and Alaska and offers a continuing education program to maintain and upgrade the skills of people working in occupational and environmental health.

The UW OSHA Education Center offers high-quality training on standards mandated by the federal Occupational Safety and Health Administration (OSHA) and state agencies in Washington, Oregon, and Alaska.

The Center for Ecogenetics and Environmental Health (CEEH), funded by the National Institute of Environmental Health Sciences (NIEHS), pulls together more than 50 faculty from 14 UW departments to study how environmental factors interact with genetics to influence diseases such as cancer, heart disease, and chronic neurological diseases. It has two outreach components:

Health and Environmental Resources for Educators (HERE @UW) trains elementary and secondary school teachers. The curriculum prepares future generations to make informed decisions about risks from chemicals in the environment and the workplace.

The Community Outreach and Education Program (COEP) helps the public understand how genetic and environmental factors interact to produce disease.

Field Research & Consultation Group works with Washington manufacturers

The Institute for Risk Analysis and Risk Communication (IRARC) works to improve risk assessment methods and the scientific foundations supporting risk assessments. Three research programs fall under IRARC:

The Center for Child Environmental Health Risks Research is funded by the US Environmental Protection Agency (EPA) and NIEHS to further knowledge of children's susceptibility to toxicants.

The Consortium for Risk Evaluation with Stakeholder Participation (CRESP) works with the US Department of Energy (DOE) to advance cost-effective cleanup of the nation's nuclear weapons production facility waste sites. A goal is to give affected parties a greater understanding of the scientific and technical basis of environmental management decisions.

The Center for the Study and Improvement of Regulation is funded by Carnegie Mellon University to merge the study of pollution, risk, public health, technology, economics, organizations, and history to improve environmental health and safety regulations.

The Pacific Northwest Agricultural Safety and Health Center (PNASH) is funded by NIOSH and the state of Washington to improve occupational safety and health in farming, fishing, and forestry in Alaska, Idaho, Oregon, and Washington. UW researchers work with colleagues at Eastern Washington University, Washington State University, and the University of Idaho, and with employers and workers in the three industries.

The Superfund Basic Research Program is an EPA and NIEHS-sponsored, interdisciplinary program involving faculty and graduate students from DEH, Civil Engineering, Biochemistry, Forestry, and Microbiology. The goals are to develop biological markers to assess people's exposure to toxicants and susceptibility to disease, to assess physiological damage in humans and wildlife, and to develop new technology to remediate contaminated sites.

The Occupational Epidemiology and Health Outcomes Program conducts research to improve medical care, update treatment guidelines, and provide information on treatment outcomes to injured workers and their physicians.

The Policy Analysis and Program Evaluation Initiative works closely with the state Department of Labor and Industries (L&I), and with business and labor to improve the quality of occupational safety and health policies and programs in Washington.

The Chemically Related Illness Center for Excellence, part of the Occupational and Environmental Medicine program, seeks to offer

PNASH

Center for Ecogenetics and Environmental Health

CRESP

the best diagnosis and treatment of patients with chemically-related illness, improve public understanding of such illness, and conduct research on this topic. Patients are usually referred through the workers' compensation system.

The EPA Northwest Research Center for Particulate Air Pollution and Health is one of five in the country recently funded by the EPA. The center addresses health effects of particulate matter air pollution.

The International Scholars in Occupational and Environmental Health is a training program based in the Occupational and Environmental Medicine program. The center is funded by NIOSH and by two of the National Institutes of Health–the Fogarty Institute and NIEHS. It supports research and training partnerships with faculty and scientists in Vietnam, Thailand, Nicaragua, Costa Rica, and Ecuador.

Our mission

graduate students Eyob Mazengia and Francis Buck analyze genetic fingerprints of E. coli strains

To identify agents in the environment and the workplace that affect human health

To elucidate their mechanisms

To develop strategies for confronting their effects

To share the knowledge obtained

In addressing this public health mission, our goal is to promote excellence in education and research.

Opposite Page

the Occupational and Environmental Medicine program works with workers and health-care providers in Vietnam, Thailand, Costa Rica, Nicaragua, and Ecuador; this Vietnamese farmer uses a manual cultivator

What we do ... and whom we serve

We are working to reduce

5,000
births per year with fetal alcohol syndrome

$40,000,000
a year in disability compensation for hearing loss in Washington state

1,000,000
current cases of Parkinson's disease in the United States

From more than 70 current projects, we have selected six to illustrate what we do. Ranging from basic research at the frontiers of science to projects with immediate practical application, they illustrate how the teaching, research, and service missions of the department serve the workplace, Washington state communities, and the larger community of environmental health researchers and professionals.

One research team has helped explain how alcohol stunts development of the fetal brain, causing permanent disability. Another team has established the nation's most sensitive genetic fingerprinting technique to track down and eliminate causes of microbial food poisoning. Other researchers examine how environmental factors–such as diet, smoking, and pesticide exposure–contribute to Parkinson's disease.

Our partnership with employers, workers, and educators is represented by three projects: research into noise levels and hearing loss in construction and metalworking industries, remote sensing of airborne hazards, and a program to educate teenage workers about on-the-job safety risks.

We hope you enjoy these snapshots of the Department of Environmental Health in action. Citations are in the appendix.

Understanding fetal alcohol

Unlocking a key environmental health problem

top: Dr. Lucio Costa

bottom: Drs. Marina Guizzetti and Lucio Costa

Fetal alcohol syndrome (FAS)–the most common environmental cause of mental retardation–is entirely preventable.

The Department of Environmental Health recently published findings that help explain the mechanism by which alcohol stunts development of the fetal brain, causing permanent disabilities.

Professor Lucio G. Costa, director of the department's Toxicology program, has spent more than a decade researching the effects of ethanol, a type of alcohol, on brain development. "Pioneering work on fetal alcohol syndrome," says Dr. Costa, "has been done here at UW by Dr. Ann Streissguth and her colleagues since the late 1970s. Yet, the mechanisms underlying the toxic effects of ethanol on the developing brain are still not known."

Children with fetal alcohol syndrome have a range of central nervous ystem dysfunctions, including microencephaly (abnormal smallness of the brain) and mental retardation.

Labels on alcohol bottles warn women not to drink during pregnancy. In the last three months before birth, a baby's brain undergoes its greatest growth. At this stage, alcohol can cause microencephaly in both rats and children. The condition appears to be irreversible. Dr. Costa's research seeks to understand potential mechanisms and determine whether therapeutic measures might prevent brain damage.

The research has focused on astrocytes–relatively large, star-shaped cells that surround neurons, the basic units of the nervous system. Astrocytes and other glial (supporting) cells are thought to have important metabolic functions.

Work by Dr. Marina Guizzetti, a postdoctoral fellow in Dr. Costa's laboratory, has shown that low levels of alcohol (the equivalent of 0.06 to 0.2% in blood–not too different from the 0.08% limit for driving) can inhibit

SYNDROME

the proliferation of astroglial cells. This may contribute to some of the toxic effects, such as microencephaly, seen in FAS.

One of Dr. Costa's graduate students, Michelle Catlin, recently published her doctoral dissertation on the effects of ethanol on astroglia. She found that low levels of ethanol inhibited the effect of calcium in these cells. As calcium plays important roles in cell functions, these results may be relevant to understanding FAS.

She studied the calcium uptake of cells using a special tool, a confocal microscope that was provided with support from the department's Center for Ecogenetics and Environmental Health grant from the National Institute of Environmental Health Sciences (NIEHS).

The center

UW is one of 20 NIEHS centers doing interdisciplinary research in environmental health sciences. Dr. Costa is director of the UW center's neurotoxicology research core, focusing on environmental causes of chronic neurological diseases, such as Parkinson's disease, Alzheimer's disease, amylotrophic lateral sclerosis (ALS), fetal alcohol syndrome, and mechanisms of cell death.

Dr. Costa coordinates the work of researchers from the UW departments of Environmental Health, Medical Genetics, Epidemiology, and Pathology. He is also studying another cause of mental retardation, the inability to metabolize phenylalanine. This may lead to a syndrome known as maternal phenylketonuria (mPKU). His research on maternal PKU-related mental retardation also comes under the NIEHS grant. This interest stems from the observation that the effects seen in children with mPKU and FAS (microencephaly and mental retardation) are very similar.

Dr. Costa's research is funded partly by the NIEHS and the National Institute on Alcohol Abuse and Alcoholism (NIAAA). ■

Michelle Catlin uses a plastic slug and salt to explain toxicology to elementary and high school students

Graduate students share knowledge

Michelle Catlin was a graduate student in Canada when she first heard about the UW's Toxicology program. She came here from Kingston, Ontario, to conduct research on fetal alcohol syndrome with Dr. Costa.

In addition to her research, she helped develop the curriculum for the department's "Tox-in-a-Box" educational program and recruited fellow graduate students to present the curriculum in public schools throughout Puget Sound. She hopes K–12 students will become interested in environmental health and begin to make connections between basic science and the principles of toxicology. Her own interest began with her first toxicology course as an undergraduate when she suddenly saw how science and the environment came together.

After receiving her PhD in 1999, Dr. Catlin began postdoctoral work in science policy at the National cademy of Sciences in Washington, DC.

Center brings disciplines together

UW's Center for Ecogenetics and Environmental Health studies interactions between genetics, human health, and the environment. The center brings together more than 50 core investigators from 14 departments within the UW schools of Medicine and Public Health and Community Medicine, Department of Pharmacy, and the Fred Hutchinson Cancer Research Center. Scientists from different disciplines work together in five research cores and six facility cores that provide specialized research tools and support.

With funding from NIEHS, the UW center strives to understand and communicate how genetic factors influence human susceptibility to environmental health hazards.

background: 10x phased-contrast microscope photograph—mixed culture of astrocytes and neurons (also see cover photo)

Tracking food-borne illness

Genetics and epidemiology trace sources of pathogens

top: Dr. Mansour Samadpour, undergraduate student Nora Su-In Chen, and research technician Dalia Alfi discuss a report

Dr. Mansour Samadpour, a microbiologist and food scientist, has established a nationally prominent molecular epidemiology laboratory at the UW. His work allows for fast identification of food- and water-borne illnesses. His work, and the groundbreaking epidemiology by the Seattle-King County Department of Public Health that it supports, are among the reasons that sources of environmental diseases are often identified first in the King County area.

For example, an outbreak of *Salmonella* in June 1999 was reported first in King County, though cases were subsequently identified in 15 other states. The strain was identified as *Salmonella,* Muenchen variety, and the King County epidemiologist, with assistance from Dr. Samadpour's laboratory, began searching for the source.

A unique genetic pattern or fingerprint allows epidemiologists to pursue only those cases of food poisoning caused by an identical strain of bacteria. Fingerprinting can definitively identify the source or, as Dr. Samadpour puts it, "weed out the background."

Within a week after the first patient clusters were identified in June, King County epidemiologists identified the source as unpasteurized orange juice that was used in fruit smoothies at a restaurant chain. The juice company issued a voluntary recall.

Proactive epidemiology

Previous epidemiological methods could take months to pinpoint a source. "They end up doing a postmortem study and writing scholarly papers," Dr. Samadpour said. He prefers to use epidemiology to identify outbreaks in the early stages– what he calls "proactive epidemiology." Identifying the cause based on the first few cases is "much harder and more time consuming" than waiting for patterns to unfold, he said. "We want to push epidemiology in a direction it hasn't gone before."

The department and the county worked together during the 1996 outbreak of *Escherichia coli* that was traced to unpasteurized apple juice. Sixty-six cases were identified and one person died, yet the toll could have been higher. The relatively quick identification allowed the juice company to pull suspect products off store shelves within a week.

Dr. Samadpour's lab also works with air and water pollution. For example, King County officials feared that fecal bacteria contaminating a beach on Lake Washington might have been from a nearby trunk sewer line. Dr. Samadpour was able to rule out the sewer line by linking the contamination to ducks and geese.

His technique, called microrestriction analysis, delivers a more exacting fingerprint of bacterial strains than the computerized analysis called PFGE (pulsed field gel electrophoresis) used by most public health departments.

Fingerprints

The fingerprints show variation among bacterial strains in the lengths of DNA fragments cut by certain enzymes. Restriction enzymes recognize specific nucleotide sequences; each enzyme cuts the DNA at a specific recognition site.

After bacteria are isolated from a patient's clinical samples, Dr. Samadpour's laboratory extracts the bacterial DNA and enzymatically cuts it into fragments, which are then resolved on the basis of their sizes to generate genetic fingerprints. The presence or absence of shared fragments shows the bacteria's relatedness: bacteria with identical restriction fragment patterns most likely come from the same source.

Dr. Samadpour's technique builds on methods established by the Centers for Disease Control and Prevention (CDC). His enhancement has become so widely known that, in 1998, he was brought in to fingerprint the cause of an *E. coli* outbreak at a suburban Atlanta water park–literally in the CDC's back yard. ■

Nortso Gyaltsong, a senior in Biology, prepares Seattle Water Department samples

Undergraduate research

Mansour Samadpour started researching enteric pathogens in 1977 as a college junior recently arrived from Iran. His research into causes of traveler's diarrhea interested him so much that he abandoned plans for medical school and majored in microbiology instead.

Because of that experience, Dr. Samadpour encourages undergraduate research. He usually has between six and eight undergraduates working in his laboratory. He recruits freshmen and sophomores majoring in Chemistry, Biology, or Environmental Health so that their lab experience can help them make sense of their studies and put theory into practice.

Molecular epidemiology laboratory

The molecular epidemiology laboratory helps DEH and health department investigators identify outbreaks of infectious diseases and conduct microbial source tracking studies.

Dr. Samadpour uses a variety of methods in molecular biology to differentiate among strains of microbial pathogens. The main focus of Dr. Samadpour's work is in rapid identification of infectious disease outbreaks, and identification of the sources of microbial pollution in the environment.

background: transmission electron micrograph of E-coli 0157:H7

Researching Parkinson's

study combines genetic, epidemiological approaches

Professor Harvey Checkoway is seeking to unlock the genetic and environmental keys to Parkinson's disease, a progressive disorder of the nervous system that was first described in 1817 by the English physician James Parkinson. It affects about one million people in the United States. It usually strikes after age 50, and is characterized by tremor, rigid movement, slowed gait, and stooped posture.

People with Parkinson's disease have low levels of dopamine, a neurotransmitter that helps control muscle coordination. Dopamine usually inhibits the transmission of nerve signals; without it, nerve pathways can overload. These excess signals can overexcite the muscles, causing them to stiffen and lock, as might a computer attempting to run too many programs at once.

The degradation of dopamine-releasing nerve cells is a normal and inevitable part of aging, Dr. Checkoway said. "We all lose some dopamine production. People move more slowly as they get older and that is one of the reasons." There is also some evidence that environment may be a factor. Rather surprisingly, some cigarette smokers are significantly less likely to develop Parkinson's disease than nonsmokers.

Recent research in the department's Center for Ecogenetics and Environmental Health helps clarify the connection between Parkinson's disease and smoking, as discussed below. Dr. Checkoway is also lead investigator on a Parkinson's study funded under a Superfund Basic Research Program grant from the National Institute of Environmental Health Sciences (NIEHS).

top: Dr. Harvey Checkoway

bottom: Dr. Paola Costa-Mallen

Genetic Factors

His study found that smoking only protects people with a gene variation that puts them at higher than average risk for contracting Parkinson's disease. Among people who do not have this variation, smoking ***increases*** the chance of getting Parkinson's disease.

The gene in question is MAO-B, which produces an enzyme that destroys dopamine. People who are at higher risk for Parkinson's have a form of MAO-B (the "G"

DISEASE

variation) that may break dopamine down too quickly. Smoking appears to slow the action of the MAO-B enzyme, helping maintain necessary dopamine supplies. A drug (selegiline) partly mimics smoking's effect on Parkinson's by inhibiting the MAO-B enzyme.

Dr. Checkoway is also researching connections between diet and Parkinson's disease. His team studied the diets of newly diagnosed Parkinson's patients at Group Health Cooperative and compared them with similar Group Health members who had no diagnosed neurodegenerative diseases. Researchers found an increased risk of Parkinson's disease among people who ate more animal fat, but there was no apparent protection from diets high in antioxidants, such as Vitamins A and C.

Pesticides have been implicated in Parkinson's disease. Laboratory experiments suggest that pesticides could damage the mitochondria (principal energy sources of the cells). Epidemiological research on this topic is being conducted through the Pacific Northwest Agricultural Safety and Health Center (PNASH).

Agricultural Workers

Drs. Checkoway and Matt Keifer, along with Dr. Kent Anger from Oregon Health Sciences University and Larry Engel, a recent PhD graduate in Epidemiology, completed a study of about 300 elderly orchardists from the Wenatchee area of Washington state. Participants filled out an extensive questionnaire that described their use of pesticides and took neurological examinations, and memory and cognition tests.

The research team looked for early Parkinson's symptoms (parkinsonism). Findings could help predict neurologic disease risk in pesticide-exposed workers. The results showed more requent symptoms of parkinsonism in orchardists with the longest duration of exposures to pesticides. However, further research will be necessary to identify specific pesticides that may contribute to these symptoms. ■

children's pesticide exposure study—playground in an orchard

Agricultural safety & health center

The Pacific Northwest Agricultural Safety & Health Center (PNASH) was established in 1996. The center's mission is to prevent occupational disease and injury among farming, fishing, and forestry workers and their families in Alaska, Idaho, Oregon, and Washington. PNASH works with employers, labor, communities, and government agencies to develop research, outreach, and evaluation programs.

Funding comes from the National Institute for Occupational Safety and Health (NIOSH) and the Washington state Medical Aid and Accident Funds.

Continuing education

Pesticide Medicine is one of the continuing education courses offered by the Northwest Center for Occupational Health and Safety. The center—one of 15 education and research centers funded by NIOSH—provides safety and health graduate programs and short courses in Oregon, Idaho, Alaska, and Washington. The department also has an OSHA education center, one of 14 centers approved by the Occupational Safety and Health Administration.

Molecular biomarker laboratory

The Molecular Biomarker Laboratory helps DEH investigators identify genetic differences that influence how individuals react to toxic substances, which can be influenced by nutrition, age, sex, other diseases, and other factors.

Research at the department and elsewhere has established that human populations possess polymorphisms (genetic variability) for many enzymes of toxicological relevance, including those that could unlock the mysteries of Parkinson's disease. The state's Medical Aid and Accident Funds help support this laboratory.

background: apples

Protecting young workers

Preparing teenagers to work safely

After school, you'll find Hannah in a restaurant kitchen, earning college money and learning lifetime work habits. But what if she gets hurt on the job? What if she burns herself or lifts something too heavy? What if her boss asks her to do something that seems unsafe?

Hannah is prepared to handle such situations. She learned to speak up for herself during classroom exercises that are part of a curriculum developed at the UW under a Washington state program called School to Work.

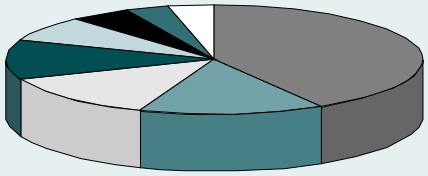
One lesson from this curriculum turns familiarization with child labor rules into a competitive game. Another lesson, the *CLEVER* game, encourages students to brainstorm alternative solutions for managing workplace hazards.

Although the curriculum includes fun and games, the teen safety problem is anything but trivial. Consider these examples:

- A 15-year-old Tukwila boy fell to his death while washing windows at a Northgate-area office building, despite a state law that prohibits anyone under 18 from working more than 10 feet above the ground.
- A 16-year-old was raped while working alone at a restaurant late at night. If she had known about child labor laws, she could have declined to work past 10 p.m. on school nights or to work unsupervised past 8 p.m. any night.

National statistics show that teens have a higher occupational injury rate per hour worked than adults. Each year in the United

WHERE DO TEEN WORKERS GET HURT?



Restaurant	41%
Service Industry	15%
Food Store	13%
Retail/Wholesale (Sales)	12%
Agriculture/Forestry/Fishing	7%
Manufacturing	5%
Construction	4%
Other (public administration, transportation, and unknown)	4%

The department's Dr. Joel Kaufman and L&I's Mary Miller studied accepted injury claims filed by teens in Washington State between 1988 and 1991 (see appendix for citation)

top: Hannah, 17, works at a local restaurant after school

States, about 70 teens die from work injuries and more than 200,000 are injured on the job, according to the National Institute for Occupational Safety and Health (NIOSH).

Addressing a need

To reduce the number of injuries, the Department of Environmental Health trains classroom teachers in a health and safety curriculum. One educator who took the course at the Washington Vocational Association conference said she had been "looking for an in-service (teacher training) like this for a long time."

The outreach program is run by the department's Health & Environmental Resources for Educators (HERE@UW). Oversight is provided by a steering committee chaired by the state Department of Labor and Industries (L&I) and created by the Governor's Task Force on School to Work.

Through this program, university researchers and staff, public schools, businesses, government agencies, and community organizations work together to educate teens about their legal rights and potential workplace hazards. The mission is to see that all young workers in Washington have a safe and healthful work environment. The program is funded jointly by the state Medical Aid and Accident Funds, the National Institute of Environmental Health Sciences, and the National Institute for Occupational Safety and Health.

The program has trained more than 300 educators to present a four-day occupational safety and health curriculum for middle and high school classrooms, using a video, wallet card reminders, posters, brochures, and Internet links.

Teacher training

Teachers are trained through UW extension courses, professional conference presentations, and exhibits. Instructors include faculty and researchers from the department's Center for Ecogenetics and Environmental Health, and representatives from L&I. Newsletters provide follow-up for the teachers.

Susie Shields, career specialist at Kentridge High School and a Parent and Teacher Association (PTA) leader, has taught the four-day curriculum in several classrooms. "The curriculum is extremely useful and should be required for all teens," she said. "My students all of a sudden felt empowered because they knew their rights and knew what to do if a problem at work occurred." ■

HERE@UW

In addition to School to Work, the department offers two curricula through its Health and Environmental Resources for Educators (HERE@UW) program, part of the outreach core of the Center for Ecogenetics and Environmental Health:

- Project Greenskate is a web-based interactive game that introduces basic toxicology and hazardous waste concepts.
- Essentials of Cell Biology: Toxicology in Action is a CD-ROM that provides a self-directed and animated overview of cell biology and toxic effects.

HERE@UW also offers a course, Environmental Health for Educators, for middle and high school educators in the Pacific Northwest. In addition, departmental graduate students use lesson plans created through this course to teach environmental health in K–12 classrooms.

School to work partnerships

Local HERE@UW partners

State Department of Labor & Industries
Alliance for Education
STW Labor Liaisons (Worker Center, AFL-CIO)
Washington Vocational Association
South King County Tech Prep Consortium
Seattle Public Schools
Office of the Superintendent of Public Instruction
Washington State PTA
Field Research & Consultation Group

National groups contributing to school to work programs

Labor Occupational Health Prog. (LOHP), UC-Berkeley
Labor and Occup. Safety & Health (LOSH) Prog., UCLA
Dept. of Labor and Industrial Relations, Univ. of Missouri
Maine Department of Labor
Young Worker Safety and Health Network
Massachusetts Department of Public Health

Protecting workers' hearing

Assessing the effectiveness of hearing protection programs

Construction sites and metal foundries are inherently noisy places, yet many workers fail to use hearing protection consistently. Researchers in two departmental programs–Occupational and Environmental Medicine, and Industrial Hygiene and Safety–are studying the nature of noise e xposures, patterns of hearing loss, costs to industry, and barriers to more widespread use of hearing protection.

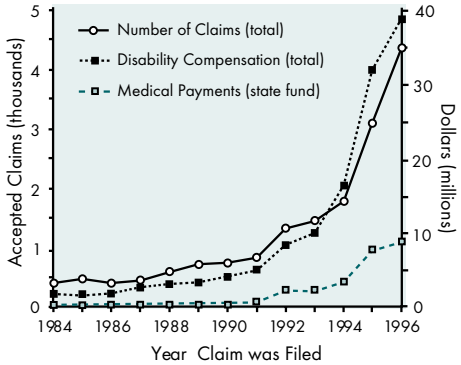
Compensation claims

The number of claims for occupational hearing loss in Washington state has increased tenfold in the past decade and the cost of compen-sation has risen even more sharply, according to research by Dr. William Daniell of the Occupational and Environmental Medicine program. By 1996, the costs of disability compensation reached almost $40 mil-lion a year.

Dr. Daniell is helping the state Department of Labor and Industries (L&I) find ways to prevent hearing disabilities and control costs. One of Dr. Daniell's graduate students, Sue Swan, worked with L&I to evaluate how well metal-casting foundries protected their workers' hearing.

L&I requires employers to have a hearing conservation program for workers whose personal exposure over an eight-hour shift exceeds 85 decibels. Employers are required to monitor noise levels, train workers, provide hearing protectors, and conduct yearly hearing tests.

Swan measured noise exposure and compliance with regulations in ten foundries. She found that all of the work sites had substantial deficiencies in their hearing conservation programs. Although all of the employers provided hearing protection and minimal annual



the number and cost of claims have increased tenfold in the past decade

top: a jackhammer operator wears a dosimeter on his shoulder to measure noise

training, none provided training in languages other than English or special retraining for employees with a documented hearing loss.

She and Dr. Daniell presented their findings to L&I. Although Swan has graduated, she and Dr. Daniell continue to work with the state to evaluate inspection methods and has received federal funds to evaluate noise exposure and hearing conservation at representative work sites in nine other Washington state industries.

Construction workers

Rick Neitzel, a research industrial hygienist with the Field Research and Consultation Group, studied construction workers for his master's thesis. From June to December 1997, he monitored 133 carpenters, laborers, ironworkers, and operating engineers.

An activity log accompanied each of the 338 samples collected with noise dosimeters–small microphones connected to sound-measuring devices. Neitzel found that 13% of the eight-hour averages exceeded the federal standard of 90 decibels and 40% exceeded the more protective state standard of 85 decibels. Higher exposures across all trades could be predicted based on the stage of construction and on the tools being used.

Electricians

Kyle Ren, a 1999 master's graduate, studied electricians in the construction industry. Working with Dr. Noah Seixas, Ren wired the workers with dosimeters. He collected 174 samples over four months and had workers fill out an activity log for each sample. Not surprisingly, pneumatic power tools were noisiest (88.89 decibels). Old-fashioned, hand-held hammers ranked third on the list, after powder-actuated tools. Ren found that younger electricians had the highest exposures, which he attributed to their work assignments and the length of time they took to complete a task. Nearly a quarter of the 174 eight-hour samples exceeded the state's limit of 85 decibels. The electricians knew their environment was noisy, yet they used hearing protection devices less than 15% of the time.

The NIOSH-funded Education and Research Center, or ERC (the Northwest Center for Occupational Health and Safety), provides stipends for industrial hygiene students, as well as occupational medicine and occupational health nursing students. Swan and Ren were partially supported by ERC funds.

Neitzel worked with faculty researchers Noah Seixas, Janice Camp, and Mike Yost, and has presented his findings to a number of trade and professional organizations.

Dr. Daniell is also collaborating with a labor-management safety and health council on a federally funded demonstration project to establish a hearing conservation program for the construction industry. ■

a grinding operation in a metal foundry

L&I collaboration

Dr. William Daniell served as affiliate medical consultant to WISHA inspectors and consultants from 1996 through 1999. The Division of WISHA Services is the state office charged with implementing the Washington Industrial Safety and Health Act. Dr. Daniell's work is an example of the department's collaboration with the regulatory, consultation, and research activities of L&I.

Field Group works with employers

The Field Research and Consultation Group–one of the department's service groups–helps employers develop noise-protection programs. The Field Group was created to provide information, measure exposures, and recommend and evaluate solutions to workplace health and safety problems, particularly for small businesses.

The services are provided through funding from the Washington State Industrial Insurance Medical Aid and Accident Funds and are without further cost to businesses served.

background: construction crane

Sensing what's in the air

Hands-off approaches measure workers' breathing air

In many occupations, workers are exposed to complex mixtures of volatile compounds, or to rapidly changing air concentrations. Traditional sampling techniques for workplace air can take weeks to analyze and, even then, often can't capture the peak levels of exposure.

A faster and more sensitive technique has been developed and refined by Dr. Michael Yost and his team at the Optical Remote Sensing (ORS) lab. Using an analytical instrument called an Open Path Fourier Transform Infrared spectrometer, or OP-FTIR, they can take a quick reading of the air in a work site, analyze its chemical composition, and determine the concentration of pollutants.

Their instrument is portable enough to be taken to work sites. It measures chemicals by shining an invisible infrared beam through the air and detecting changes in the intensity and color of the light.

Just as visible light can be sorted into a spectrum of wavelengths, infrared light can be sorted into a spectrum corresponding to different temperatures or energy levels.

The infrared light bounces off a reflector and is gathered by a telescope fitted with a special detector that is cooled by liquid nitrogen to -320° F. Because infrared light is thermal energy, the detector provides extraordinary sensitivity. A given chemical will absorb energy only at particular wavelengths, producing a unique pattern or fingerprint for each compound. The instrument can qualitatively identify contaminants in the air and quantitatively measure their concentration, nearly instantaneously.

The method can identify components in complex mixtures with detection limits down to a few parts per billion. Because it allows remote sampling, the instrument can measure contaminants several hundred meters away, without requiring workers to enter potentially hazardous areas.

top: Dr. Michael Yost

left: OP-FTIR sensing equipment

Risk evaluation

OP-FTIR technology was used at the Hanford Nuclear Reservation as part of the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) project. Investigators Dr. Ram Hashmonay and PhD student Robert Crampton established baseline OP-FTIR measurements at the Hanford "tank

farms" (which contain 54 million gallons of high-level, radioactive waste). In February and March 1999, they monitored tanks during waste pumping operations. Preliminary analysis identified release of hydrocarbons and nitrous oxide, and the team plans to follow up using nitrous dioxide as a tracer for hydrocarbon compounds.

Worker Exposures

OP-FTIR technology was also used to monitor worker exposures at a boat-building company in Skagit County, where resins released a mixture of styrene and other volatile chemicals into the air. Some worker exposures were brief but intense, and couldn't be measured by conventional methods.

Another recent project involves Noel Fitzgerald, an undergraduate student in the chemistry honors program at UW and a firefighter. His research topic is to adapt OP-FTIR sensing methods to identify and measure noxious vapors at fire scenes.

Other uses

Dr. Yost sees future applications in pinpointing emission sources and hot spots. Instead of measuring gases along a single path, he and his colleagues can set up an array of reflectors and feed data into a computer program that can map pollutant concentrations spatially.

These maps can pinpoint sources, for example, in an industrial area with several potential emitters. Mapping can also determine impacts on neighborhoods near refineries, industrial sites, dairy farms, or other emission sources.

The US Department of Agriculture and the Environmental Protection Agency have expressed interest. Dr. Hashmonay, a postdoctoral researcher with the department for the past three years, is moving to a consulting firm in North Carolina and will "carry the torch" of OP-FTIR research to those agencies.

"This is a tool that can measure a wide range of occupational and environmental exposures," Dr. Yost said. "Our role now is to improve the echnology and make it easier to use and more sensitive." ■

Hanford Nuclear Reservation at night

Other Hanford work

Dr. Tim K. Takaro wants to know why some Hanford workers are susceptible to beryllium disease and how to prevent future illnesses.

Beryllium is a strong, lightweight metal used widely at Department of Energy sites in nuclear weapon casings, reactor shields, and fuel rod seals.

Most people who are exposed to beryllium dust do not become sensitized. In a few people, however, genetic differences cause their lungs to mount a strong immune reaction.

These genetic factors weren't taken into account when federal standards for beryllium were developed during World War II. Dr. Takaro's research is part of the evidence being collected to issue more protective exposure standards.

CRESP at the UW

The Consortium for Risk Evaluation with Stakeholder Participation (CRESP) is a university-based national organization created to provide information for risk-based cleanup of complex contaminated environments.

CRESP was formed at the request of the US Department of Energy (DOE) and the National Research Council as an independent institution for integrating risk evaluation work. After a national competition, a five-year grant was awarded to CRESP in March 1995.

UW researchers are part of a consortium that includes colleagues at universities in New Jersey, and a nonprofit institute in Washington DC. It focuses on risk evaluation at DOE sites.

Opposite page

graduate students 1998

back row (l to r): Gary Palcisko, Nancy Judd, Alma Cárdenas, Jeff Stewart, Doug Johns, Sue Swan, Matt McQueen, Tom Lewandowski, Brian Nichols, Chang-Fu Wu

third row (l to r): Yingying Guo, Stephanie Pingree, Therese Mar, Richard Wang, Diane Yoder, Michael Box, Hailing Lu, Siqing Lu, Emily Schneider, Xiaoqiang Zhu, Claire Olsovsky, Denise Koch

second row (l to r): Aileen Mendoza, Lynn Wilder, Michelle Bell, Cynthia Curl, Shengli Shi, Joshua Porton, Dianne Knutson, Stephanie Carter, Keone Pang

front row (l to r): David Mayfield, Helen Smith, Michael Rosato, Jennifer Finley, Debra Winterton, Gabriela DePavia, Min Wei, Xuemei Zhang

Where we've been ... & where we're going

$33,000,000
biennial budget

18% *increase in funding over the 1997–99 biennium*

4 *programs reaccredited*

2 *new centers*

4 *new graduate courses*

We in the Department of Environmental Health are pleased and excited to be in this place, at this time. We have many reasons to feel both successful and grateful, and many reasons to call upon our best efforts in the next two years. I hope you find the accounts of our past and current activities interesting, and that your imaginations are touched by the possibilities to come.

–Dave Kalman

The end of the 1997–1999 biennium finds the Department of Environmental Health in robust condition and already beginning to meet the challenges of a new academic year and a new millennium.

Over the past two years, we have had several opportunities to take stock of our progress and consider our future directions.

Some of this reflection surrounded new or renewed accreditation for departmental programs. Accreditation reviews required us to assess the quality of our teaching nd research programs, the vitality of our service relationships, and our plans for the future. In each case, external reviewers reaffirmed the high quality of our programs and our place among the best programs across the nation in each academic area.

Strengths

Reviewers considered our strengths to be: highly interdisciplinary programs; research centers with close ties to other academic programs and community groups; good financial resources with excellent support for graduate students; nationally and internationally known faculty; and well-trained and motivated staff. There have been significant developments in each of these areas during the past two years. The following programs were accredited:

- Our undergraduate program, which has offered a bachelor of science degree in Environmental Health for 51 years, renewed its accreditation with the National Environmental Health Science and Protection Accreditation Council. A new minor in Environmental Health was developed and approved by the UW, and a new major pathway was developed under expanded UW sponsorship.
- The graduate program in Industrial Hygiene and Safety was accredited for another three years by the Related Accreditation Commission of the Accreditation Board for Engineering and Technology.
- The Environmental Health Laboratory was reaccredited by the American Industrial Hygiene Association (AIHA). It has been accredited continuously since February 1, 1977 and was recognized by the AIHA this past June as one of the "pioneer" laboratories that had been accredited for at least 20 years.
- The department, along with the other four departments in the School of Public Health and Community Medicine, was reaccredited by the Council on Education in Public Health.
- The department's PhD program was reviewed by the UW Graduate School and advanced from "provisional" to "continuing" approval.

We have added or expanded several research centers and multiproject programs within the department.

- Our faculty successfully competed for one of eight children's environmental health centers funded by NIEHS and EPA. The new Center for Child Environmental Health Risks Research, funded in September 1998, focuses on children's exposures to agricultural chemicals. The department's team, led by Dr. Elaine Faustman, consists of Drs. Tom Burbacher, Lucio Costa, Richard Fenske, John Kissel, Zhengui Xia, Mike Yost, and several external investigators.
- Our faculty also successfully competed as one of five academic centers for research on atmospheric particulate matter and health, one of the largest external research efforts ever funded by EPA. The center, led by Professors Jane Koenig and Dave Kalman, will focus on the unique characteristics of particulate air pollution in the Northwest, which is more affected by vegetative burning and less by coal combustion than is the case in other parts of the US.
- The Pacific Northwest Agricultural Safety and Health Center was funded in 1997 as an initiative under the state's Medical Aid and Accident Funds, supplementing federal funding awarded by NIOSH in 1996.

Our faculty continues to mature, with several members winning recognition for outstanding professional accomplishments (see page 31). Since 1997, two faculty members have advanced from

associate professor to professor and four made the critical transition from assistant to associate professor. We added one new junior faculty member, Dr. Sally Liu, in 1998, and are seeking two additional faculty. Our full-time regular faculty now consists of 13 professors, 11 associate professors, 4 assistant professors, and 3 lecturers and senior lecturers, plus a larger number of research, part-time, on-leave, and auxiliary faculty listed in the appendix.

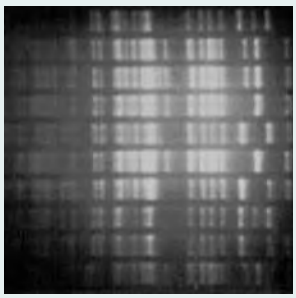
During the biennium, we graduated 51 students with bachelor of science degrees in Environmental Health, 37 with master of science degrees, 10 with doctor of philosophy degrees, and 3 with master of public health degrees. Degree recipients are listed in the appendix. We hosted 17 postdoctoral fellows. Our students continue to earn widespread recognition for their scholarly activities and contributions to community and professional groups, as is documented in the honors and awards section of the appendix.

Changes

We have seen key changes in departmental leadership positions, with Dr. Gerald van Belle stepping down as Chair to take a well-earned sabbatical before resuming his role as professor in Environmental Health and Biostatistics. The search is underway for a permanent Chair. Other "graduations" include Dr. Tom Burbacher, who has been succeeded by Dr. Noah Seixas as graduate program coordinator; and Dr. Scott Barnhart, who moved on from his role as leader of the Occupational and Environmental Medicine program to become Chief of Medicine at Harborview Medical Center, succeeded by Dr. Matt Keifer as interim OEM program director.

In the past two years, several faculty have been recognized for professional excellence, as detailed in the appendix. Examples of such honors include:

- Charles Treser was given the Health Practice Program Office Honor Award and Certificate of Appreciation by the US Centers for Disease Control and Prevention for serving as the Washington State Public Health Distance Learning Coordinator for four years.
- Dr. Lucio Costa won the Society of Toxicology Zeneca Award in 1997, as did Dr. Curt Omiecinski in 1998. The Zeneca traveling lectureships recognize excellence in research and service in toxicology and are intended to promote greater collaboration between European and North American toxicologists.



graduate students work in lab, construction workers are trained to reduce dust exposure, DNA biomarker

- Dr. Zhengui Xia, appointed as the first Sheldon Murphy Endowment Assistant Professor in 1997, was awarded a Burroughs Wellcome New Investigator Award in Toxicology in 1998, which provides three years of partial support to the few most promising new biomedical researchers each year.

Faculty and staff continue to contribute prominently to local, state, and national efforts to understand and manage environmental and occupational health issues. Faculty members serve as consultants, or members of advisory boards or special topic panels for numerous regulatory or research organizations.

At the national level, most of our faculty members participate on peer review and expert panel activities. Among the most important are the committees of the National Research Council, convened by the National Academy of Sciences at the request of Congress; regulatory agencies; or other national groups to address pressing issues of science and public policy.

Faculty and staff continue to provide leadership to their professions and to groups organized to address specific problems related to science, health, and policy. They have served as chairs or presidents for many regional and national professional organizations, as noted in the appendix.

Financially, the department experienced stability and strong expansion. Funding from all sources progressed from about $28 million in the 1995–97 biennium to more than $33 million in 1997-99 (Figure 1). We rely on state and private sources for about 37% of our departmental funds, and federal research and training grants for the remaining 63%. Our state funding base, which includes both funding from the university and industrial insurance program (the Medical Aid and Accident Funds), contributed 33% to last biennium's increase, with the balance coming from research grants. Figure 2 shows the approximate distribution of departmental expenditures among our three activities–research, service, and teaching. However, many of our activities and programs are multipurpose.

Two items of particular interest are student support and the special support derived from the Washington industrial insurance system. Direct student support such as traineeships accounted for about 9% of all departmental expenditures. As Figure 3 shows, grants provided 62% of the nearly $1 million per year required to support our graduate students. Figure 4 shows how the state's Medical Aid and Accident Funds support a variety of departmental programs.

Departmental fiscal health will continue to be nourished by a diversity of funding sources including faculty success in obtaining research and training grants, and strong state support.

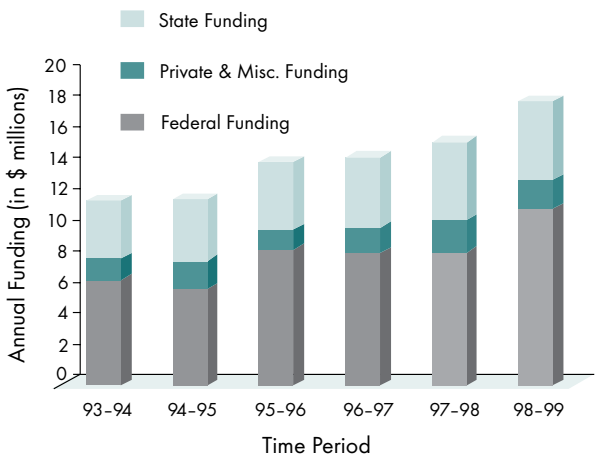


Figure 1. *Budget growth, 1993–1999*

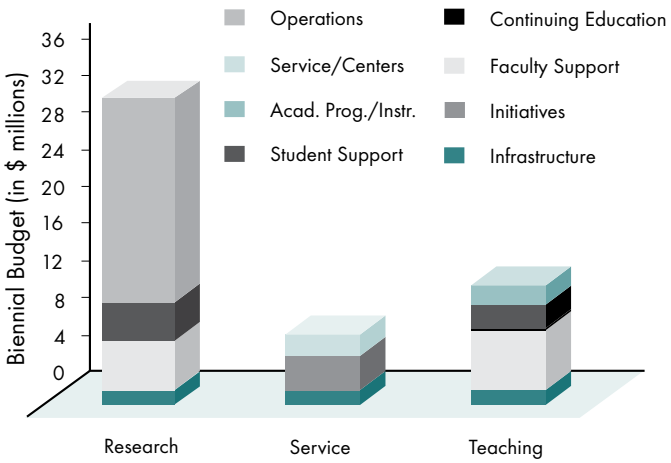


Figure 2. *Distribution by activity, 1997–1999 biennium*

Challenges and goals

As we enter the 21st century, the Department of Environmental Health faces more internal and external changes than in any biennium in our history. Four areas could account for many of the these changes:

Organizational development

Dean Patricia Wahl is leading the School of Public Health and Community Medicine in a strategic planning effort involving students, staff, faculty, and external stakeholders. We will develop new priorities and goals, and a renewed sense of our identity as part of the public health community. The Department of Environmental Health will soon select a permanent Chair, who will be aided by a strong and motivated faculty; vigorous programs in research, service, and teaching; and good fiscal health.

Teaching in the 21st century

Currents of change tug at our traditional ways of providing graduate and undergraduate instruction. We are experiencing a decreased demand for our most advanced training, while costs escalate for educating each new student. At the same time, the demand for nontraditional education–including in-service training for working professionals, and distance and web-based instruction–is increasing markedly. We face challenges in blending new and old ways of teaching, and finding the resources to accomplish the transition. The following new projects will help us in these areas:

Recruitment

We are finding new ways to identify and recruit potential students. These include a redesigned Web page (see addresses on page 54) and new departmental publications and marketing efforts.

Distance learning and Web-based instruction

Distance learning has been part of our educational approach since at least 1980. Recent innovations include audio and videocassettes of lectures, satellite teleconferencing, computer-based instruction using CD-ROM and the Web. These are still the exception in our teaching, but are likely to grow in coming years. An example is Project Greenskate (see page 15).

Certificate programs

The UW OSHA Education Center launched a Safety and Health Specialist certificate program to train professionals in federal OSHA and state standards for Washington, Oregon, and Alaska and assist them in solving compliance challenges.

Risk emphasis

Because graduates increasingly find themselves working with risk science, we added a risk emphasis degree

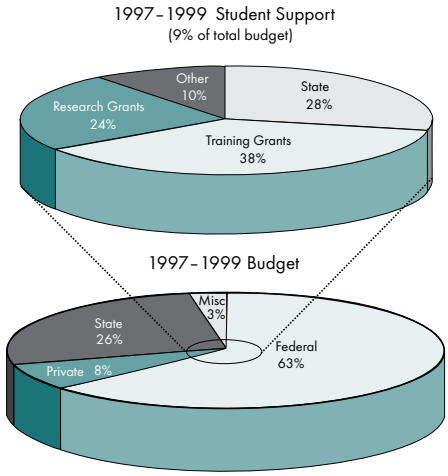


Figure 3. *Student support, 1997–1999*

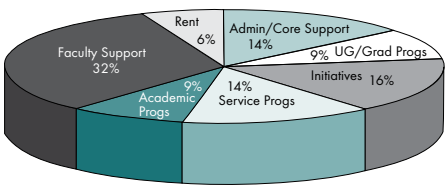


Figure 4. *Use of state Medical Aid and Accident Funds, 1997–1999*

option. Students can earn a degree in Toxicology, Industrial Hygiene and Safety, or Environmental Health Technology with specialized skills in risk analysis and risk communication.

New curricula present and future

In the fall of 1999, faculty approved a new option for the undergraduate major in Environmental Health. Three years in the making, this program will provide two pathways leading to the BS degree in Environmental Health. One option emphasizes the evaluation and management of sanitary hazards associated with drinking water, wastewater, food, housing, and insects and rodents. The other option emphasizes the evaluation and management of chemical and physical hazards associated with indoor and outdoor air, water, soil, and the workplace. Both options focus on understanding the impact of hazards on human health. New graduate courses in air quality, modeling, occupational diseases, and toxicology have been introduced in the past two years. We are considering new curricula in ergonomics and safety science, program management and policy, behavioral aspects of occupational protection, and chemical water quality.

Research opportunities & challenges

We are in a period of expanded opportunity for federal research funding, particularly from the National Institutes of Health (NIH). We hope for continued success in competing for funding of research ranging from the most basic biomedical topics to the most highly applied. As we increase our linkages with government and private-sector partners in addressing service and research needs, we can expect vigorous growth in field and research activities applied to workplaces and communities.

We are working with the School of Public Health and Community Medicine and the university to obtain additional space for existing and projected departmental needs.

Renewing & expanding our service impact

The partnerships between the university and government agencies, employers, workers, and the general public continue to present us with opportunities to contribute to better environmental and occupational safety and health. We are seeking greater dialogue with these groups, to learn their needs for new research and service activities and their suggestions for disseminating the results of our projects more effectively. We are developing a better process to communicate with a broad array of stakeholder groups and take their views into account as we plan for the 2001–2003 biennium.

In conclusion

In reviewing our recent development and considering future plans, I am struck by the breadth of groups and individuals who both contribute to and benefit from departmental activities. Our aim for the future should be to maintain and extend these alliances to advance the cause of better health.

–Dave Kalman

Opposite page

undergraduates Phebe Mason and Gina Colby test samples for Listeria food poisoning

Facts and figures 1997–99

51 *undergraduate degrees*

50 *graduate degrees*

34 *honors & awards*

31 *full-time, active faculty* & 11 *emeritus faculty*

67 *adjunct, clinical and visiting faculty*

17 *postdoctoral fellows*

350 *scientific publications*

Degrees conferred

Undergraduate

1997–99

Summer 1997
Thu Bui
Jason Chen
Wun Hang Chow
Michelle Cox
Lyle Gee
Lyle Jumawan
Karen Kuter
Dashia Magee
Bridghid McMonagle
Joleen Mobley
Greg Perez
Saeid Rastegar
Michael Reddy

Autumn 1997
Mohammed Adem
Diane Agasid
David Christensen
Liana Criscuolo
Suzanne Giftai
Rozelle Rivera
Carole Rolllins
Rafael Solis

Winter 1998
Stephanie Kenny
Carolyn Snowberger

Spring 1998
Michael Box
Jennifer Finley
Carolyn Guertin
David Kang
Kara Lemieux
Samuel McCormick
Minchau Nguyen
Ella Raczkowski
Chad Rogers
Martin Smith

Summer 1998
Margaret Bandy
Hang Do
Aran Enger
Erica Swanson
Andrea Unger

Autumn 1998
Keith Chhum
Michael DeSota
J. Douglas McMurtrie
Neda Vaseghi

Spring 1999
Nasreen Bhatti
Anthony DeRubeis
Jason Dettori
Nichole Fus
Xiang-Yu Ge
Jesse Mushen
Aaron Sargent
John Norman Stilz
Loc Van Tran

undergraduate students

Phebe Mason

Chris Rowe

Laurette Rasmussen

Graduate

Master of Science (MS), Master of Public Health (MPH), and Doctor of Philosophy (PhD). Graduate Programs: Industrial Hygiene and Safety (IHS), Environmental Health Technology (Tech), Toxicology (Tox), Occupational and Environmental Medicine (Occ Med). Faculty preceptor (*italics*)

Summer 1997

Chetana Acharya, MS (Tox). A recombinant RNA standard for quantitative competitive RT-PCR of rat cytochrome P450 gene expression. (*Curt Omiecinski*)

Xavier Alcaraz, MS (IHS). Determinants of exposure to airborne metals in Washington State tool grinding operations. (*Noah Seixas*)

Timothy Garlock, MS (Tech). Effects of activity patterns on assessment of dermal exposure to contaminated soils. (*John Kissel*)

Jo Ann Johnson, MS (IHS). A cryogenic technique using differential temperature for sampling volatile organic compounds in air. (*David Kalman*)

Thomas Johnston, MS (IHS). Demolition worker lead exposure: Validation of predictive model using workplace variables. (*Mike Morgan*)

Thomas McHugh, PhD (Tox). Metabolism of aflatoxin epoxide by glutathione S-transferase: New insights into GST function. (*Dave Eaton*)

Ying-Chung Ou, PhD (Tox). Mechanisms of methylmercury-induced toxicity in primary embryonic CNS cells: The role of cell cycle regulatory genes and glutathione. (*Elaine Faustman*)

Jason VanLoo, MS (Tox). The role of glutathione S-trans-ferase Pi polymorphism in determining susceptibility to disease. (*Dave Eaton*)

Lena Wang, MS (IHS). Investigation of measurement error and possible shortcut methods in determining mean velocity in ducts. (*Steve Guffey*)

Ann Wawrukiewicz, MS (Tech). Validation studies of Monte Carlo modeling of children's pesticides and arsenic exposures due to residential soil contamination. (*John Kissel*)

Min Wei, MS (Tox). Exposure to 60 hz electromagnetic fields increases the proliferation of human astrocytoma cells. (*Lucio Costa*)

Brian Zevenbergen, MS (IHS). The relationship between atmospheric urinary fluoride concentrations in potroom workers. (*Noah Seixas*)

Autumn 1997

Sean Quigley, MS (Tox). RNA amplification and reverse northern analysis to measure gene expression changes in MeHg exposed mice. (*Terrance Kavanagh*)

Winter 1998

Mark R. Andersen, PhD (Tox). Quantification of cytochrome p450 expression: A biomarker of chemical exposure and a tool for basic research. (*Curt Omiecinski*)

Ulrike Luderer, MPH (OccMed). Reproductive endocrine effects of acute, controlled toluene exposure in men and women. (*Elaine Faustman*)

Greg Nothstein, MS (Tech). Public willingness to pay for improvements in visibility and air quality. (*Dave Kalman*)

Spring 1998

Derald Anderson, MS (IHS). Biological monitoring of occupational exposure to nitrous oxide in dental operatories. (*Mike Morgan*)

Kathryn Brown, MS (Tech). Public health significance of the presence of *Pseudomonas aeruginosa* in a municipal water distribution system. (*Mansour Samadpour*)

Francis Buck, MS (Tech). Microbial source tracking: The use of a single vs. a double restriction enzyme. (*Mansour Samadpour*)

Francisco Dieguez, MS (Tox). Inhibition of nuclear factor Kappa B DNA binding by mercury and effects of competitive Thiol reagents in normal rat renal epithelial cells. (*James Woods*)

Benjamin Howarth, MS (Tech). Electromagnetic field (EMF) assessment for electric trolley transit workers in Seattle, Washington. (*Mike Yost*)

Siqing Lu, MS (Tox). Identification of differentially expressed mitochondrial genes in methylmercury (MeHg) exposed rat embryonic CNS cells. (*Elaine Faustman*)

Eyob Mazengia, MS (Tech). Microbial source tracking: Utility of a clonal database. (*Mansour Samadpour*)

Mark McMillan, MS (Tox). Establishment of a novel method for analyzing cell cycle-specific changes in gene expression. (*Elaine Faustman*)

Patrick Moore, MS (IHS). An assessment of occupational exposure to respirable particulates and sulfur dioxide during aluminum smelter potroom operations. (*Noah Seixas*)

Richard Neitzel, MS (IHS). An assessment of occupational noise exposures in four construction trades. (*Noah Seixas*)

Ravi Sanga, MS (Tox). Effects of uncertainties on exposure estimates to methylmercury: A Monte Carlo analysis of biomarkers of exposure vs. predictive dietary estimation. (*Elaine Faustman*)

David Suchard, MS (Tox/OccMed). Heart rate variability in farm workers exposed to organophosphate pesticides. (*Matthew Keifer*)

Pi-Ching Peggy Yang, MS (Tech). Comparison of molecular subtyping methods for *E. Coli 0157:H7*: Their utility in epidemiological investigations. (*Mansour Samadpour*)

Summer 1998

Cheryl Hart, PhD (IHS). Theory and evaluation of a new physiologic sampling pump. (*Mike Yost*)

Melinda Vredevoogd, MS (Tox). Gene expression patterns as potential biomarkers of heavy metal exposure in terrestrial ecosystems. (*Elaine Faustman*)

Autumn 1998

Nancy Beck, PhD (Tox). Phenobarbital mediated induction of the cytochrome p450 2B genes: Mechanistic investigations. (*Curt Omiecinski*)

Clint Farr, MS (Tox). Gene expression as a biomarker of mercury exposure in raccoons from the Savannah River nuclear weapons facility. (*Elaine Faustman*)

Therese Mar, PhD (Tox). The effects of physical activity and gender on the toxicokinetics of toluene in human volunteers. (*David Kalman*)

Marc Stifelman, MS (Tox). *In vitro* characterization of canine hepatic aflatoxin metabolism. (*Dave Eaton*)

Chang-Fu Wu, MS (Tox). Evaluating a radial beam geometry for mapping indoor air contaminants: OP-FTIR application to locate a leak in indoor environments. (*Mike Yost*)

Xiaoqiang Zhu, MS (IHS). Development of a potential biomarker of environmental wood smoke exposures. (*David Kalman*)

Winter 1999

Michelle Catlin, PhD (Tox). Effects of ethanol on muscarinic receptor-induced responses in astroglia. (*Lucio Costa*)

Gabriela Depavia, MS (Tech). Microbial health hazards associated with the wastewater treatment plant environment. (*Mansour Samadpour*)

Wan-Fen Li, PhD (Tox). Development of a mouse model to study the role of paraoxonase (PON1) in organophosphate detoxication. (*Lucio Costa*)

Spring 1999

David Canton, MPH (OccMed). An analysis of United States Coast Guard aviation mishaps between 1993 to 1998 for potential risk factors. (*Matthew Keifer*)

Sanders Chai, MPH (OccMed). Perceptions on pediatric environmental health: A needs assessment survey questionnaire. (*Scott Barnhart*)

David Mayfield, MS (Tox). The effects of *in utero* methylmercury exposure on vision and hearing in nonhuman primates, *Macaca fascicularis*. (*Thomas Burbacher)*

Brian Nichols, MS (Tox). Effects of ozone exposure on nuclear factor kappa B and tumor necrosis factor alpha expression in human nasal epithelial cells. (*Jane Koenig*)

Joshua Porton, MS (IHS). Comparison of the permeation rates of selected glove materials by mixtures of methyl ethyl ketone and toluene at skin and room temperatures. (*Mike Morgan*)

Kyle Ren, MS (IHS). Noise exposure to electricians in the construction industry. (*Noah Seixas*)

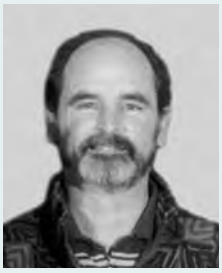
Peregrin Spielholz, PhD (IHS). A comparison of upper extremity physical risk factor measurement methods. (*Mike Morgan*)

Changhong Wang, PhD (Tox). Identification of hepatic glutathione S-transferase(s) involved in aflatoxin B1-8,9-Epoxide conjugating activity in the nonhuman primate *Macaca fascicularis*. (*David Eaton*)

Honors & awards

July 1997–June 1999

Faculty & staff



Terry Kavanagh

Susan Silbernagel

Jane Koenig

Carl Andrew (Drew) Brodkin
President, Association of Occupational and Environmental Clinics, 1997

Tom Burbacher
Member, National Academy of Sciences review of methylmercury, 1999

Janice Camp
President-elect, Pacific Northwest Section, American Industrial Hygiene Association, 1998–1999

David Eaton
Vice president-elect, Society of Toxicology, 1999-2000
Associate Dean, Research, School of Public Health and Community Medicine, appointed 1999

Joel Kaufman
President, Northwest Association of Occupational and Environmental Medicine, 1997

Terry Kavanagh
Outstanding Teaching Award, School of Public Health and Community Medicine, 1998

Jane Koenig
Faculty/staff community service award, School of Public Health and Community Medicine, 1999

Michael Morgan
Chair, Biological Exposure Indices Committee, American Conference of Governmental Industrial Hygienists
Keynote speaker, Third International Occupational Hygiene Association Scientific Conference, Switzerland, 1997

Sharon Morris
Board of Scientific Counselors, National Institute for Occupational Safety and Health

Curt Omiecinski
Society of Toxicology Zeneca Award, 1998
Burroughs Wellcome Fund Toxicology Scholar Award, 1995-2000
Associate editor, Toxicological Sciences, Journal of the Society of Toxicology

Mansour Samadpour
Group recognition award from US Food and Drug Administration, 1998, for his team's work in solving the E. coli identification problem in the Odwalla apple juice case

Susan Silbernagel
School of Public Health and Community Medicine staff service award, February 1999

Nancy Simcox
Environmental Health Philanthropy Award, American Lung Association of Washington, for her work with the Master Home Environmentalist program

Zhengui Xia
Sheldon Murphy Endowment Assistant Professor
Burroughs Wellcome New Investigator in Toxicology

Students

Keriya Adem, undergraduate

School of Public Health and Community Medicine outstanding student scholarship 1999

Derald Anderson, MS student, IHS
Scholarship from the Pacific Northwest Section, American Industrial Hygiene Association

Michael Box, undergraduate student
School of Public Health and Community Medicine outstanding student scholarship 1998

Stephanie Carter, PhD student, IHS
3M Corporation industrial hygiene scholarship

Ed Doran, PhD student, IHS
EPA STAR Fellowship

Marie Foltz, PhD student, IHS
School of Public Health and Community Medicine outstanding student scholarship 1999
Scholarship award from Stockhausen

Cheryl Hart, PhD student, IHS
ARCS fellowship

Doug Johns, MS student, IHS
Scholarship from the Pacific Northwest Section, American Industrial Hygiene Association

Cecile Krejsa, PhD student, Tox
School of Public Health and Community Medicine outstanding student scholarship 1999

Janet Krober, undergraduate student
Presidential Scholar Award

Keriya Adem, undergraduate student

Marie Foltz, PhD student

Thomas Lewandowski, PhD student, Tox
School of Public Health and Community Medicine outstanding student scholarship 1998

Patrick Moore, MS student, IHS
Scholarship from the Pacific Northwest Section, American Industrial Hygiene Association

Rick Neitzel, MS student, IHS
Scholarship from the Pacific Northwest Section, American Industrial Hygiene Association

Ravi Sanga, MS student, Tox
Society of Toxicology's Risk Assessment Specialty section award for best student or post-doctoral research presentation at 1998 Society meeting

Faculty, 1999–2001

Scott Barnhart, MD, MPH, is an Associate Professor (joint appointment with the School of Medicine) and director of the Occupational and Environmental Medicine Residency/Fellowship program. He directed the Occupational and Environmental Medicine program until his appointment in 1999 as medical director of Harborview Medical Center. One area of research is the natural history of asbestos-related lung disease, including possible protective effects of beta-carotene and vitamin A. A related project is control of silicosis in developing nations. A second area of investigation is use of a public health approach to reduce occupational hazards on Department of Energy sites.

Carl A. (Drew) Brodkin, MD, MPH, is an Associate Professor of Medicine and teaches in the Occupational and Environmental Medicine program. His research involves solvent-related liver disease and occupational pulmonary epidemiology. He served as president of the Association of Occupational and Environmental Clinics.

Thomas M. Burbacher, PhD, is an Associate Professor in the Toxicology program and deputy director of the department's Center for Child Environmental Health Risks Research. His research focuses on the effects of prenatal or early postnatal exposure to environmental pollutants on central nervous system development; the cognitive and sensory effects of prenatal methylmercury exposure in aged monkeys; prenatal exposure to methanol on information processing in adolescent monkeys; and early pesticide exposure on brain development in rodents. In 1999, he was appointed to the National Academy of Sciences review panel on the effects of methylmercury exposure on children's health.

Janice Camp, MSN, MSPH, is a Lecturer in the Industrial Hygiene and Safety program and director of the Field Research and Consultation Group. Her research interests include field industrial hygiene and safety, ergonomics, and program evaluation. Ms. Camp, a Certified Industrial Hygienist, is president-elect of the Pacific Northwest Section of the American Industrial Hygiene Association.

Harvey Checkoway, PhD, is a Professor in the Occupational and Environmental Medicine program. His research interests include occupational and environmental risk factors for cancer, dust-related lung diseases, and neurological disorders. Increasingly, his research has incorporated biomarkers of exposure, response, and genetic susceptibility. Recent projects include a study of silica, silicosis, and lung cancer among diatomite industry workers; semen quality among lead smelter workers; environmental exposures and genetic variations in Parkinson's disease; and parkinsonism signs among pesticide-exposed farmers.

Lucio G. Costa, PhD, is a Professor and director of the Toxicology program. His area of research is neurotoxicology, particularly the study of the cellular, biochemical, and molecular mechanisms involved when toxicants affect the nervous system. His laboratory uses *in vivo*, *in vitro* and cell culture systems, as well as biochemical, molecular, and imaging techniques. Research projects include the effects of alcohol and lead on brain cells, and studies on the toxicity of pesticides and on genetic predisposition to neurotoxicity. He has published more than 150 articles in peer-reviewed journals and contributed dozens of book chapters and other publications, including a book on Occupational Neurotoxicology in 1998.

William Daniell, MD, MPH, is an Associate Professor in the Occupational and Environmental Medicine program. His research interests involve noise-induced hearing loss, carpal tunnel syndrome, and the utility of workers' compensation data for research and intervention purposes. Past research includes neuropsychological consequences of occupational chemical exposures, particularly organic solvents, and multiple chemical sensitivity syndrome. Dr. Daniell served as Affiliate Medical Consultant to the Washington State Department of Labor and Industries from 1996 through 1999.

David L. Eaton, PhD, is a Professor in the Toxicology program and Associate Dean for Research in the UW School of Public Health and Community Medicine. He has published more than 70 research papers, contributed to 17 books, and written a dozen articles explaining toxicological principles to the general public. He directs a training program for elementary and secondary educators and is Vice President-elect of the Society of Toxicology. His research specialty is chemical carcinogenesis, focusing on how enzymes in the liver activate and detoxify carcinogenic chemicals in our diet. He directs the Center

for Ecogenetics and Environmental Health, which brings together about 50 UW investigators to study how small differences in human genes (polymorphisms) can influence susceptibility to cancer-causing chemicals. The center is funded by the National Institute of Environ-mental Health Sciences (NIEHS).

Elaine M. Faustman, PhD, is a Professor in the Toxicology program, director of the Institute for Risk Analysis and Risk Communication, and director of the Center for Child Environmental Health Risks Research. Her long-range research objective is to identify biochemical and molecular mechanisms of developmental toxicity. Because 70% of human birth defects have an unknown cause, she wants to identify preventable causes, focusing on two types of pollutants, N-nitroso compounds, and metals such as lead and methylmercury. She traveled to the White House in this biennium for the announcement launching the EPA/NIEHS Child Health Center. She is an elected fellow of the American Association for the Advancement of Science and chairs the National Academy of Sciences Committee on Developmental Toxicology. Dr. Faustman has published more than 65 papers in peer-reviewed journals and more than a dozen book chapters and other publications.

Richard A. Fenske, PhD, MPH, is a Professor in the Industrial Hygiene and Safety program, and director of the Pacific Northwest Agricultural Safety and Health Center, one of nine such centers supported by the National Institute for Occupational Safety and Health. He is also deputy director of the Center for Child Environmental Health Risks Research. He researches new methods for assessing workplace and community exposures and risks. This work has included development of a quantitative fluorescent tracer technique for characterizing dermal exposure during pesticide applications, evaluation of risks associated with residential pesticide use, and community-based biological monitoring of children's exposure to pesticides. He teaches courses in exposure assessment and environmental risk analysis. He is a member of the EPA Science Review Board for pesticide science policy, an advisor to the National Cancer Institute's Agricultural Health Study, and a member of the NIOSH Implementation Team for the National Occupational Research Agenda.

Gary M. Franklin, MD, MPH, is a Research Professor in the Occupational and Environmental Medicine program, and Medical Director of the Washington State Department of Labor and Industries. His research interests include occupational injury, public health nutrition, and occupational and environmental diseases of the nervous system.

Steven E. Guffey, PhD, is an Associate Professor in the Industrial Hygiene and Safety program. His research interests are industrial ventilation, confined space entry, ergonomics, exposure assessment, and engineering controls to reduce dust exposures in the woodworking industry. Dr. Guffey, a Certified Industrial Hygienist, serves on the editorial boards for the *American Industrial Hygiene Association Journal* and *Occupational Health and Safety*. He has published more than 20 papers in peer-reviewed journals. Dr. Guffey oversees the department's wind tunnel, which is used for research in ventilation and exposure assessment. His laboratory also houses a full-scale ductwork system for testing pressure and flow relationships in industrial exhaust ventilation.

Jack Hatlen, MS, is an Associate Professor Emeritus in the Environmental Health Technology program. His research specialties include environmental sanitation practices in public health agencies, environmental health planning and management, and workforce education and development. He is the first executive director of the newly formed Association of Environmental Health Academic Programs.

David A. Kalman, PhD, is Interim Chair and Professor in the Environmental Health Technology program. His research focuses on chemical issues, such as hazardous properties of materials, environmental fate and transport; environmental quality assessment; hazard management; and occupational and community exposure assessment, especially using biomarkers of exposure. He heads the environmental health laboratory.

Joel Kaufman, MD, MPH, is an Associate Professor in the Occupational and Environmental Medicine program. He has a joint appointment with Medicine and an adjunct appointment with Epidemiology. His research activities fall into three areas: epidemiology of occupational and environmental asthma; surveillance and pre-vention of occupational illnesses and injuries, including lead poisoning and occupational skin disorders; and occupational and environmental factors in cardiovascular disease. He is past president of the Northwest Association of Occupational and Environmental Medicine.

Terrance J. Kavanagh, PhD, is an Associate Professor in the Toxicology program. His research interests include free radical biology and oxidative stress, and the effects of chemicals on diseases of aging including cancer, atherosclerosis, pulmonary fibrosis, Parkinson's disease and Alzheimer's disease. His laboratory assesses the role of the free radical scavenger glutathione (GSH) and the antioxidant enzymes catalase, superoxide dismutase, and glutathione peroxidase in preventing free radical injury. Another research interest involves assessing the role of genetic polymorphisms in these enzymes in free radical-mediated diseases.

Matthew C. Keifer, MD, MPH, is an Associate Professor and interim director of the Occupational and Environmental Medicine program. He joined the faculty after serving as project epidemiologist for CARE in Nicaragua, where he participated in health surveillance and development activities related to pesticide exposures and health effects. His activities pertain to studies of pesticide health effects on humans. He is codirector of the Pacific Northwest Agricultural Safety and Health Center, one of nine agricultural centers in the US funded by NIOSH.

John Kissel, PhD, is an Associate Professor and director of the Environmental Health Technology program. His research interests include pathways of human exposure to environmental contaminants in soils. Exposure factor data collected by Dr. Kissel and his students and staff are used in cleanup decisions at Superfund sites. He also investigates community exposures to pesticides and currently serves on the EPA Science Advisory Panel for the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Dr. Kissel is a Councilor of the International Society of Exposure Analysis and former chair of the Exposure Assessment Specialty Group of the Society for Risk Analysis. He has published more than 20 papers in scientific journals.

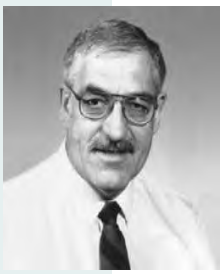
Jane Q. Koenig, PhD, is a Professor in the Toxicology program. Her research interests are the respiratory health effects of air pollution, especially the responses of suscep-tible individuals, such as those with asthma or other chronic respiratory diseases. She is involved in three general areas of research: controlled laboratory studies using human subjects; field or epidemiological studies evaluating respiratory health in populations exposed to fine particulate matter from wood smoke or other sources in their neighborhoods; and assessment of physical or

Dave Kalman, professor

Elaine Faustman, professor

Janice Camp, lecturer

Richard Fenske, professor



Sally Liu, assistant professor

Gerald van Belle, professor

Noah Seixas, associate professor

Zhengui Xia, assistant professor

chemical changes in cultured human epithelial cells after air pollutant exposure. She has published more than 60 peer-reviewed journal articles. In 1999, Dr. Koenig received a five-year, $8.2 million grant from US Environmental Protection Agency to establish a particulate matter research center at UW.

L.-J. Sally Liu, SD, is an Assistant Professor in the Environmental Health Technology program. Her research focuses on air pollution and exposure assessment. She earned her doctorate in 1994 from Harvard University's School of Public Health and has published about a dozen papers in peer-reviewed journals and two book chapters. She is working on a project funded by the Environmental Protection Agency to assess personal exposure to particulate matter among high-risk populations, including people with heart and lung diseases.

Daniel L. Luchtel, PhD, is a Professor in the Toxicology program. His research projects include the effects of gaseous air pollutants (ozone, nitrogen dioxide, and sulfur dioxide) on cultured human nasal epithelial cells and primate bronchial epithelial cells; toxicology of carbon/graphite fibers used in advanced composite materials by the aerospace industry; and mucociliary clearance as a defense mechanism in the lung. He has developed new ways of preserving and fixing mucous cells with ultrarapid freezing and freeze-substitution. He is also interested in the applications and techniques of microscopy. He has published more than 50 papers in peer-reviewed publications.

Lee Monteith, MS, is a Senior Lecturer Emeritus in the Industrial Hygiene and Safety Program. Mr. Monteith, a Certified Industrial Hygienist, is a member of the Air Sampling Instruments Committee, American Conference of Governmental Industrial Hygienists. He is a contributing author to that committee's major publication, *Air Sampling Instruments*, and its monograph, *Air Sampling Instrument Selection Guide: Indoor Air Quality*. He is also a member of the Gas and Vapor Detection Systems Com-mittee, American Industrial Hygiene Association and a liaison between the two committees. He is a Diplomate member of the American Academy of Industrial Hygiene. He received the Distinguished Industrial Hygienist Award from the Pacific Northwest Section, AIHA in 1985. His research interests include the adsorption process in passive dosimeter badges, methods for the measurements of glove permeation, and methods for the detection and measurement of trace compounds in the environment.

Michael S. Morgan, ScD, is a Professor in the Industrial Hygiene and Safety program and director of the department's undergraduate program. He holds adjunct appointments in the Department of Civil Engineering at UW, and in the Environmental Sciences program at Washington State University. Dr. Morgan is a Certified Industrial Hygienist. His main academic interest is in respiratory physiology and inhalation toxicology. He measures and models the dynamics of industrial solvent exposures, and studies the performance of personal protective equipment used with solvents. He also studies lead exposures in the construction industry, particularly among demolition workers. He chairs the Biological Exposure Indices Committee of the American Conference of Governmental Industrial Hygienists. In 1997, he was keynote speaker at Third International Occupational Hygiene Association Scientific Conference in Switzerland. He has published about 30 papers in peer-reviewed journals.

Sharon L. Morris is a Senior Lecturer in the Occupational and Environmental Medicine program and the department's Assistant Chair for Community Outreach, as well as associate director of the Pacific Northwest Agricultural Safety and Health Center. Her research interests include occupational safety and health policy and program evaluation, and she directs the department's Policy Analysis and Program Evaluation Initiative. She serves on the Board of Scientific Counselors of the National Institute for Occupational Safety and Health.

Ahmad E. Nevissi, PhD, retired in July 1999 as Research Associate Professor in the Environmental Health Technology program. He is a radiochemist with long-standing ties to nuclear monitoring programs at Hanford Nuclear Reservation and at various former atomic test sites. He also has a general interest in environmental radiation hazards, including radon, and in chemical environmental pollution, especially marine pollution and its ecological impacts.

Curtis J. Omiecinski, PhD, is a Professor in the Toxicology program. His research program in molecular toxicology seeks to understand genetic factors that determine susceptibilities of individuals to toxic effects associated with chemical exposure. A major research interest is the study of molecular mechanisms regulating phenobarbital induction and transcriptional regulation of the P450 and EH genes. He is identifying differences in these genes in collaboration with the department's biomarker laboratory. He received the Society of Toxicology's Zeneca Award, 1998 and the Burroughs Wellcome Fund Toxicology Scholar Award, 1995-2000. He is associate editor of *Toxicological Sciences*, the official journal of the Society of Toxicology. He has published more than 60 papers in peer-reviewed journals and numerous book chapters, technical reports and other articles.

Linda Rosenstock, MD, MPH, is a Professor in the Occupational and Environmental Medicine program, on leave as director of the National Institute for Occupational Safety and Health (NIOSH). Her research interests are occupational and environmental medicine, occupational and general internal medicine, clinical determinants of occupational disease, chemoprevention of lung cancer in asbestos exposed workers, musculo-skeletal effects of repetitive motion, and neuropsycho-logical sequelae of pesticide and solvent exposure.

Mansour Samadpour, PhD, is an Assistant Professor in the Environmental Health Technology program. He is trained in microbiology and food science. Recent projects include source analysis for fecal coliforms in relation to shellfish beds and public water supply; molecular epidemiology of food-borne outbreaks; and prevalence and implications of food-borne pathogens in public food supplies. His laboratory specializes in rapid identification of sources of outbreaks of infectious diseases and the microbiology of food, water, and wastewater, and air. He received a group recognition award from US Food and Drug Administration in 1997 for his team's work in solving the *E. coli* identification problem in the Odwalla apple juice case.

Noah S. Seixas, PhD, is an Associate Professor in the Industrial Hygiene and Safety program and graduate program director. Dr. Seixas is a Certified Industrial Hygienist and a member of the editorial board of the *American Industrial Hygiene Association Journal.* He also serves on the AIHA Occupational Epidemiology Committee. His interests are in the quantification of exposure for occupational epidemiology, especially agents affecting the respiratory tract. Research projects include characterizing noise exposure among construction trades, doing a prospective evaluation of exposure among aluminum potroom workers using both air and biological monitoring techniques, and simulating the effects of alternative grouping strategies for exposure assessment on exposure-response analyses.

Elizabeth (Lianne) Sheppard, PhD, is a Research Assistant Professor in the Occupational and Environmental Medicine Program with a joint appointment in Biostatistics. Her applied work focuses on air pollution health effect and occupational epidemiologic studies. Her biostatistical research interests emphasize estimation of health effects from environmental and occupational exposures, and incorporating group information in epidemiologic studies.

Charles D. Treser, MPH, is a Senior Lecturer in the Environmental Health Technology program. His interests include administrative law and process applied to environmental health, and vector control and housing. Current research projects include a comparison of job descriptions for public sector employers with the curriculum content of schools of public health in five states. He is spearheading a national effort to produce a practical manual on housing and health for environmental health practitioners. He is president-elect of Association of Environmental Health Academic Programs.

Gerald van Belle, PhD, a Professor in the Environmental Health Technology program (joint with Biostatistics), was department Chair from 1990 to 1998. His research specialties include design of experiments, data characterization, and analysis with particular emphasis to neuro-degenerative diseases and environmental studies. He is the principal investigator for the core in Biostatistics, Epidemiology, and Statistical Genetics of the UW Alzheimer Disease Research Center. He also researches the effects of air pollution on health, particularly the link between daily fluctuations in air pollution levels and morbidity and mortality statistics. He is a member of the Research Committee of the Health Effects Institute, a board member of the Mickey Leland National Urban Air Toxics Research Center, and a member of the Food and Drug Administration's Peripheral and Central Nervous System Drug Advisory Committee. He is the author or coauthor of more than 100 papers and coauthor with L. Fisher of the Wiley book, *Biostatistics: A Methodology for the Health Sciences.*

James S. Woods, PhD, MPH, is a Research Professor in the Toxicology program. His research focuses on the molecular mechanisms of toxicity of heavy metals such as mercury, arsenic, and lead, with interest in changes in metabolism of porphyrins (a type of pigment) as biomarkers of metal exposure and toxicity. He conducts epidemiological studies of metal toxicity in human populations, including a study to determine the potential health risks of mercury amalgam dental fillings in children. He is past president of the American Board of Toxicology and has served on numerous national and international advisory committees to evaluate human health risks from metal exposures. He has published more than 100 papers in peer-reviewed journals and numerous book chapters and review articles.

Zhengui Xia, PhD, is an Assistant Professor in the Toxicology program. She has published 20 papers, mostly on the mechanisms for regulating apoptosis, a form of programmed cell death. During development, apoptosis helps remove cells that are produced in excess, have developed improperly, or are no longer needed. In adults, apoptosis removes cells that are potentially dangerous, such as viral infected cells, genetically damaged cells, or toxin-damaged cells. Dr. Xia studies the role of chemical toxins such as ethanol and sodium arsenite on apoptosis. Abnormal apoptosis has been implicated in various diseases, such as cancer, autoimmune disorders, Huntington's disease, Alzheimer's disease, and stroke. Dr. Xia's research is supported by the Sheldon Murphy assistant professor endowment and she is also a recipient of the Burroughs Wellcome new investigator award.

Michael G. Yost, PhD, is an Associate Professor and director of the Industrial Hygiene and Safety program. His research interests include optical remote sensing of chemicals in the environment, and physical agents in the workplace such as noise, vibration, and electromagnetic radiation. Dr. Yost is a member of the Bioelectromagnetics Society (BEMS) and the American Conference of Government Industrial Hygienists (ACGIH). He is developing new tools for exposure assessment, such as Optical Remote Sensing (ORS) methods that use electromagnetic radiation (such as lasers, UV, visible, or infrared light) to rapidly identify and measure contaminants. He is developing new types of sampling methods, such as a heart rate controlled sampling pump and instruments for measuring solvent concentrations in exhaled breath samples using infrared spectroscopy.

Retired faculty

Peter Breysse, MPH, *Associate Professor Emeritus*

Lee Doolittle, PhD, *Associate Professor Emeritus*

Stanley Freeman, MS, *Senior Lecturer Emeritus*

Joseph P. Geraci, PhD, *Retired Associate Professor*

Jack Hatlen, MS, *Associate Professor Emeritus*

Richard Hibbard, *Lecturer Emeritus*

Kenneth Jackson, PhD, *Professor Emeritus*

Goldy Kleinman, MA, *Lecturer Emeritus*

Lee Monteith, MS, *Senior Lecturer Emeritus*

N. Karle Mottet, MD, *Professor Emeritus*
(*Joint with Pathology*)

Maurice Robkin, PhD, *Professor Emeritus*

John Wilson, MD, ScD, *Professor Emeritus*

Part-time & visiting faculty

Bruce Fowler, PhD, *Visiting Associate Professor*
University of Maryland School of Medicine

Alfred Franzblau, MD, *Visiting Associate Professor*
University of Michigan

Richard Gleason, MSPH, *Lecturer*

Vincent Gregory, *Visiting Lecturer*
CEO-Emeritus, Rohm and Haas Company

David Lenning, *Lecturer*

Crispin Pierce, PhD, *Acting Instructor*

Kate Stewart, MS, *Lecturer*

Timothy Takaro, MD, *Acting Assistant Professor*

Postdoctoral fellows

Theo Bammler

Kevin Brand

Jane Smith Cavanaugh

Marina Guizzetti

Ram Hashmonay

Vinayak Hosagrahara

Jacob Jabbour

Edward Kelly

Barbara Krovat

Wan-Fen Li

Yan Lu

Paola Costa-Mallen

Therese Mar

Uk Namgung

Ying-Chung Ou

Crispin Pierce

Kevin Yagle

Auxiliary Faculty

Leonard Altman, MD, *Clinical Professor*
Joint with Medicine (Primary Appointment), Oral Biology

Harriet Ammann, PhD, *Affiliate Assistant Professor*
Washington state Department of Health, Office of Environmental Assessment Services

Steven Bao, *Affiliate Assistant Professor*
Washington state Department of Labor and Industries

Stanley Bigos, MD, *Adjunct Professor*
Spine Research Clinic, Harborview

Alvah Bittner, PhD, *Affiliate Professor*
Battelle Human Affairs Research Centers

Denis Bourcier, PhD, *Affiliate Associate Professor*
Environmental Engineering, Boeing Defense and Space Group

John Calcagni, MD, *Clinical Instructor, Richland*

Stephen Cant, *Affiliate Assistant Professor*
Industrial Safety and Health, Washington state Department of Labor and Industries

Martin Cohen, ScD, *Affiliate Assistant Professor, SHARP,*
Washington state Department of Labor and Industries

Jon Counts, DrPH, *Clinical Assistant Professor*
Assistant Secretary, Washington state Department of Health

David Covert, PhD, *Adjunct Research Professor*
Civil Engineering, Atmospheric Sciences

Stanley Curtis, PhD, *Affiliate Professor*
Fred Hutchinson Cancer Research Center

Foppe DeWalle, PhD, *Affiliate Professor*
Delft, The Netherlands

Frank Dost, DVM, ATS, *Affiliate Professor*
Veterinary Sciences, Freeland, WA

Robert Dreisbach, MD, PhD, *Clinical Professor*
Professor Emeritus (Pharmacology), Stanford University

Charles Easterberg, MS, *Clinical Instructor*
UW Environmental Health and Safety

Diana Echeverria, PhD, *Affiliate Associate Professor*
Battelle Human Affairs Research Centers

Alan Fantel, PhD, *Adjunct Research Professor*
Department of Pediatrics

Steven Gilbert, PhD, *Affiliate Associate Professor*
President, SNBL-USA, Director, Institute of Neurotoxicology and Neurological Disorders

Timothy Gilmore, MD, *Clinical Assistant Professor*
Group Health Cooperative

Gary Goodman, MD, *Clinical Associate Professor*
Joint with Medicine (Primary Appointment), Swedish Tumor Institute

Thomas Hamilton, MD, *Clinical Assistant Professor*
Joint with Medicine, Endocrinology

Samuel Hammar, MD, *Clinical Professor*
Joint with Pathology (Primary Appointment)

Thomas Henn, MD, *Clinical Assistant Professor*
Benton-Franklin District Health Dept.

John Holland, MD, MPH, *Clinical Assistant Professor, Joint with Orthopaedics (Primary Appointment)*

Scott Iverson, PhD, *Adjunct Associate Professor*
Industrial Engineering

Damir Janigro, PhD, *Adjunct Research Associate Professor*
Neurological Surgery

James Karr, PhD, *Adjunct Professor*
Department of Zoology

Ronald Kathren, PhD, *Affiliate Associate Professor*
US Transuranium and Uranium Registries
Washington State University, Richland

Philip Landrigan, MD, *Clinical Professor, Director, Division of Environmental and Occupational Medicine, Mt. Sinai Medical Center, New York*

Timothy Larson, PhD, *Adjunct Professor*
Department of Civil Engineering

Brian Leroux, PhD, *Adjunct Research Assistant Professor*
Biostatistics and Dental Public Health Sciences

Joellen Lewtas, PhD, *Affiliate Professor, US EPA, Region X*

Roseanne Lorenzana, PhD, *Affiliate Assistant Professor*
US EPA, Region X

Donald Malins, PhD, *Affiliate Professor*
Pacific Northwest Research Foundation

Thomas Martin, MD, MPH, *Adjunct Associate Professor*
Director, Toxicology Services, Emergency Medicine, UW

Willard Meader, MD, MPH, *Clinical Associate Professor*
Regional Vice President, Group Health Northwest

Roscoe Moore, PhD, *Affiliate Associate Professor*
Office of International Health, Rockville, MD

Karen Morris-Fine, PhD, *Affiliate Assistant Professor*
The Boeing Company

Michael Muhm, MD, MPH, *Clinical Associate Professor*
The Boeing Company

Gilbert Omenn, MD, PhD, *Affiliate Professor, Executive Vice President for Medical Affairs, University of Michigan*

Carl Osaki, MSPH, *Clinical Associate Professor, retired director of Environmental Health Services, Seattle-King County Department of Public Health*

Stanley Pier, PhD, *Affiliate Associate Professor*
Consultant

William Pierson, MD, *Clinical Professor Joint with Pediatrics (Primary Appointment)*

Bradley Prezant, MSPH, *Affiliate Instructor, Prezant and Associates*

Susan Sama, PhD, *Affiliate Assistant Professor*
SHARP, Washington state Department of Labor and Industries

Lowell Sever, PhD, *Affiliate Professor*
Battelle Seattle Research Center

Barbara Silverstein, PhD, MPH, *Affiliate Associate Professor, SHARP Program, Washington state Department of Labor and Industries*

Michael Silverstein, MD, MPH, *Affiliate Associate Professor (Joint with Health Services), Assistant Director for WISHA Services, Washington state Department of Labor and Industries*

Patricia Sparks, MD, *Clinical Associate Professor*
Consultant, occupational and environmental medicine and clinical toxicology

Mark Stuart, PhD, *Affiliate Assistant Professor*
Washington state Department of Labor and Industries

Dennis Stumpp, MD, *Clinical Assistant Professor*
Providence Crossroads Medical Center

Wayne Turnberg, MSPH, *Affiliate Instructor*
Washington state Department of Ecology

Philip Watanabe, PhD, *Affiliate Professor, retired director of health services, Dow Chemical Company*

Stephen Whittaker, PhD, *Affiliate Assistant Professor*
SHARP Program, Washington state Department of Labor and Industries

Paul Williams, MD, *Clinical Associate Professor*
Northwest Asthma and Allergy Center, Mount Vernon

Walter Wilson, PhD, *Affiliate Associate Professor*
Battelle Northwest Laboratories, Richland

Helmut Zarbl, PhD, *Affiliate Associate Professor (Joint with Pathology), Fred Hutchinson Cancer Research Center*

Publications

Publications in peer reviewed journals and books. Departmental researchers are boldfaced. Citations printed in color refer to the six feature stores on pages 7–19.

Alexander BH, Checkoway H, van Netten C, **Kaufman JD,** Mueller BA, Vaughan TL, **Faustman E**. Paternal occupational lead exposure and pregnancy outcome. Int J Occup Environ Health 1996; 2:280–285.

Alexander BH, Checkoway H, Costa-Mallen P, Faustman EM, Woods JS, Kelsey KT, van Netten C, **Costa LG**. Interaction of blood lead and delta-aminolevulinic acid dehydratase genotype on markers of heme synthesis and sperm production in lead smelter workers. Environ Health Perspect 1998; 106:213–216.

Alexander BH, Checkoway H, Faustman E, van Netten C, Muller CH, Ewers TG. Contrasting associations of blood and semen lead concentrations with semen quality among lead smelter workers. Am J Ind Med 1998; 34:464–469.

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Andersen MR, **Farin FM, Omiecinski CJ**. Quantification of multiple human cytochrome P450 mRNA molecules using competitive reverse transcriptase -PCR. DNA Cell Biol 1998; 17:231–238.

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Audesirk G, **Burbacher T,** Guilarte TR, Laughlin N, Lopachin R, Suszkiw J, Tilson H. Understanding the NIH review process: A brief guide to writing grant proposals in neurotoxicology. Neurotoxicology 1999; 29:91–97.

Balmes J, Ngo L, Cullen M, **Brodkin CA,** Williams J, Redlich C, **Omenn G, Barnhart S**. Effect of Vitamin A and beta-carotene on loss of lung function in the CARET trial. Am J Respir Dis Crit Care Med 1998; (No.3, Part 2):A46.

Barnhart RL, **Van Belle G,** Edland SD, Larson E. Referral bias in Alzheimer's disease (letter). J Clin Epidemiol 1997; 50:365–366.

Barnhart RL, **van Belle G,** Edland SD, Larson E. Referral bias in Alzheimer's disease (letter). J Clin Epidemiol 1997; 50:365–366.

Barnhart S, Keifer M, Yingratanasuk T. Occupational health: An emerging discipline in developing economics. Washington Public Health. Volume 15, Fall 1997.

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We have expanded our use of the Internet to extend our reach around the globe. This section explains how to find us on the World Wide Web. It also explains the structure of our organization. We invite you to visit us online, by phone, or in person.

DEH ONLINE

We invite you to visit the following Web sites for more information about specific projects mentioned in this report.

Department Web site
http://depts.washington.edu/envhlth/

This biennial report online
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Fetal alcohol syndrome
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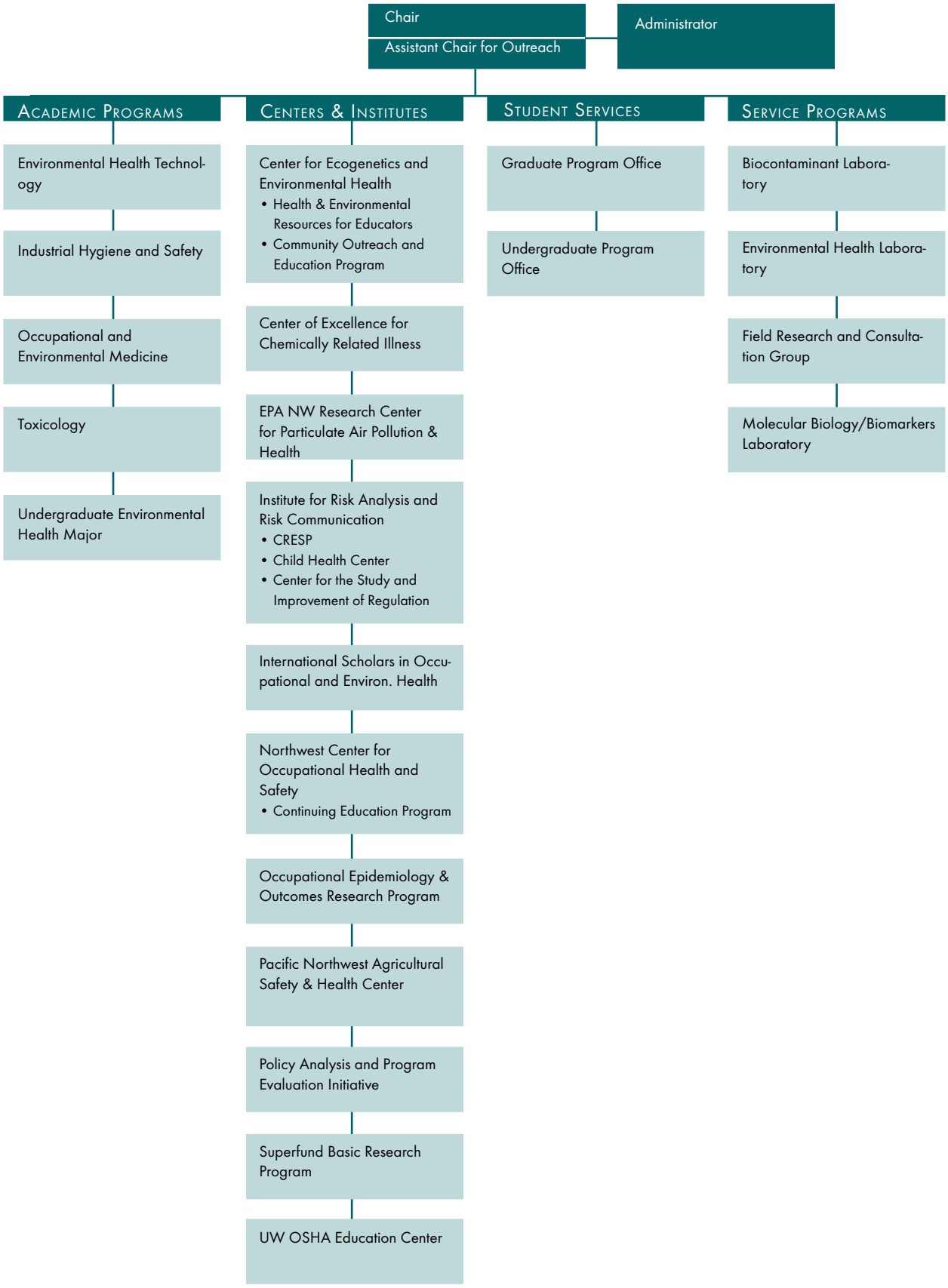
Organizational Chart



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Front Cover

insets (l to r): Dr. Matthew Keifer demonstrating cholinesterase testing in rural Vietnam; Nancy Simcox assessing pesticide exposure of apple thinners; foundry workers pouring molten metal; background: astrocytes from fetal alcohol syndrome research—20x magnification with fluorescence microscope

Back Cover

insets (l to r): the Pacific Northwest Agricultural Safety and Health Center works with Snoqualmie valley farmers; undergraduate students Phebe Mason, Katia Harb, and Gina Colby in the Environmental Health Laboratory; the new EPA Particulate Matter Center at the UW studies air pollution

the soulcatcher, logo of the School of Public Health and Community Medicine, is a northwest coast Indian symbol of physical and mental well-being (artist: Martin Oliver)

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