



## COEH Researchers to Study Impact of Air Pollution on Asthmatic Children

COEH researchers have received two grants totalling \$3.5 million from California's Air Resources Board to study collaboratively how airborne particles affect the long-term health of asthmatic children in Fresno County.

The Fresno County region of California has a high prevalence of asthma and high levels of air pollution, especially particulate matter.

Ira Tager, MD, professor of epidemiology at Berkeley, and John Balmes, MD, professor of medicine at UC San Francisco, will investigate how air pollutants affect the respiratory health of 450 asthmatic children, ages six to ten, while Katharine Hammond, associate professor of environmental health at Berkeley, will evaluate the pollutants to which the children are being exposed. Berkeley post-doctoral researcher Kathleen Mortimer, who formerly directed the Inner City Asthma Study for the National Institute of Environmental Health Sciences, will manage the two-part project.

In addition to studying the seasonal effects of pollution on the children's health, Tager and Balmes—in an innovative addition to the traditional focus on short-term effects—will follow the children throughout the study to learn whether or not the asthma of those who are more sensitive to pollution becomes more severe over time.

The asthma study will draw upon data from two major air quality measurement efforts in the region—the U.S. Environmental Protection Agency's assessment program for particle air pollution in Fresno and the California Re-



Source: American Academy of Allergy, Asthma and Immunology

gional PM<sub>2.5</sub>/PM<sub>10</sub> Air Quality Study in the San Joaquin Valley. Using this information will make it possible for Hammond to characterize particulate pollution better than in any previous study.

Hammond will develop methods to evaluate the relationships between air pollution at these fixed sites and the concentrations of various pollutants to which children are exposed in the home and the outdoor environment.

"There is substantial evidence that outdoor air pollution exacerbates asthma, which is on the rise in the developed world, yet we have very few studies available to assess how day-to-day responses to air pollution affect the long-term respiratory health of asthmatics or the progression of the disease," Tager said. "The state and federal air quality studies will provide a unique database that will enable us to learn

See *Air Pollution*, page 7

### COEH Symposium *Particulate Pollution: Research and Policy* April 7, 2000

**Pre-registration** required.  
510-231-5645 or via:  
<http://garnet.berkeley.edu/~coehce/>

**Location:** □ Clark Kerr  
Conference Center, UC  
Berkeley

**Time:** 8:15 am □ to 4:00 pm

**Reception:** 4:15 pm

**Cost:** Free to COEH faculty,  
staff, & students; \$40 to  
others (includes lunch)

**Parking:** \$8 for the day

**REGISTER EARLY!**

## Symposium to Address the Dangers of Airborne Particles

Whether COEH researchers are studying polluted air, tobacco smoke, diesel exhaust, cooking fires, or agricultural dust, they share a common concern about how these different kinds of tiny particles affect our health.



To encourage interdisciplinary discussion of the problems associated with exposure to particulate aerosols, COEH will sponsor a one-day symposium on *Particulate Pollution: Research and Policy Issues* at UC Berkeley on Friday, April 7, 2000.

COEH faculty members in areas as diverse as rice hull burning and

tuberculosis exposure will share their findings and examine questions of common interest. □ New research will be highlighted—particularly findings in occupational health that have implications for environmental health—and controversial issues will be discussed.

### Research Changes Focus

“When I was doing my doctoral degree in the late ’70s, particulates were considered ‘old hat,’” recalls Kirk Smith, professor of environmental health at UC Berkeley and an indoor air pollution expert who will be one of the symposium speakers. “Air standards had been set, consistent with epidemiological studies by prominent scientific bodies, and we thought we had a level that was safe. Then, in the ’80s and the early ’90s, new studies—some re-analyzing older studies and others using more sophisticated measurement techniques and more detailed examination of the nature of the particles—showed that there were serious health effects below the levels that we had thought were safe.”

As more became known about particles, Smith said, the earlier focus on all particles switched to a focus on particles of smaller sizes that penetrate deeper into the lung. U.S. standards were reset in the mid-1980s to focus on particles that could penetrate deep into the lungs—particles that were less than 10 microns in size ( $PM_{10}$ ). In 1998, the Environmental Protection Agency tried to add a  $PM_{2.5}$  standard—an effort that industry has successfully blocked to date.

“The proposed  $PM_{2.5}$  standard would be very strict, but some specialists believe the regulations should be even more stringent,” Smith said. “We now know that tiny particles can penetrate into the bloodstream from the lungs and may have a direct impact on the heart. Research keeps chasing smaller and smaller particles, as we learn more about the health effects. Even at the very low pollution levels we have in the United States, it is thought that 60,000 people die prematurely each year from outdoor urban air pollution.”

Exploration at the cellular level and advanced epidemiological methods are bringing to light both the mechanism and the consequences of exposure to airborne particulates. This new research, Smith said, has given rise to more questions and controversies, as the nation’s political leaders seek to reconcile social and economic trade-offs. For example, most epidemiological studies track the relationship of pollution to deaths on a short-term basis—noting a rise in the particulate level on a given day and an increased incidence of deaths the next. The question is whether, in the long-term, the increased pollution is primarily affecting people who are already vulnerable due to age or infirmity or whether long-term exposure also causes people to become more vulnerable, thus substantially shortening lives. “The current thinking is that there is increased long-term risk, although the issue is by no means resolved.” Smith said.

With lives at stake and billions of

“We now know that tiny particles can penetrate into the bloodstream from the lungs and may have a distinct impact on the heart.”

See *Symposium*, page 5

## Needle Stick Safety Pioneer Honored



PHOTO BY PEC SKORPINSKY

The Occupational Health and Safety Section of the American Public Health Association (APHA) has honored COEH faculty member June Fisher, MD, with the Lorin Kerr Award for innovative service in public health and safety.

The award is given annually in memory of Lorin Kerr, MD, a clinician and an advocate for mine workers in their fight against black lung disease.

Darryl Alexander, occupational health and safety director of the American Federation of Teachers, presented the award at the November meeting of the APHA in Chicago. Also at the meeting, Fisher received a commendation from Region 9 of the Department of Health and Human Services for her contributions to the health and safety of workers.

Fisher, associate clinical professor of medicine at UC San Francisco, is best known for pioneering work that has helped inspire legislation to prevent injuries from needles and other sharp objects in the health care workplace.

Alexander said Fisher has demonstrated her dedication to workers' health and safety through her activities with labor unions and working people: "June has been a fantastic advocate, and she has led innovative research projects which involve the people being studied. Her work has led to improved working conditions for transit and health care workers and has been an inspiration to the doctors, nurses, industrial hygienists, and epidemiologists who are members of the Occupational Health and Safety Section of the APHA." 🙏

## Cell Biologist Wins SERCA Award

Assistant Research Biologist Karen King has received a Special Emphasis Research Career Award (SERCA) from the National Institute for Occupational Safety and Health (NIOSH) to study the cellular mechanisms of injury to musculoskeletal tissue.

The three-year SERCA grant supports the work of researchers at the start of their careers. A cell biologist in the Division of Occupational and Environmental Medicine at UC San Francisco, King works in the UC Ergonomics Program at the Richmond Field Station.

"King fills an important void in our program, because she studies the basic scientific mechanisms involved in musculoskeletal injury due to work," said COEH faculty member David Rempel, director, UC Ergonomics Program. "Not many programs have someone of her expertise."



Karen King

## Exposure Analysis Conference

*Exposure Analysis in the 21st Century: Integrating Science, Policy & Quality of Life* will be the theme of the Year 2000 Meeting of the International Society of Exposure Analysis, October 24-27, at the Asilomar Conference Center in Monterey.

The goal of the meeting "is to advance both the science and application of exposure analysis in public policy aimed to improve health and quality of life. The conference will unite people working in exposure and related fields to exchange information and define new research efforts. There will be a strong focus on public policy and regulatory applications of current research."

COEH faculty member Thomas E. McKone, who holds joint appointments at UC Berkeley's School of Public Health and the Lawrence Berkeley National Laboratory, and Jed Waldman of the California Department of Health Services, Berkeley, are co-chairs of the conference organizing committee.

Abstracts for the conference are due April 15. For further information, visit the conference Web site at [www.iseaweb.org/isea2000.html](http://www.iseaweb.org/isea2000.html).

# Computer Keyboard Design Does Make a Difference

**E**ver walked away from your computer with aching shoulders or a feeling of numbness in your hand or arm? Your body is



PHOTO BY PEG SKORPINSKY

hinting at the rise in musculoskeletal disorders (MSDs) reported throughout the nation, as computers have become ubiquitous in the workplace. COEH Faculty Member David Rempel and his research team are trying to learn how to prevent and reduce computer-related MSDs. This story, excerpted from *Forefront 2000*, a publication of UC Berkeley's College of Engineering,

describes a recent project.

"Office work may sound benign, but, in situations requiring heavy computer use, the number of people who experience decreased productivity, or lost workdays, or who simply can't function because they are in pain is actually quite substantial," says David Rempel, MD, who holds joint appointments in bioengineering and mechanical engineering at UC Berkeley and in medicine at UC San Francisco.

"This is an important public health problem where recovery can take years, and the problem will only grow as we spend more time on computers. Worse yet, it's a problem that is not widely recognized," says Rempel.

To evaluate the impact of the computer revolution on workers, doctoral student Pat Tittiranonda and Rempel launched a study to look at the effects of alternative computer keyboards on hand discomfort, in conjunction with health services researchers at the Lawrence Livermore National Laboratory. It was the first controlled, randomized workplace study of its kind

to last more than a few weeks.

Eighty Lawrence Livermore employees with hand pain or numbness participated in the study. All were diagnosed with computer-induced carpal tunnel syndrome or tendonitis prior to the study.

Each participant was randomly assigned one of three commercial keyboards marketed to reduce typing discomfort—Microsoft Natural Elite Keyboard, the Apple Adjustable Keyboard, the Comfort Keyboard System—or a placebo keyboard. Each of the non-placebo keyboards was split into right and left halves, each side rotated or tilted, creating what Rempel calls an alternative keyboard geometry designed to minimize discomfort.

For six months, study participants performed all their usual work with their assigned keyboards, assessing ongoing hand pain and function in reports sent back to Rempel's ergonomics lab every six weeks. At the end of the six-month trial, only the Microsoft keyboard users showed improvement, reporting pain severity scores 50 percent lower than at the beginning of the research study. The pain severity scores for other users remained essentially constant.

"We didn't expect to see such a dramatic difference," says Rempel. "Pain levels dropping in half is a pretty big impact. There aren't too many other interventions, including surgery, that get those results."

Rempel is quick to point out that it took awhile before improvements occurred with the Microsoft keyboard, underscoring the need for long-term studies such as this one: "Pain improvement only became noticeable after about 12 weeks. The lesson here is that when people begin to modify their keyboard, mouse, or workstation, it may take two or three months before there is an effect."

"There's really very little solid research telling us what kind of intervention in the office helps reduce musculoskeletal pain," says Rempel. "If we see this kind of improvement with a

See *Keyboard*, next page

David Rempel points out the carpal tunnel region of the hand and wrist on a teaching model of a hand. This is where tendons can become inflamed from prolonged computer use. The Microsoft Natural Elite keyboard, pictured closest to Rempel, beats out the competition, cutting hand pain in half.

### Keyboard

Continued from page 4

relatively minor change in the keyboard design, just imagine how much more could be done to reduce hand discomfort as we rethink the whole workstation. The long-term impact of this kind of knowledge is obviously great, since computer work will be the primary work of the future.”

—Kathleen Scalise and Nancy Bronstein

### Symposium

Continued from page 2

dollars riding on the line, the Congress has asked the National Academy of Sciences (NAS) to review the nation’s particle program. The NAS is examining whether we are asking the right questions, taking into account new research techniques that make it possible to determine much more precisely how particles affect public health and to understand the risks involved. “A small health effect is important when it is applied to a large population,” Smith said.

### Greater Danger Abroad

The danger from airborne particulates is considerably greater in developing countries, where exposure to air pollution is one of a multitude of serious health issues.

“My work indicates that air pollution may cause about 2 million premature deaths globally each year—it ties with tobacco as the No. 3 risk factor for ill health and premature deaths in the world, after malnutrition and dirty water,” Smith said. “These numbers aren’t well recognized yet, because we don’t have good enough data.” With funding from the World Health Organization (WHO), Smith and researchers at Carnegie Mellon and in the Netherlands are conducting a global risk assessment to develop burden of disease estimates for updated WHO reports on the relative importance of major risk factors on health.

One of Smith’s greatest challenges in the years ahead will be learning how to make information about health risks from airborne particles meaningful for developing countries.

“A tremendous amount of work has already been done in Europe and North America that can apply to the developing world,” he says. “It is difficult to translate impacts of pollutants in rich, industrialized populations to the developing nations, and, politically, every country wants to see its own statistics. On the other hand, it would be unconscionable to wait for another 100 studies to be done before making decisions.”

## The Many Facets of Particle Research

### Area of Interest

Agricultural Particulates  
 Infectious Droplets (TB)  
 Combustion  
 Diesel Exhaust

Environmental Tobacco Smoke  
 Asthma

Metal Fumes  
 Indoor Air Pollution - Developing World  
 Physics and Chemistry of Exposure  
 Risk Assessment

### COEH Faculty Leadership

Marc Schenker, Colin Solomon  
 Robert Harrison, Mark Nicas  
 Catherine Koshland  
 Paul Blanc, Katharine Hammond, Allan Smith, Katharine Hammond, Marc Schenker  
 Katharine Hammond  
 John Balmes, Ira Tager, Colin Solomon, Katharine Hammond  
 Paul Blanc, John Balmes, Colin Solomon  
 Kirk Smith  
 William Nazaroff  
 Thomas McKone

## Scholarship Winners to Address High Tech Safety Conference

Seven UC Berkeley scholarship winners will present their research on health and safety in the high technology industry this month at the annual meeting of the Semiconductor Safety Association (SSA) in Crystal City, Virginia.



PHOTO BY PEG SKORPINSKY

The scholarship recipients, all graduate students in environmental health sciences, have won \$1,500 grants from SSA to explore a problem relevant to health and safety in the high technology industry.

**Patrick Corcoran** has designed *A New Graphic Interface for the US EPA Industrial Source Complex*.

**Michael Hogan** has explored *Exposure Assessment for Controlled Pulse-Etching with Xenon Difluoride*.

**Linda Kincaid** has examined *Toxic Gas*

*Monitoring*. **Mark Minto** has focused on *Creating a "Practical" Model for Industrial Hygienists/Safety Specialists*. **Emi Nagata** has studied the *Trend of Pollution Prevention in Major Electronics Markets*. **Aimee Tucker** has examined *Ergonomics in the Semiconductor Industry: Work-Related Musculoskeletal Disorders*. **Colleen Yeh** has investigated *Exposure Assessment and Health Hazards Associated with Gallium Arsenide*.

COEH Faculty Member Katharine Hammond, associate professor of environmental health at Berkeley, has supervised the students' research. Hammond earlier this year taught a seminar on health and environmental issues in the semiconductor industry that provided background for the students' work.

Berkeley scholars captured one-third of all the SSA awards for the 1999-2000 academic year—the largest number the campus has ever received. 🎉

## Three Young Researchers Win Seed Grants

COEH has awarded three \$17,000 grants for pilot projects under a new program to develop the research skills of junior faculty and young investigators.

The COEH Pilot Project Research Training Award program, funded by the National Institute for Occupational Safety and Health (NIOSH), supports occupational health research that has a high likelihood of attracting further extramural support.

Fadi Fathallah, assistant professor of ergonomics and biomechanics in the department of Biological and Agricultural Engineering at UC Davis, will evaluate a new device (BackTalk) designed to capture extreme trunk postural data from agricultural workers. Fathallah's research aims to improve techniques for assessing the physical risk factors that may lead to low back disorders.

Karen King, assistant research biologist in the Division of Occupational and Environmental Medicine at UC San Francisco, will develop an animal model for investigating work-related arthritis of the hand. King will investigate whether overuse of the fingers leads to pathological changes in the articulating joints of the hand.

Colin Solomon, assistant professor of Medicine at UC San Francisco, will study how repeated exposure to zinc oxide—a common occupational air toxin—affects airway inflammation in asthmatic and non-asthmatic subjects.



how short-term and multiple year exposures to air pollution affect asthmatic children.”

Tager, Balmes, and Hammond anticipate that their detailed health evaluations and assessment of exposure over time will provide new insight into the impact of air pollutants (especially the size and composition of particulate matter) on childhood asthma. Their findings will help to inform public health policies for air pollution.

Announcing the grant, Governor Gray Davis said, “This important research will help us find new and better ways to protect California’s most vulnerable residents from the health impacts of air pollution (and will) benefit people with respiratory illnesses everywhere.” 🌍

## Balmes Named Acting Director of COEH



PHOTO BY PEG SKORPINSK

John Balmes, MD, professor of medicine at UC San Francisco and chief, Division of Occupational and Environmental Medicine at the San Francisco General Hospital, has been named acting director of COEH through July 2001. Balmes replaces COEH Director Robert Spear, who is serving as chair of UC Berkeley’s Academic Senate, the governing body of the Berkeley faculty.

## Rempel Appointed to NAS Committee

COEH faculty member David Rempel, associate professor of medicine at UC San Francisco and director, UC Ergonomics Program, has been appointed to a National Academy of Sciences/Institute of Medicine committee that is examining whether work causes musculoskeletal disorders such as back pain and injuries to muscles, tendons, and nerves. The committee is also studying the extent to which ergonomic intervention might prevent workplace injuries and disability. A report will be issued at the end of the year. 🌍

## Continuing Education

For a list of COEH Continuing Education courses, visit the CE website at

<http://socrates.berkeley.edu/~coehce>.

Additional seminar series available include:

- *Grand Rounds: Current Topics in Occupational and Environmental Medicine.* For information on seminars in Sacramento, call 916/752-3317; for seminars in San Francisco, Santa Clara, and Berkeley, call 415/206-8950
- *Agriculture Seminar Series.* For information, visit [http://agcenter.ucdavis.edu/agcenter/announceseminar\\_series.htm](http://agcenter.ucdavis.edu/agcenter/announceseminar_series.htm)



Located on the Berkeley, San Francisco and Davis campuses of the University of California, Center for Occupational and Environmental Health trains occupational and environmental health specialists in medicine, nursing, toxicology, epidemiology, policy, ergonomics and occupational hygiene. It also conducts research and facilitates exchange of information and experience among labor, industry, and the academic community to better serve the working population. In 1982, it was designated an Education and Research Center (ERC) of the National Institute for Occupational Safety and Health (NIOSH). *COEH Bridges* is published quarterly and made available at no charge.

**Acting Director**

John R. Balmes

**Program Directors**

John R. Balmes, Robin L. Baker

Julia Faucett, S. Katharine

Hammond/Marc B. Schenker,

Robert C. Spear

**Newsletter Staff**

Suzanne Llewellyn,

Managing Editor

Nana Angelakis,

Production Designer

Vivian Auslander

Communications and

Editorial Services

**Phone:** 510/643-4422

**Fax:** 510/642-5815

**E-mail:** [llew@uclink4.berkeley.edu](mailto:llew@uclink4.berkeley.edu)

**Home Page:** <http://ehs.sph.berkeley.edu/coeh/>



# Bridges

CENTER FOR OCCUPATIONAL  
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 School of Public Health  
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