technologies that can analyze and make sense of large swaths of data derived from the human genome can greatly advance environmental health research. They can provide the “big picture”—sweep over thousands of genes and identify particular ones affected by a chemical exposure, such as from pesticides. They can help researchers understand the biological impact of a specific environmental pollutant.

But these tools also require considerable resources and expertise. An array-based global transcriptome profiling study may cost between $10,000 and $30,000, and microarray processing instruments, which can analyze potential biological markers for disease, are well over $100,000 per unit. Individual scientists often do not have these kinds of resources.

For this reason, two centers affiliated with the department (the Center for Ecogenetics and Environmental Health and the Superfund Research Program) developed the technical infrastructure and the facilities—the Functional Genomics Laboratory and the Bioinformatics and Biostatistics Facility—to pair researchers with experienced staff who can help
develop and implement studies that use these complicated but powerful assays and equipment. Both centers are funded by the National Institute of Environmental Health Sciences.

The Center for Ecogenetics and Environmental Health (CEEH), directed by Professor David Eaton, fosters collaborations among investigators from different disciplines to understand how genetic factors influence human susceptibility to environmental health risks. The Superfund Research Program, directed by Professor Harvey Checkoway, brings scientists together to uncover human and wildlife biological markers of exposure to and physiological damage from environmental toxicants.

A third center outside the department, the Center on Human Development and Disability, which is funded by federal legislation and the National Institute of Child Health and Human Development, uses services provided by the laboratory and facility for research on a broad spectrum of problems relevant to individuals with neurodevelopmental disabilities.

Early on, the Functional Genomics Laboratory performed genotyping assays for CEEH researchers. The studies compared base-pair sequences that make up an individual’s DNA. They were looking for DNA variations associated with susceptibility to an adverse outcome when exposed to a particular environmental toxin or pharmacologic agent. And the researchers discovered them, explained Fred Farin who directs the laboratory. With Research Professor Emeritus James Woods, the laboratory has identified DNA variants associated with neurobehavioral changes from mercury exposure.

In addition, their collaborative studies with Professor Allan Rettie (School of Pharmacy) on warfarin, a blood-thinning medication used to prevent blood clots, heart attacks, and stroke, found that people who had a genetic variant are more prone to catastrophic bleeding events. These and subsequent findings influenced the US Food and Drug Administration’s decision in 2007 to require the drug label to state that genetic makeup affects a person’s response to the medication.

Fast forward to today. “It’s not enough to generate data,” said Theo Bammler. He manages the Bioinformatics and Biostatistics Facility, which applies computer programming and biostatistical algorithms to decipher and extract information gleaned from functional genomics-related technologies. Microarrays, for example, can display genetic fingerprints, simultaneously measuring

Functional Genomics and Bioinformatics

New technologies help answer research questions about how environmental exposures can cause injury and disease. Functional genomics works to uncover the relationship between the double helix control tower and how it steers the body’s biological mechanisms. To analyze potential biological markers for disease, scientists use a gene chip or microarray instrument to measure the reaction or “expression” of thousands of different genes to a drug, an environmental pollutant, or a pathogen. Bioinformatics tools—computer programming and biostatistical algorithms—decipher and extract information gleaned from functional genomics-related technologies. Illustration: Cathy Schwartz
Theo Bammler (background), who manages the Bioinformatics and Biostatistics Facility, discusses an assay using microarray technology with Fred Farin, who directs the Functional Genomics Laboratory.

Photo: Elizabeth Sharpe

the reaction or “expression” of thousands of different genes to a drug, an environmental pollutant, or a pathogen. The data output without bioinformatics tools is too great to meaningfully visualize. Imagine finding patterns in a spreadsheet crisscrossed by thousands of rows of discreet numbers.

In addition to researchers from the three centers, Farin and Bammler also find themselves approached by other UW investigators who would like to collaborate. The result: an impressive number of studies published in peer-reviewed journals, and in the last five years, they have coauthored more than 70 manuscripts.

One study was the first of its kind to find a potential biomarker for low-level, chronic exposure to a toxin found in some kinds of algae. Another study looked at the molecular impact of organophosphate pesticides and heavy metals like copper on the olfactory systems of freshwater fish. Still another project investigated the mechanisms involved in the seasonal changes in bird brains—whereby the number of brain cells increase in spring and decrease in autumn. Their findings may one day have important implications for human neurogenerative diseases, which are characterized by brain cell death. “If we can figure out how to make these cells proliferate, we may be able to find a therapeutic approach to treat these diseases,” said Farin.

BLOOD TEST FOR Parkinson’s disease

Travis Cook is on a fishing expedition, but a different one from his winters of ice-fishing home in Minnesota. With Professor Jing Zhang (Department of Pathology) and Fred Farin (director of the Functional Genomics Laboratory), the fourth-year Toxicology PhD student is screening donated plasma from patients diagnosed with Parkinson’s disease and from welders who have a motor coordination disorder called parkinsonism with symptoms similar to Parkinson’s.

Cook’s research will help find biological markers that provide doctors with an objective tool to evaluate patients and that may indicate whether treatment is effective.

The first challenge is to locate biomarkers for Parkinson’s disease. No easy task. The disease originates in the brain, and definitive diagnosis can only be made post-mortem. Therefore, researchers must find a “surrogate” marker that accurately represents what is happening in the brain. Second, “Parkinson’s disease is progressive,” Cook explains, meaning it has evolving biomarkers. He is fishing for a match in the plasma proteome, a complicated soup containing thousands of proteins. Amidst all these potential targets, Cook must identify the right fingerprint: a unique set of proteins that have been modified chemically by Parkinson’s disease. Ideally, the combination will be distinct from the same set in healthy individuals, in people diagnosed with Alzheimer’s disease, and welders with parkinsonism.

To find Parkinson’s particular fingerprint, Cook and Zhang work with plasma from individuals in early to late stages of the disease. As the disease progresses, the pattern of chemical modifications should grow stronger. Initial results using protein microarrays are promising.
On May 24, at the annual Student Research Day, a second-year master’s student from each of the five graduate degree programs gave a presentation on his or her research. These are summarized below. Faculty preceptors are listed in parentheses. The remaining graduating master’s students and trainees from the Biostatistics, Epidemiologic, and Bioinformatic Training in Environmental Health presented posters of their work. Thesis abstracts are online at http://depts.washington.edu/envhlth/research_day/srd_12.php.

**Toxic Algae in Lakes**
**Jesse Billingham, MS, Environmental Health**  
(Scott Meschke)

The prevalence of cyanobacteria (blue-green algae) blooms in western Washington lakes has increased over the past two decades. Cyanobacteria produce a variety of toxins, including microcystin, which is harmful to humans. Billingham surveyed the recreational behavior of residents living along 11 Washington lakes and modeled their risk of exposure to microcystin. He found that residents could come in contact with enough of the toxin to cause liver damage. Further research is still needed to determine the toxicity of microcystin at low levels of exposure.

**Day Laborers and Safety Training**
**Rachael DeSouza, MPH, Environmental and Occupational Health**  
(Noah Seixas)

Latino day laborers have high rates of work-related injuries, which may be partly due to their work status and the language and cultural differences that make access to legal and labor protections difficult. DeSouza worked with Casa Latina, a nonprofit that assists day laborers, to create a safety training program based on an empowerment model. Her results indicate that day laborers learn from and value this type of training. She also found that barriers to jobsite safety still exist, and centers like Casa Latina can help day laborers be safer on the job.

**Pesticide Exposure and Blood Biomarker**
**Aaron Riutta, MS, Occupational & Environmental Exposure Science**  
(Christopher Simpson)

A new blood test may help measure an agricultural worker’s exposure to organophosphorus (OP) pesticides and identify risk factors for exposure as well. The test measures the amount of an adduct (chemical bond) that forms between the pesticide and an enzyme called cholinesterase. In a study of 127 agricultural workers, Riutta found the results from the new blood test comparable to those from the test currently used by regulatory agencies. He also found a clear association between the adduct and paraoxonase 1, an enzyme in our bodies that plays an important role in breaking down certain OP pesticides into less toxic forms. Finally, Riutta surveyed participants and discovered potential occupational risks associated with the adduct’s presence.
Quantum Dots and Toxicity
David Scoville, MS, Toxicology (Terrance Kavanagh)
Quantum dots (QDs) are nanoparticles with fluorescent properties that make them useful as imaging tools for biomedical research and medicine. Since QDs are made from heavy metals, including cadmium and selenium, their toxicity to humans and their manufacture and use in occupational settings have raised concerns. One indication of toxic exposure is inflammation. Using mouse models, Scoville found that genetic differences influenced variations in the inflammation found in their lungs. Thus, genetics may play an important role in susceptibility to QDs and should be considered in nanotoxicology risk assessment.

Lead and Battery Recycling in Vietnam
Ryan Wallace, MPH, Occupational and Environmental Medicine (William Daniell, Catherine Karr)
Lead recycling from used car batteries is an important source of revenue for poorer communities in Vietnam. Ryan Wallace, in collaboration with the Vietnamese National Institute of Occupational and Environmental Health, researched children’s blood lead levels in one such village and identified risk factors associated with the highest levels. Vietnamese health authorities will use these results in structuring interventions for this and other similar villages.
November 4, 2011, marked the University of Washington’s 150th anniversary and the launch of a year’s worth of activities that commemorate the integral role the UW has had in our region. Our department is part of this legacy; our faculty, staff, students, and alumni have contributed to making the public healthier and workers safer.

This story highlights important historic events that call attention to the need for a department like ours, committed to educating environmental and occupational health professionals.

CHERNOBYL, FUKUSHIMA, AND HANFORD
lessons learned

This spring marked the first anniversary of the disaster from the Fukushima Daiichi nuclear power plant, damaged by Japan’s 9.0-magnitude earthquake on March 11, 2011, and the 26th anniversary of the nuclear plant catastrophe in Chernobyl that released radioactive contamination into the atmosphere. These tragedies remind us of the enormous consequences of nuclear contamination and the importance of trained professionals, health and safety plans, and communicating risks to workers and the public.

We are mindful, too, because closer to home is the US Department of Energy’s Hanford Nuclear Reservation in southeastern Washington state. The site includes an operating nuclear power station and a 586-square mile area contaminated by radioactive waste from reactors used to produce weapons. These reactors were decommissioned at the end of the Cold War.

Our department’s imperative lies in training students and providing them opportunities to engage with specialists in the field. In the past two years, four nuclear experts have presented their research in the weekly Environmental Health Seminar, required of all graduate students and open to the public. One of the speakers, Daniel Hryhorczuk, an environmental health epidemiologist from the University of Illinois College of Medicine, spoke in February about the actions taken after the Japanese explosion and what happened after the accident in Chernobyl (his major research interest). He said that governments, and particularly public health agencies, can mitigate radiation risks—if they act quickly. Immediate notification and prompt evacuation can reduce exposure.

In a year-long course taught by Professor Elaine Faustman, students spent winter and spring quarters focused on risk assessment, risk management, and risk communication around the Fukushima Daiichi plant accident.

Then in May, a group from the department took a tour of Hanford and met with professionals at the facility.

“One segment of the tour I will not soon forget was stepping off the bus in front of the historic B reactor, the first large-scale nuclear reactor ever built,” recalled graduate student Tyler Zalobowski, who instigated the tour and helped in its planning. “This awkwardly shaped little cinder block building in the middle of nowhere not only marked the beginning of the nuclear era in the United States, but also of 43 years of nuclear activity on the Hanford Site in response to our country’s urgent demand for plutonium,” he reflected. “The consequent contamination was part of the price paid for such productivity and the restoration of the site will undoubtedly depend, at least in part, on the efforts of public health professionals like those produced by the department.”

Environmental Health Seminar
Held every Thursday during the academic year, this seminar features scientists, practitioners, and policymakers who speak on issues of current scientific importance.

Grand Rounds
The Occupational & Environmental Medicine (OEM) Grand Rounds address topics of interest to the OEM provider community. This lecture series gives participants the opportunity to interact with and learn from leaders in the field. Lectures are streamed live, and participants may be eligible to receive continuing education or medical credits.
https://osha.washington.edu/coursedetail.cfm?courseid=2390

Public Health Café
The Center for Ecogenetics and Environmental Health holds a quarterly Public Health Café (photo above) at Chaco Canyon Organic Café in West Seattle. After a presentation from a public health expert, participants are invited to join a lively, guided discussion.
http://depts.washington.edu/ceeh/community_phcafe.html

Children’s Environmental Health
On the third Tuesday of the month, research on children’s environmental health and its connection to policy and practice are highlighted in a webinar or at an on-campus meeting. The series is sponsored by our Center for Child Environmental Health Risks Research and Northwest Pediatric Environmental Health Specialty Unit, and the webinar is in collaboration with the US Environmental Protection Agency.
http://depts.washington.edu/pehsu/conference

Journal Clubs
Several faculty members sponsor journal clubs, one-credit academic courses in which students read and discuss articles on a current topic. Journal clubs focus on risk assessment (ENVH 593), toxicology (ENVH 591), occupational and environmental medicine (ENVH 596), and environmental and occupational health (ENVH 597).
http://depts.washington.edu/envhlth/prospective/courses.php

Safety and Health Training
Instructors for the Pacific Northwest Occupational Safety and Health Administration (OSHA) Education Center provide safety and health training that meets the needs of working professionals in Alaska, Idaho, Oregon, and Washington. They even customize the standard courses and train employees at regional companies and agencies. For example, in August, an ergonomics course (OSHA 2250) was offered to military personnel from Joint Base Lewis-McChord. Taught onsite, the multi-day training was part of a series of courses for soldiers interested in earning a Safety and Health Leadership Certificate.
https://osha.washington.edu

Continuing Education
Our Northwest Center for Occupational Health & Safety provides continuing education for professionals in the region, using a combination of onsite and distance learning. For example, the 2012 Occupational Health Nursing Institute consisted of five interactive online learning modules and a half-day session on campus in June. The course was designed for practicing nurses, recent nursing graduates, and those with an interest in occupational health who have not yet received formal training in the field.
https://osha.washington.edu/coursedetail.cfm?courseid=2825
Scientists identify potential biomarker to help diagnose autism

Autism affects one in 88 children in the United States. Some children’s symptoms are relatively mild, while others can be severely disabling. Yet, this developmental brain disorder is difficult to diagnose, since, until now, no biological markers specifically associated with autism have been described. A team of University of Washington and Battelle scientists have identified metabolites in urine that potentially indicate children at risk for developing the disorder.

Autism is a group of developmental brain disorders, collectively called autistic spectrum disorder or ASD. Although ASD is mainly defined by impaired social interactions, difficulty in communicating, and repetitive behavioral patterns, numerous other symptoms can be present, including anxiety, depression, learning disabilities, sleep disorders, and gastrointestinal problems.

Currently, diagnosing a child with ASD involves a thorough evaluation by a team of health professionals with a wide range of specialties. Early intervention can reduce or prevent the more severe symptoms and disabilities.

Research Professor Emeritus James Woods and senior scientists Nicholas Heyer and Diana Echeverria (also affiliate professor in our department) at Battelle Centers for Public Health Research and Evaluation evaluated porphyrins in the urine of children to determine if the levels of these metabolites could predict ASD.

While porphyrins are found in everyone’s urine, the research team found that certain kinds of these metabolic byproducts are much higher in the urine of some children with autism compared with typically developing children (non-autistic) of the same age. Additionally, when children with autism were randomly compared with typically developing children or children with other developmental disorders, these porphyrin biomarkers correctly identified more than 30 percent of autistic children without incorrectly identifying a single non-autistic child. The ability to detect porphyrins in a simple urine test may allow for a rapid, low-cost and widely used screening test for identifying young children at a high risk for developing ASD.

“The significance of this biomarker is not only that it may facilitate earlier detection of autism risk, but also that it might help identify those ASD children whose symptoms are specifically associated with altered porphyrin metabolism. When validated in a larger study, this biomarker could help to identify a specific subset of ASD kids and improve the search for more focused treatment options for these children,” said Professor Woods.

The findings were published in the April edition of Autism Research and coincided with Autism Awareness Month.

Funding for this research was provided by the National Institute of Environmental Health Sciences, Autism Research Institute, and Wallace Research Foundation.
On May 16, Martin Cohen (acting director, Field Research and Consultation Group) gave a class on local exhaust ventilation systems at a Washington State Department of Labor & Industries’ (L&I) Division of Occupational Safety and Health symposium in Wenatchee, Washington. The Superfund Research Program’s Research Translation and Outreach Core sponsors an Agency Seminar Series that brought Professor David Ehrenfeld from Rutgers University to Seattle on May 17. The series features topic experts who can help federal and state agency staff address hazardous waste and contamination issues at Superfund sites.

On May 21 at the Colloquium on Occupational Health Best Practices in Seattle, Occupational Health Nurse Terri Smith-Weller presented with Susan Campbell from L&I on a new pilot program. The pilot aims to test whether the Progressive Goal Attainment Program™ (PGAP), also called activity coaching, will be useful to and accepted by healthcare providers and injured workers in Washington state. Injured workers meet weekly with a PGAP-trained activity coach—usually an occupational or physical therapist—who provides structured coaching focused on the worker resuming normal life activities and reentering the workplace.

Butch de Castro, an assistant professor and director of the Occupational Health Nursing program in the UW School of Nursing, will direct the Minority Worker Training Program (MWTP) for our Continuing Education Programs. The MWTP is offered by the Western Region Universities Consortium and is funded by the National Institute of Environmental Health Sciences (NIEHS). The MWTP provides training to underrepresented minorities in communities at risk, such as those near hazardous waste sites or contaminated locations.

Adjunct Associate Professor Kelly Edwards was appointed the UW’s Graduate School’s acting associate dean for the 2012–2013 academic year.

Iris Davies (BS, 2012), Abigail McClintic, Nazila Shakibaei, and Anh Tran presented at the UW Undergraduate Research Symposium on May 21. In June, Davies and Shakibaei presented their research at the National Environmental Health Association’s Annual Educational Conference in San Diego, California.

Carlos Dominguez, a staff scientist in Professor Noah Seixas’ research program, was elected chair of the Board for Health Alliance International.

Participants in the department’s Environmental Health Research Experience Program arrived in June. Funded by NIEHS, it is a nine-week summer experience for undergraduate students interested in environmental health

**Hanford Trip**

On May 8, 25 graduate and undergraduate students, post-doctoral researchers, and faculty took a tour of the Hanford Site and met with experts at the facility. They learned about the programs that help protect employee health and safety, monitoring methods for the 177 waste tanks on the property, approaches used to decontaminate soil and groundwater, and long-term containment strategies. Read more about the tour on page 6.  

*Photo: Courtesy of Marc Beaudreau*
On April 27, the department held its annual Staff Appreciation Brunch and Awards ceremony. The Distinguished Staff Award was given to Susan Inman, who is pictured (front row, fourth from left) with the other award nominees.

On June 20, Ryan Blood, PhD candidate in Occupational and Environmental Hygiene, received the Erwin Tischauer Award for Best Student Presentation at the American Industrial Hygiene Conference and Expo in Indianapolis, Indiana.

Effective July 1, Professor Michael Morgan retired and received emeritus status. Associate Professor Christopher Simpson was awarded tenure, and Stephen Bao, David Boyle, and Chang-Fu Wu were promoted to affiliate associate professors.

PNASH sponsors the UW Extension Summer College Program which is part of ConneX. This year, Associate Professor Catherine Karr and Research Scientist Martha Perla offered a course on children’s environmental health and disparities at Heritage College in Toppenish, Washington. ConneX is an educational program sponsored by the Yakima Valley Farm Workers Clinic that encourages young people from disadvantaged backgrounds to enter health professions.

In July, Jennifer Krenz, Agricultural Specialist Pablo Palmandez, Research Coordinator Maria Negrete, and Nadine Lehrer (Washington State University) participated in two farmworker health fairs sponsored by the Washington Association of Community & Migrant Health Centers in Wenatchee, Washington.

Our Center for Ecogenetics and Environmental Health organized a School of Public Health team in the August 25 Duwamish Bike Tour in South Seattle. The ride ended at Duwamish Waterway Park, where the annual Duwamish River Festival was being held.
WORKERS MEMORIAL DAY

A Workers Memorial Day ceremony at the University of Washington on April 27 honored the workers who died from job-related injuries in Washington state last year, and included a special reading of the names of those workers from King County. The event was organized by Research Industrial Hygienist Nancy Simcox from the Field Research and Consultation Group. Department faculty and staff collaborated with UW campus students, union leaders, UW Environmental Health and Safety, and the Harry Bridges Center for Labor Studies to hold the event.  

Photo: Elizabeth Sharpe

CONNECTING WITH COMMUNITY PARTNERS

Our Superfund Research Program’s Research Translation and Outreach Core helped sponsor an air quality workshop on April 27 and the Northwest Toxic Communities Coalition Annual Summit on April 28 in Seattle. The workshop focused on ways that citizens can more effectively engage with federal, state, and local governments to address air quality issues in their communities. It included a live streaming interactive video conference for participants in Portland, Oregon, and Boise, Idaho. At the summit, presentations were given by Professor Thomas Burbacher, state and local agency staff, and leaders in several nonprofit organizations that are a part of the coalition.

Photo: Elizabeth Sharpe

AWARD WINNERS

Steven Hecker, Senior Instructor  
DEOHS Graduate Student Advisory Committee’s 2012 Annual Faculty Mentor Award

Susan Inman, Undergraduate Program Manager  
DEOHS Distinguished Staff Award

Jenna Armstrong, PhD student, Occupational and Environmental Hygiene  
DEOHS Outstanding Student Award

Scott Pease, MS student, Environmental Health  
DEOHS Outstanding Student Award

Xiaoqiong (Christy) Huang, BS student  
DEOHS Outstanding Student Award

Vickie Carper, BS student  
2012 Jack Hatlen Scholarship

For more details on the award winners, visit: http://depts.washington.edu/envhlth/news/award.php?content_ID=1623

Chair David Kalman poses with award winners (l to r): Scott Pease, Xiaoqiong (Christy) Huang, and Vickie Carper.  
Photo: Christina Benton
The Occupational and Environmental Medicine Clinic at Harborview has a new director: Debra Milek. She is also the new medical director for the Harborview-based Center of Occupational Health and Education.

Program Coordinator Laura Black replaced Melinda Fujiwara in Research Professor Gary Franklin’s group.

Susan Inman took at new position in the School of Public Health as program and advising manager for the undergraduate programs in Public Health. Trina Sterry is the new undergraduate program manager for our department.

This summer Mike Willis, who has been the director of our Pacific Northwest OSHA Education Center, moved to Chapel Hill, North Carolina, to begin a PhD program. He will continue to work with our department to provide training opportunities for tribal workers to safely respond to hazardous spills and accidents on their tribal lands.

Susan Tao is a new research scientist in the Environmental Health Laboratory.

Andrew Hieb joins the department as a web developer.

Sean Schmidt left the department to take a new position in the Center for Clinical and Epidemiological Research, and William Pickert is the new manager of the Northwest Center for Occupational Health & Safety.