

Guest Editorial

Take HEED—If Not Now, When?

As never before in history, humans can dramatically change the world and do it quickly. No more is there the need for millennia and the trials of natural selection or the cumulative effects of human-related alteration of the environment; we have genetic engineering on one hand, and industrial pollution and deforestation on the other, occurring at an unprecedented speed and time scale. On the political side, things can change even faster. An election, for example, is often quickly felt within weeks, and the changes following the events in New York and Washington, DC, on 11 September 2001 were effected in not more than a blink of the eye. Although these may appear to be disparate themes, they are all related to the environment, including the physical, the social, and the political. In addition, they all impact in one way or another on the huge and growing global disparity in the health of people in the rich nations versus the poor ones, which is attributable in large part to environmental degradation, social disruption, and political dysfunction. To make matters worse, these disparities are magnified by a growing knowledge divide on the ways to improve health through new approaches to a safe environment and strategies to develop and deliver drugs, vaccines, and medical care; social organization; and political mobilization of resources.

In recent years, an important theme and a new paradigm has been emerging. It begins with the dual recognition that riches without health impoverishes the quality of life, and the fact that the impoverished cannot buy good health; in fact, ill health directly contributes to poverty. In turn, poverty traps and ill health lead to economic instability and may sow the seeds of political instability. Like it or not, the world, its environment, and its people are interconnected, even when separated by geography, socioeconomic gaps, or political systems. SARS (severe acute respiratory syndrome) and bird influenza are but two recent examples of the consequences of viral admixture arising in Asia within uncontrolled and crowded populations of fowl, mammals, and humans. The ripples of both emerging infections have been rapidly felt in distant and well-sanitized corners of the earth—just ask the economists, public health professionals, and the people of Toronto, Canada. Yet, humans can just as easily apply knowledge toward solutions for common problems, if there is a will to do so. Science advances allowed the identification of the SARS coronavirus within weeks of its emergence, an unprecedented tour de force. This has set the stage for rapidly scaled-up public health control efforts, vaccine development, and a search for effective drugs. Global mobilization can also work to limit the spread and impact of bird influenza. This global science is, importantly, no longer colonial in nature; it is conducted by the well educated and privileged in all countries, developed and developing, on behalf of the undereducated and underprivileged. In reality, to be effective, contemporary science must include scientists of all nations in order to identify problems quickly and to work on solutions in timely fashion.

The National Institutes of Health (NIH) and its Fogarty International Center (FIC) have played an increasingly important role in globalizing science to developing countries. In the field of environmental health, the National Institute of



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Environmental Health Sciences (NIEHS) together with the FIC has supported critical and collaborative research as well as long-term investments in the career development of the needed environmental health scientists in developing countries. Together, the FIC and the NIEHS have promoted an ecologic research approach toward emerging infec-

tions, have supported prospective multidisciplinary studies on the relationship between improved health and economic performance, have helped to train ethicists who can ensure that research conducted in developing countries is both ethical and culturally consistent with global standards, and are investing together in the improvement of medical journals in Africa and medical journalism for the public. Some may be surprised that a high-level national biomedical research agency such as the NIH would have such a global perspective, but it is entirely consistent with the NIH mission to conduct research to improve the health of people everywhere. In this context, science is no longer alone in the ivory tower, separated from the real world, or conducted for the sake of exploration alone. Although creativity, ingenuity, and invention continue to be the guiding light of excellent science, this is not enough to address the problems. It has long been said that science without dissemination is not good science. Today, the thought must be extended to the concept that science without application is also not good science. Biomedical and health-related social science, however fundamental and “upstream,” must maintain a goal orientation toward ultimate application to improve human health; to this mantra, we must also add the word “everywhere.”

The Health, Environment, and Economic Development (HEED) program, codeveloped by the FIC and the NIEHS and described in this issue of *EHP*, is an example of bringing creative scientists together to address broad interdisciplinary problems. HEED was created to focus science on the concept of sustainable development—specifically to encourage research on the human health consequences of development investments and their environmental consequences. It complements an existing FIC program, International Studies in Health and Economic Development (also cofunded by the NIEHS), which studies the impact of improving human health on productivity and economic development. HEED represents the reverse intent—to better understand the impact of development-related environmental alterations on health. Together, the two programs will generate new information of considerable relevance to the future of the human race and the earth, as well as all of the species that coinhabit the planet with us.

There has never been a time when the availability of resources, trained people, new approaches, and global awareness coincide as they do today. Given the continued abuse of our physical, social, and health environments; the magnitude of global environmental problems; and the potential to develop solutions, we must ask if not now, when? To those who say we

in this country cannot afford to pay attention to the rest of the world, it can be countered that we actually cannot afford not to.

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Editorial

Relevance of the National Institutes of Health Roadmap Initiatives to the Field of Environmental Health

Advances in biomedical research have been remarkable during the decades of the 1980s and 1990s. Yet, translation of the basic research discoveries into prevention and treatment strategies has been disappointing. In an attempt to make the process more efficient, the National Institutes of Health (NIH) unveiled a Roadmap initiative in October 2003. The overall objective of the Roadmap investments is to provide scientists with the technologies, human resources, and institutional infrastructures to enable the more efficient translation of basic science discoveries into practice. The NIH Roadmap is entirely consonant with the mission of the National Institute of Environmental Health Sciences (NIEHS) and presents numerous opportunities for environmental health scientists to expand current research studies and explore new directions.

In fact, the NIEHS has developed several new research programs over the past 6 years to achieve many of the same objectives targeted in the NIH Roadmap initiatives. These include the Environmental Genome Project in 1997; the Mouse Genetic Variation Mapping Initiative in 2000; the National Center for Toxicogenomics in 2001; and the Consortium Centers Program for Parkinson's Disease and Breast Cancer in 2002 and 2003, respectively. Multicenter clinical studies and community-based prevention/intervention research programs were also developed in the early 1990s to promote translation into practice. The NIEHS initiated these efforts because our investigators need access to the same tools, databases, and other resources required for the advancement of biomedical research, irrespective of the field of specialization.

Both the scientific opportunities and the scale and complexity of environmental health research have changed dramatically over the past decade. Simplistic models and reductionist approaches to



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the understanding of toxicity are giving way to more holistic or systems biological approaches that allow us to investigate multiple molecular events, pathways, and interactive networks simultaneously. In part, this evolution in scale and complexity is the

result of a voluminous literature, derived from epidemiologic studies as well as human and animal experiments, which show that human health and disease are the result of complex interactions involving genetic, environmental, behavioral, and age-related factors often combined with random or stochastic events. Also, investments in the genomic sciences over the past 25 years have led to the development of new knowledge, resources, and powerful technologies for use in probing biological events at the molecular level. However, to untangle the complex interactions between genes, environment, and behavior to prevent human illness, we will need even more powerful tools—new databases and resources—and more robust institutional infrastructures to translate the science into the practice of public health and medicine.

One of the major challenges in understanding how genes, environment, and behavior interact to influence phenotype is to develop technologies and methodologic approaches to identify and characterize all of the functional molecules (e.g., RNA, protein, carbohydrate lipids, and metabolites) encoded by genomic DNA of humankind and other animals (e.g., mouse and rat) used as surrogate models in medical research. These technologies, reagents, and standards must be sensitive and reproducible enough to detect a single molecule per cell. Also, large-scale multi-institutional standardization studies are critical for developing robust databases and other resources, and for sharing and

comparison of data between investigators and among laboratories. Although identification and characterization of the above "parts list" is a daunting challenge, it is just the first requirement; to prevent illness, we must understand how these parts work together in health and disease. Such complex problems cannot be addressed within the framework of a single field of knowledge, so this endeavor will require the creation of radically new approaches and technologies. New multidisciplinary teams that are capable of studying complex systems will have to be developed; this new way of approaching biomedical research is at the core of the NIH Roadmap.

Environmental health research is an important discipline that has had a huge impact on environmental health regulatory policies, public health and the practice of medicine, and the national economy. To continue to play an important role in the biomedical research enterprise, we must embrace new technologies and model systems, as described in the NIH Roadmap, to elucidate interactions between genes, proteins, and the environment. The time-honored way of determining which drug or environmental xenobiotics are toxic to humans (i.e., to expose hundreds of animals to the specific compound and observe them months or years later for adverse health outcomes) costs millions of dollars, requires hundreds of animals, provides little information with respect to mechanisms, and does not take into account genetic and age-related differences in the human population.

I am pleased that the environmental health sciences are experiencing a renaissance, being invigorated by efforts to apply "omic" technologies to gain a better understanding of the biological basis of toxicity of drugs and other environmental xenobiotics. I am proud of my involvement in the development of the NIH Roadmap Initiatives because I believe they represent the "right" investments to "enable or empower" medical researchers to make the next quantum leap in conquering the epidemic of chronic diseases. Their development and pursuit represent a welcomed and much needed departure from "business as usual." I expect that the proposed initiatives will accelerate both the pace of discoveries in the environmental health sciences and translation into practice.

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Note from the Editors: Online Submission Begins This Month

Beginning this month, authors will be able to submit manuscripts to *EHP* over the Internet. Since the late 1990s, *EHP* has been accepting manuscripts electronically as e-mail attachments. In fact, over 95% of submissions are currently received this way. Although an e-mail submission system is much better than the paper submission process of old, there are obvious limitations, such as file size and formatting issues.

We have chosen to use the Online Submission and Review System (OSRS) developed and used by the American Society for Biochemistry and Molecular Biology, publishers of the *Journal of Biological Chemistry (JBC)*. If you have submitted to *JBC*, you will have no problem with the *EHP* version. The new system will not only simplify submissions but will also accelerate the peer-review process by permitting our reviewers to access the submitted articles online.

We hope you will find OSRS to be a simple and flexible template-based manuscript submission system. Authors will have the option of submitting the text and graphics as a PDF document or as a word-processing document (preferably Microsoft Word), and graphics can be submitted as EPS or TIFF files. If you cannot submit a PDF file, we will produce a PDF document for you. However, before beginning the peer-review process of your manuscript, you will be asked to review the converted document for accuracy. This extra step would necessarily slow down the entire process.

We anticipate that authors will be pleased with the ease of submission and the more rapid peer-review process made possible by implementing our Internet-based system for submission. Peer reviewers should find the online review process to be easier and more efficient. These expectations have been realized by journals that already have in place an Internet-based submission and review system.

At first, the Internet-based submission system will be optional, but please consider submitting your next manuscript to *EHP* using OSRS. The submission site and instructions can be found online at <http://www.ehponline.org/submit>.

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