

Editorial

Biocomplexity and a New Public Health Domain

Extraordinary progress has been made in science and engineering over the past several decades, notably in information science and technology, systems engineering, and the biological sciences. What has been most striking, however, is the blurring of the boundaries between these and other disciplines. What were quite separate areas of study have become interdisciplinary wellsprings of new knowledge, providing important new benefits to society. Human health and medicine have, without question, benefited from advances in molecular biology, fundamental chemistry, physics, and mathematics. But a new frontier in scientific exploration provides the next leap for the health sciences, namely the integration of the ecological sciences, conservation biology, system engineering, and medicine. Ecosystems analyses from investments made in biocomplexity are proving insightful. Most striking is merging of what were considered disparate databases and rendering these interoperable through advances in information science and technology. Very large data sets accumulated by ecologists, toxicologists, public health scientists, climatologists, and atmospheric scientists are now being merged and mined to yield new understanding and fundamental principles previously unrecognized because of limitations arising from disparate and unlinked systems. These advances are being made at a time when the most pressing problems facing human populations in today's world are complex, global, and no longer amenable to simple solutions.

Infectious diseases of humans, plants, and animals, as a clear example, have acquired a new urgency, requiring an immediacy of attention because of their potential for nearly instantaneous pandemics. Therefore, the threads of climate, demography, and global monitoring must be woven together to deal with the complexity that had not risen previously in a global society that was less mobile. Recent

analyses of air travel alone reveal an astounding mobility of human populations. As Gro Harlem Brundtland—former director of the World Health Organization—has said, “In a modern world, bacteria and viruses travel almost as fast as money. With globalization, a single microbial sea washes all of humankind. There are no health sanctuaries.” Health issues in the 21st century, indeed, reflect the worldwide movement of people and goods and the recognition that earth processes operate on a global scale. International travel has skyrocketed in the past half-century, up to almost 500 million international arrivals per year (Fig. 1).

Our understanding of the complex interactions of disease with the web of life and the global environment will ultimately enhance our ability to predict cause. An example is a new threat, arising from the demographics and socio-industrial advances of today's world, the Atmospheric Brown Cloud over southern Asia, uncloaked through collaborations of US, Indian, and European scientists in the Indian Ocean Experiment. This man-made aerosol haze is spreading from the Himalayan Mountains to the Indian Ocean. The surprising scope of brown clouds, and the recognition that they are a common problem for many regions, calls for broader collaboration of scientists and nations to study the transport of pollutants around the earth. The complex link between clouds, chemistry, and climate requires interpretation from earth, ocean, and atmospheric scientists, as well as computer scientists and mathematicians. The US–India Center for Environmental Research is one such collaboration. By bringing complementary viewpoints to bear on global aspects of weather, climate, and health, the ability to predict storms, droughts, and disease is facilitated, as well as reduction in the uncertainties of climate change science.

In summary, public health is no longer the domain of any one bounded discipline, instead, it is the work of

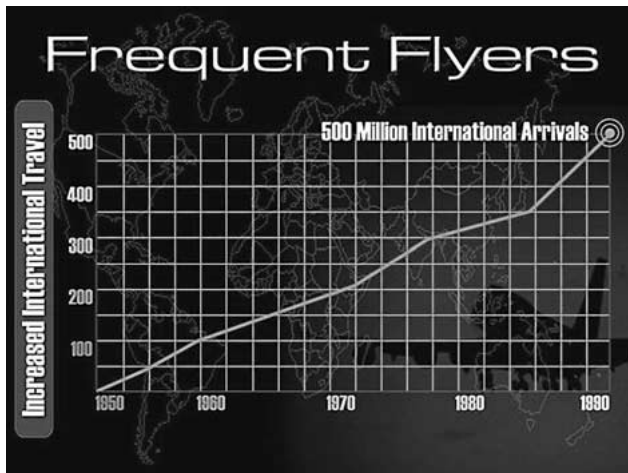


Figure 1. The pace of international travel.

clinicians, epidemiologists, ecologists, climate scientists, oceanographers, and even space scientists working together to provide a new perspective, using many tools, including remote sensing. Tracking, treating, and preventing disease

are truly global in their scope and require the richness of interdisciplinary research. The journal, *EcoHealth*, has been designed to provide an outlet for the new ideas, the newly discerned principles drawn from the interfaces of many disciplines working connectedly in the expanded arena of public health research. It is, indeed, an exciting time for *EcoHealth* to be born.

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