

BOOK REVIEW

***Microbial Threats To Health Emergence, Detection, and Response.* 2003. Mark S. Smolinski, Margaret A. Hamburg and Joshua Lederberg, Editors. The National Academies Press, Washington, D. C. ISBN 0-309-50730-8.**

This book, consisting of four chapters and five appendixes, is a summation of the findings from the Committee on Microbial Threats to Health in the 21st Century. In 2001 the Institute of Medicine commissioned this committee to identify, review and assess the current knowledge regarding factors in the emergence of infectious diseases. This committee was asked to evaluate the capacity of the United States to respond to microbial threats to health, and identify opportunities for actions needed to strengthen the detection, prevention and response to microbial threats. The 2001 committee was a follow up 1992 Institute of Medicine report *Emerging Infections: Microbial Threats to Health in the United States* which identified several areas for improvement. The current H1N1 pandemic has demonstrated the lack of preparedness as well as limited capacity of the United States to respond to emerging infections.

The book contains a complete Executive Summary of the work conducted by the committee. A thought provoking convergence model is introduced in figure ES-1, at the center of the model is a box that represents the convergence of the factors leading to the emergence of an infectious disease. These factors include physical and environmental, genetic and biological, social political and economic, ecological, human and microbe interactions. The remainder of the executive summary introduces the topics discussed in subsequent chapters such as the Spectrum of microbial threats, Factors of Emergence and suggested opportunities for addressing the new microbial threats.

Chapter one is a short introduction discussing factors associated with emerging infectious such as human behavior, international travel, imported food sources, livestock, exotic pets and material goods to name a few. Other mitigating factors such as humans entering new areas, environmental (climate changes, floods and earthquakes), recreational activities that brings humans in contact with arthropod vectors or rodents, poverty, war leading to refugee camps, poor sanitation and the transition from agricultural to urbanized society. Finally, intentional exposure of humans to infectious agents via bioterrorism such as in 2001 when 22 people were exposed and 11 contracted inhalational anthrax resulting in five deaths. West Nile virus is used as an example of global transmission of a new microbial threat, introduced into New York in 1999 and by 2002 was identified in 39 states. This chapter also provides some background on HIV and various other epidemics facing the world today. Finally it makes the sobering conclusion, ten years after the 1992 IOM report on Emerging infections that the global burden of infectious disease on the United States has actually increased. Diseases not known in the United States in 1992 are emerging ten years later such as West Nile, hantavirus and CA-MRSA as well as other drug resistant pathogens.

Chapter two examines the magnitude of the problem and reviews the spectrum of microbial threats. It is disappointing that in the 21st century one out two deaths that occur in developing countries are from infectious disease. Infectious disease is the leading cause of death in children under five years of age. Estimates are that hourly 1,500 people die from infectious disease – and over half of the victims are children under the age of five. This chapter has two

text boxes that review the status of infectious disease in the United States and a summation of potential agents of biological warfare. The chapter is a good reference of epidemiology data up to the time of publication and focuses on the major emerging infectious agents such as AIDS, Tuberculosis and Malaria. Comprehensive reviews of other emerging infectious diseases are discussed including recently emerging and re-emerging infectious agents. Also discussed is the trend toward the development of antimicrobial resistant strains as well as pathogens that could be utilized in bioterrorism.

In chapter three the factors leading to the emergence of infectious disease are discussed at length. There are 13 criteria including: Microbial adaptation and change, Human susceptibility to infection, Climate and Weather, Changing Ecosystems, Human Demographics and Behavior, Economic development and land use, International travel and commerce, Technology and industry, Breakdown of public health measures, Poverty and social inequality, War and famine, Lack of political will and Intent to harm. Each of these areas are explored and reviewed as they fit within the Convergence Model. As with the previous chapter there is a wealth of information and statistics on each of these areas presented in graphic form. Twenty text boxes in this chapter review everything from the Human Microbiome to 1918 Influenza Pandemic.

The final chapter of this book is a call to action for the United States not only based on the humanitarian need for preventing emerging infectious disease globally but also as a means of protecting the citizens of the United States. The action plan is broken up into categories of: Enhancing Global Response Capacity, Improving Global Infectious Disease Surveillance, Rebuilding Domestic Public Health Capacity, Improving Domestic Surveillance Through Better Disease Reporting, Exploring Innovative Systems of Surveillance, Developing and Using Diagnostics, Educating and Training the Microbial Threat Workforce, Vaccine Development and Production, Need for New Antimicrobial Drugs, Inappropriate Use of Antimicrobials, Vector-Borne and Zoonotic Disease Control, Comprehensive Infectious Disease Research Agenda and Establishment of Interdisciplinary Infectious Disease Centers. Specific suggestions of action are given for each of these areas.

This is an extremely comprehensive, informative and timely manuscript that undertakes the topic of Microbial Threats. It is not only informative but provides a well-thought-out plan of action for dealing with this important societal issue. Perhaps the greatest strengths of the book are the number of topics covered as well as the model and action plan proposed. The limitation of the book is that the delay in timing from the committee's work 2001 to publication of this book has resulted in some of the information being not completely up-to-date. Still this book remains an excellent read for students and faculty interested in the topic of emerging microbial threats. The action plan is a comprehensive program that if implemented would reduce the potential for additional microbial threats to the United States population.

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BOOK REVIEW

Surrounded By Science: Learning Science in Informal Environments. 2010. Marilyn Fenichel and Heidi A. Schweingruber. Board on Science Education, Center for Education, Division of Behavioral and Social Sciences and Education, National Research Council. The National Academies Press. Washington, DC. xv + 220 pages. ISBN978-0-309-13674-7.

This text introduces newcomers to the growing body of research on informal science education, enhances the knowledge base of mid-level professionals, and provides seasoned professionals with a source that summarizes research in an accessible format. It is my opinion that the authors have accomplished these goals. The text presents how people learn in informal science environments to all of these audiences. The text addresses the importance of both understanding and capitalizing on the science learning in these settings.

The book is divided into three parts: Part I. Frameworks for Thinking About Science Learning, Part II. Designing experiences to Promote Science Learning and Part III Reaching Across Communities, Time and Space.

Part I, Chapter 1, Informal Environments for Learning Science, defines informal learning environments as those that take place outside school; it discusses the range of settings in which science learning takes place. A few examples may be in after school programs, science clubs, 4-H, museums, nature centers, zoos, libraries, and in homes. The authors list four common commitments exemplified in these activities: (1) to engage participants in multiple ways, including physically, emotionally, and cognitively; (2) to encourage participants' direct interactions with phenomena of the natural and designed world largely in learner directed ways; (3) to provide multifaceted and dynamic portrayals of science; and (4) to build on learners' previous knowledge and interests.

In Chapter 2. Science and Science Learning, the authors define and discuss the "culture of science"—the collective set of the norms, the practices, the vocabulary and the instrumentation used by the different disciplines of science. They also adopt the "strands of science learning" framework that was developed in *Learning Science in Informal Environments* and include Sparking Interest and Excitement, Understanding Scientific Content and Knowledge, Engaging in Scientific Reasoning, Reflecting on Science, Using the Tools and Language of Science, and Identifying with the Scientific Enterprise.

Part II. , Chapter 3, Designing for Science Learning: Basic Principles discusses three strategies to put research into practice and outlines, in detail, learning from interactive experiences. Case Studies give the reader varied examples of promoting learning.

Chapter 4, Learning with and from Others, discusses how interactions with other people play a role in learning and suggest that science experiences should be designed with groups in mind. There is a very interesting discussion involving types of talk that takes place at the exhibits. It recognizes learning as a social process enhanced by conversation and engagement with others.

Chapter 5, Interest and Motivation: Steps Toward Building a Science Identity, focuses on the interest and motivations that

learners bring to each science experience, and how these variables affect learning in an informal science environment. The chapter presents Deborah L. Perry's six-component motivation model as a framework to enhance the quality of museum exhibits. Case Studies provide examples.

Chapter 6, Assessing Learning Outcomes, explores the challenges of assessing science learning in informal settings. The authors suggest the NSF Evaluation Framework as a tool for both planning and assessment. NSF has identified five areas that can be identified and assessed in these informal settings. Several assessment instruments are discussed. Most are meant to fit the outcomes they were designed to measure. However, there are often many unintended outcomes that also should be addressed.

In Part III Reaching Across Communities, Time and Space, Chapter 7, Culture, Diversity and Equity, discusses the meaning of "equity" and how the informal science settings can be made more accessible to diverse populations. The authors discuss topics such as dominant and non-dominant culture, family structure, physical disabilities, language differences, and variations in beliefs and values that need to be addressed in displays and/or settings.

Chapter 8., Learning Through the Life Span, notes the challenges involved in designing science learning experiences for children, teens, adults, seniors and all those in between and cites examples.

Chapter 9, Extending and Connecting Opportunities to Learn Science, explores the future of informal science learning: the relationship between formal and informal science environments, how to extend experiences across different media, and the advantages of stronger links between formal and informal science learning. This is a great chapter for those preparing to design a new learning area, or perhaps those given the task to update an area.

Special Features

Throughout the book, case studies present actual examples of the research strategies from each chapter. Readers can use the examples directly or adapt them to create programs that meet their goals. The gold color used to highlight these studies helps distinguish case studies from the text. The finished copy of this book was a tremendous treat from the prepublication copy.

Three other sections including Things to Try, For Further Reading, and Web Resources also offer valuable information.

Audiences

At first glance, this book would probably be most valuable to those who design science displays at museums, science centers and planetariums. I have been to science centers that really have missed the mark, and I wondered just who could have designed the area without thinking—about students and how they learn, about vocabulary and use of language labeling, about choosing activities that excite kids and about developing topics for age levels.

Actually, all science educators may benefit from a review of this text. Teachers at all levels create daily learning environments for their science students. This book provides them with the research, and many examples of activities and programs that have succeeded in engaging students in science learning. Informal science learning occurs everywhere and students of all ages can become engaged when science topics are presented appropriately. Although it seems logical that program and display designers would research

equity—considering culture, language, disabilities and age of their audience—many use time as an excuse to overlook these topics. This text provides the reader with insights and information regarding all of these important issues in one book.

Providing professional development may be one of the most important contributions of the informal-formal science learning connection. In my opinion a strong positive correlation can be observed by connecting the learner-directed programs found in museums, zoos, and science centers with teacher professional development. These informal institutions have professional staffs with the content knowledge, the materials, the skilled activities,

and the setting to enhance teachers' levels of understanding in many science areas. Working together to develop further programming that addresses specific student needs in science learning is a worthy goal.

The publication also mentions learning progressions in science and preparation for future learning as emerging areas of science study. Both have promise and could provide learners with continued success in learning science.

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