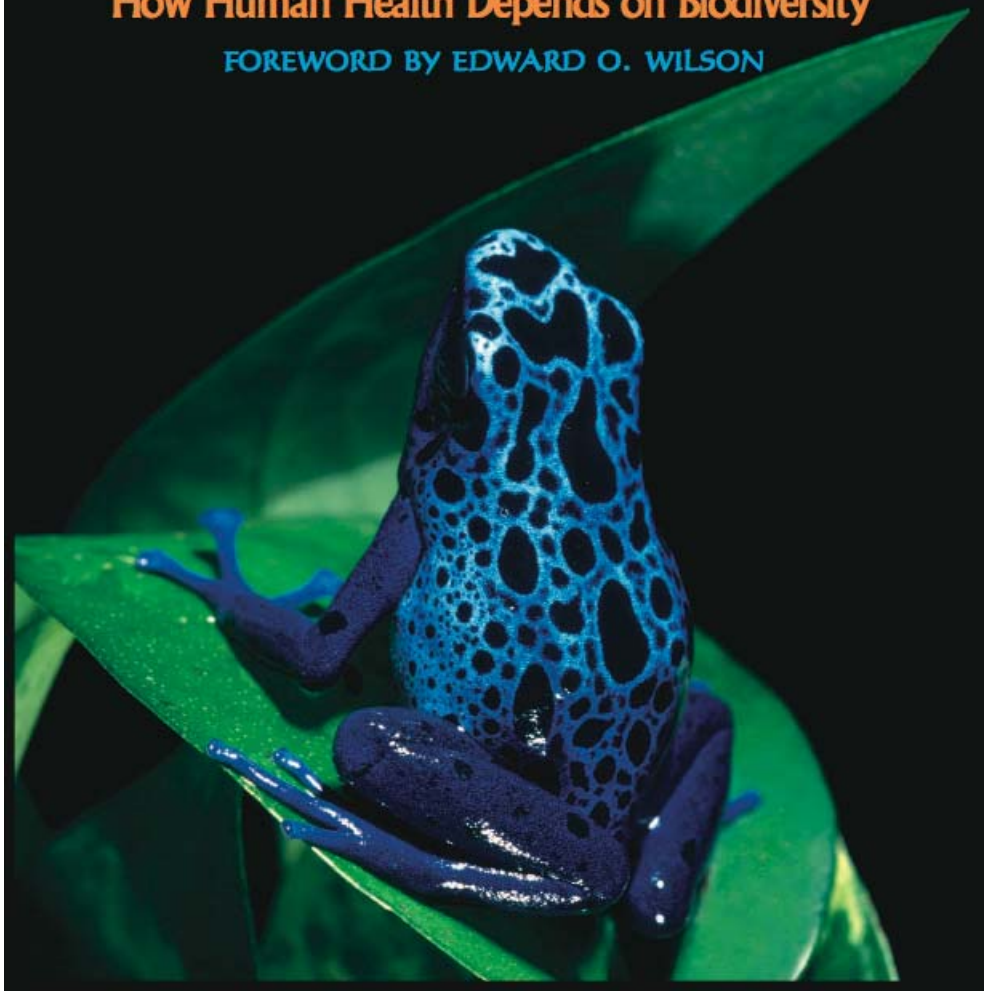
Sustaining Life

How Human Health Depends on Biodiversity

FOREWORD BY EDWARD O. WILSON



Edited by Eric Chivian and Aaron Bernstein

About the Editors

Eric Chivian, MD, is the founder and Director of the Center for Health and the Global Environment at Harvard Medical School. In 1980, he co-founded, with three other Harvard faculty members, International Physicians for the Prevention of Nuclear War, which won the 1985 Nobel Peace Prize. He runs Pairidaeza Farm, an almost fully organic orchard in central Massachusetts growing heirloom apples, peaches, pears, apricots, plums, cherries, and grapes. He is the senior editor and author of *Last Aid: The Medical Dimensions of Nuclear War*, and of *Critical Condition: Human Health and the Environment*, which appeared in German, Spanish, Chinese, Japanese, and Persian editions.

Aaron Bernstein, MD, has been affiliated with the Center for Health and the Global Environment since 2001 and is currently a resident in the Boston Combined Residency in Pediatrics. He received his undergraduate degree from Stanford University and medical degree from the University of Chicago Pritzker School of Medicine.

Front Cover Image
Blue Dart Poison Frog (*Dendrobates tinctorius*). The Blue Dart Poison Frog (formerly known as *Dendrobates azureus* but now considered a color variety of *D. tinctorius*), found in lowland forests of South America in the Guyanas and adjacent Brazil, is threatened with extinction. It contains several toxins called alkaloids in its skin that have been useful tools for understanding how local anesthetics, and some drugs like phencyclidine (PCP or "angel dust"), work. Its vivid coloring is a warning that it is dangerous to eat.

Cover Design: Pamela Poore

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Sustaining Life is the most complete and powerful argument I have seen for the importance of preserving biodiversity."

—Al Gore, former Vice President,
Co-recipient of the 2007 Nobel Peace Prize

It was an exhilarating moment when scientists broke the genome code and showed us the basic building blocks of the human being. Now scientists are showing us how biodiversity works and why it is crucial to saving our planet for our children's children and beyond. This important and compelling book is a blueprint for acting wisely and urgently."

—Bill Moyers, former White House Press Secretary,
Host of PBS's *Bill Moyers Journal*

There is probably no better way to convince anyone still uncertain about the urgent need to preserve biodiversity, which is rapidly diminishing as a result of human activities, than to document its importance to human health and medicine. The authors have done this with great thoroughness and from every possible angle, producing a volume that pairs authority with anecdote and scholarship with passion."

—Harold Varmus, President, Memorial Sloan-Kettering Cancer Center,
Co-recipient of the 1989 Nobel Prize in Medicine or Physiology,
former Director of the National Institutes of Health

As a public health physician, I have been deeply involved for decades in helping political leaders, policy makers, and the general public understand the relationship between human beings and the environment. *Sustaining Life* is the best and most comprehensive resource available demonstrating how human health depends on the health of the natural world."

—Gro Brundtland, former Director-General of the World Health Organization,
former Prime Minister of Norway

One of the main reasons the world faces a global environmental crisis is the belief that we human beings are somehow separate from the natural world in which we live, and that we can therefore alter its physical, chemical, and biological systems without these alterations having any effect on humanity. *Sustaining Life* challenges this widely held misconception by demonstrating definitively, with the best and most current scientific information available, that human health depends, to a larger extent than we might imagine, on the health of other species and on the healthy functioning of natural ecosystems."

—Kofi Annan, former Secretary-General of the United Nations,
Co-recipient of the 2001 Nobel Peace Prize, from the Prologue

Center for Health
and the Global Environment
Harvard Medical School

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Chivian
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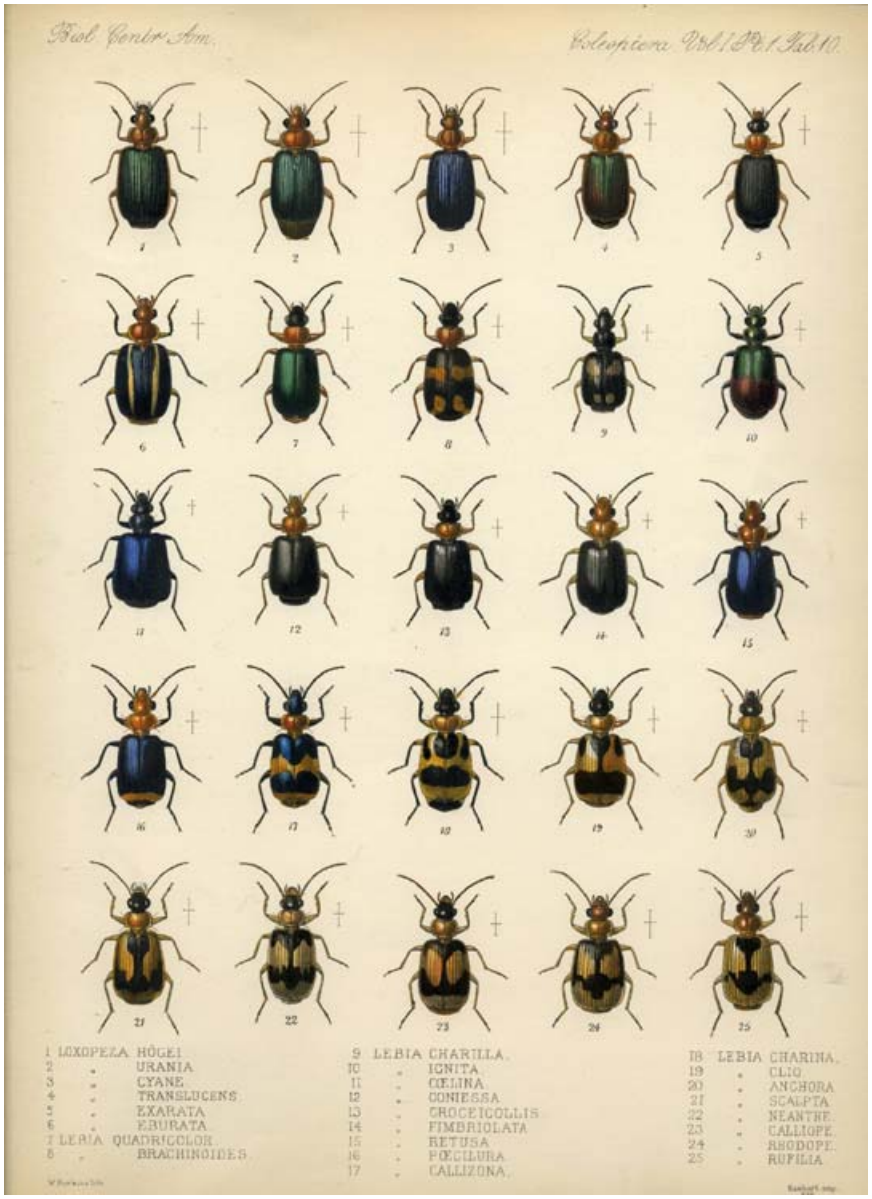
Recent discussion of biodiversity loss has focused on its expected ecological consequences, as well as on the aesthetic, ethical, sociological, and economic effects this loss will have on our world. *Sustaining Life* is the first book to examine fully the relationship between biodiversity decline and repercussions for human health.

This volume presents a comprehensive review of how human medicines, biomedical research, the emergence and spread of infectious diseases, and the production of food all depend on biodiversity. It is edited and written by two physicians from Harvard Medical School, with contributions by more than 100 leading scientists from around the world.

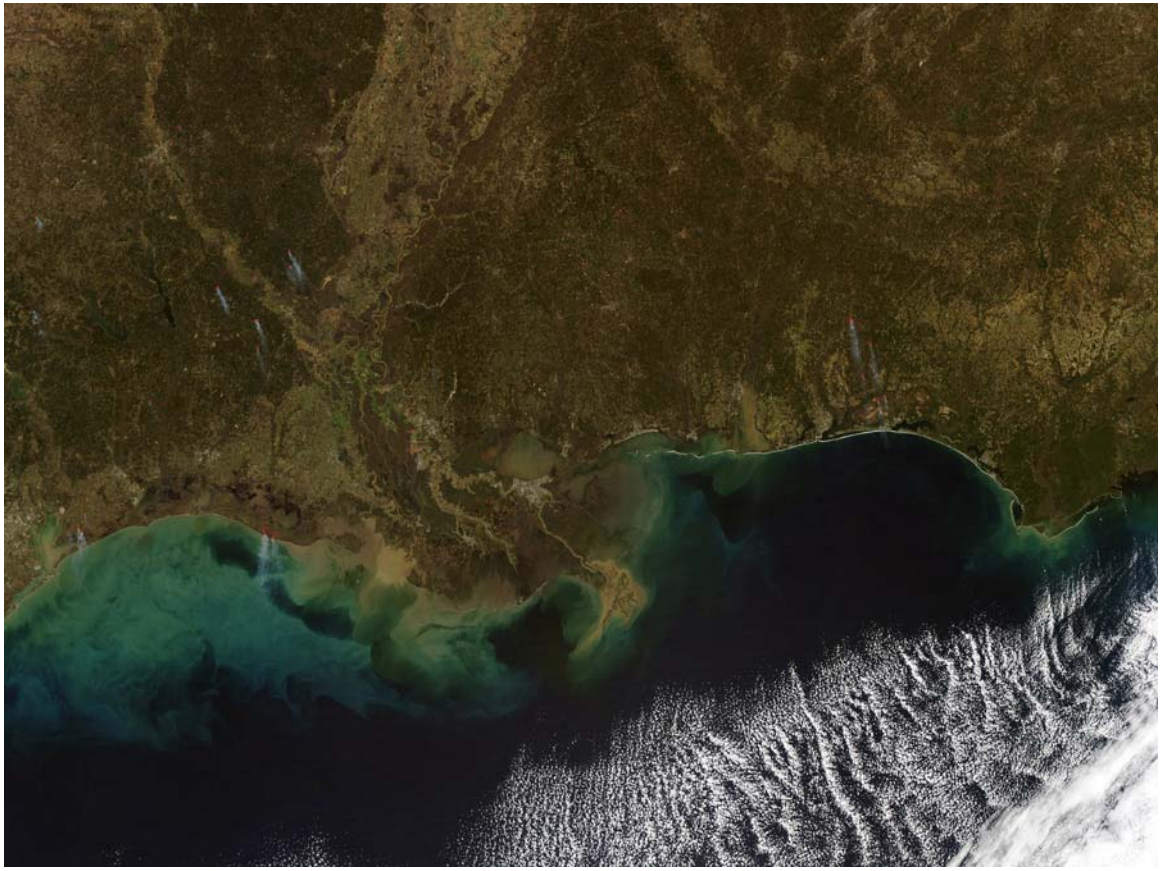
Seven groups of organisms—some of the most endangered on Earth—provide detailed case studies that illustrate their great value to human medicine, and that point to other contributions soon expected, if we do not drive them to extinction. The book introduces the concepts of biodiversity and ecosystems services and explains how both are threatened by human activity. It concludes with a chapter on what individuals can do to help conserve biodiversity.

With its in-depth review of the latest scientific literature, *Sustaining Life* will satisfy the most demanding scholar in ecology or medicine. Written in nontechnical language, it is understandable to a general reader. For those with a deep interest in human health and in nature, especially physicians, environmentalists, and policy makers, the book will be required reading.

Sustaining Life was co-sponsored by the United Nations Development Programme, the U.N. Environment Programme, the Secretariat of the Convention on Biological Diversity, and the World Conservation Union.



From C.G. Champion, *Biologia Centrali-Americana; or Contributions to the knowledge of the Fauna of Mexico and Central America*, Vol. 1, Part 1, Insecta. Coleoptera, table 10 (Frederick Du Cane Godman and Osbert Salvin, editors), R.H. Porter and Dulau and Company, London, 1881-1884. From the collections of the Ernst Mayr Library, Museum of Comparative Zoology, Harvard University.



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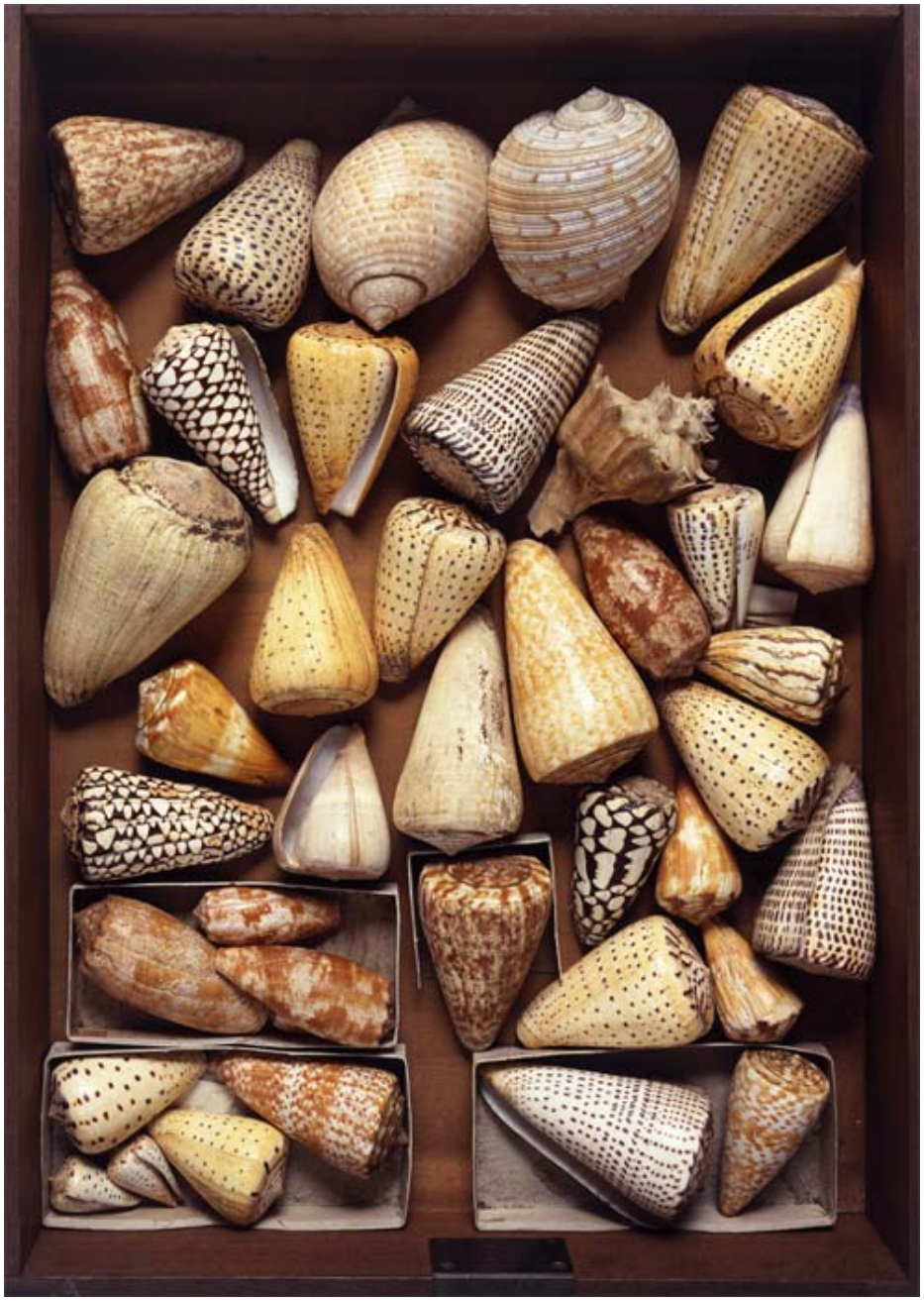
From Farooq Ahmad and Uma Patrap, International Center for Integrated Mountain Development, Nepal.



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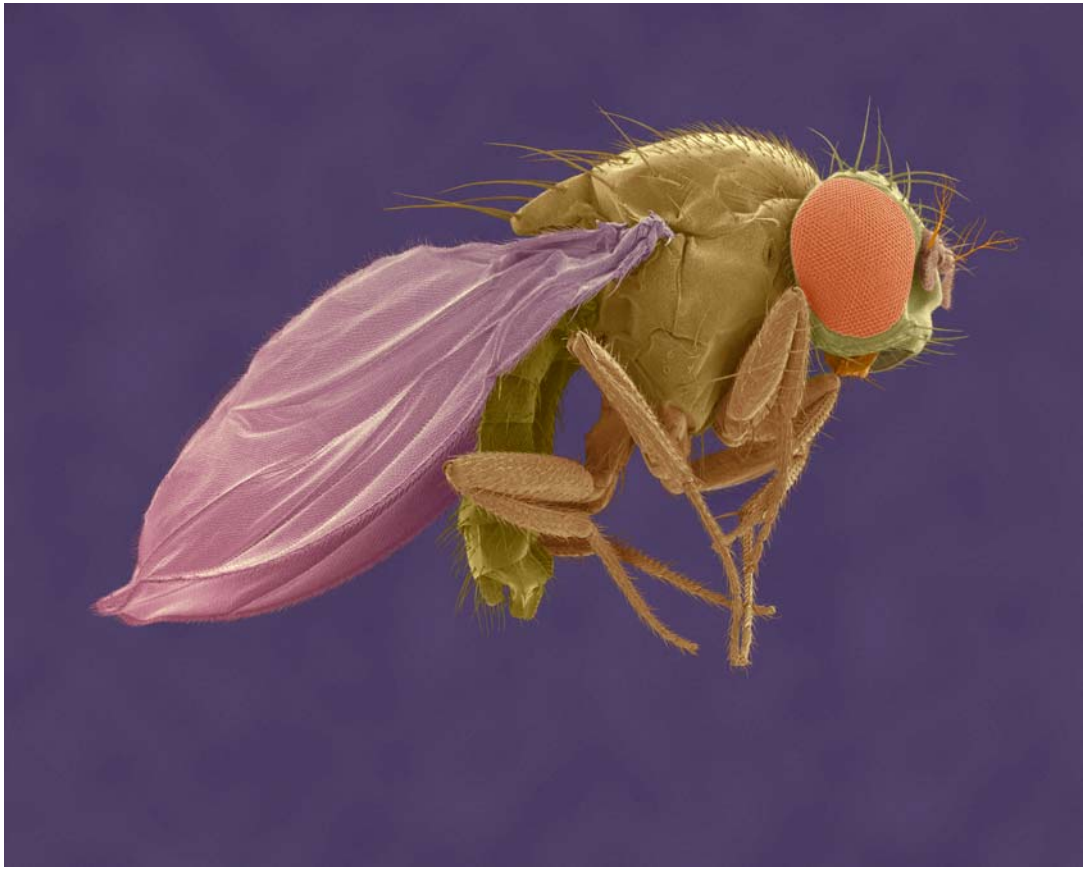
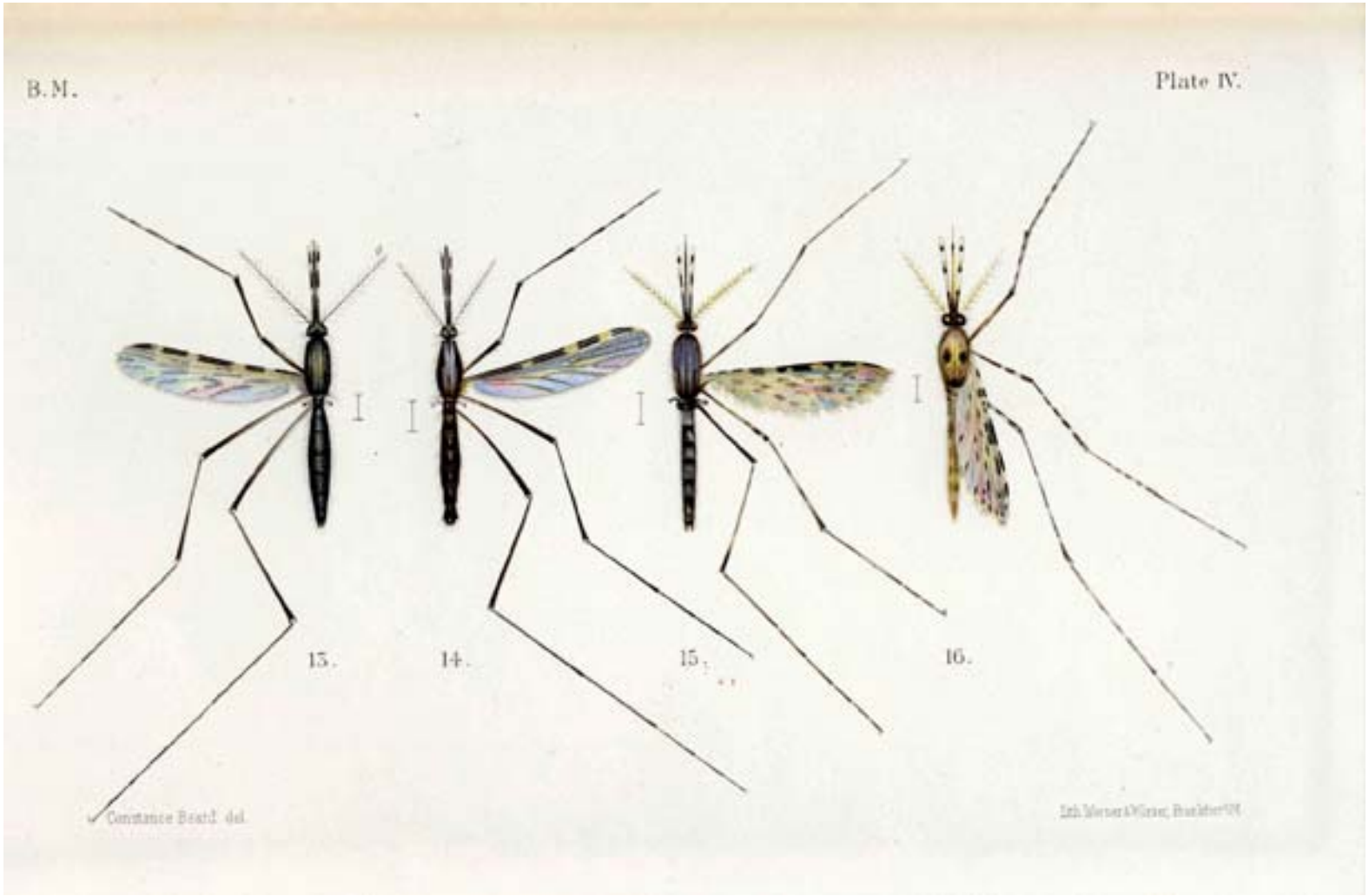


Photo by Steve Amstrup, U.S. Fish and Wildlife Service



From E.V. Theobold, *A Monograph of the Culicidae or Mosquitoes. Mainly Compiled from the Collections Received at the British Museum from Various Parts of the World in Connection with the Investigation into the Causes of Malaria Conducted by the Colonial Office and Royal Society.* 1901, Plate IV. Printed by the Order of Trustees, London. From the collections of the Ernst Mayr Library, Museum of Comparative Zoology, Harvard University.

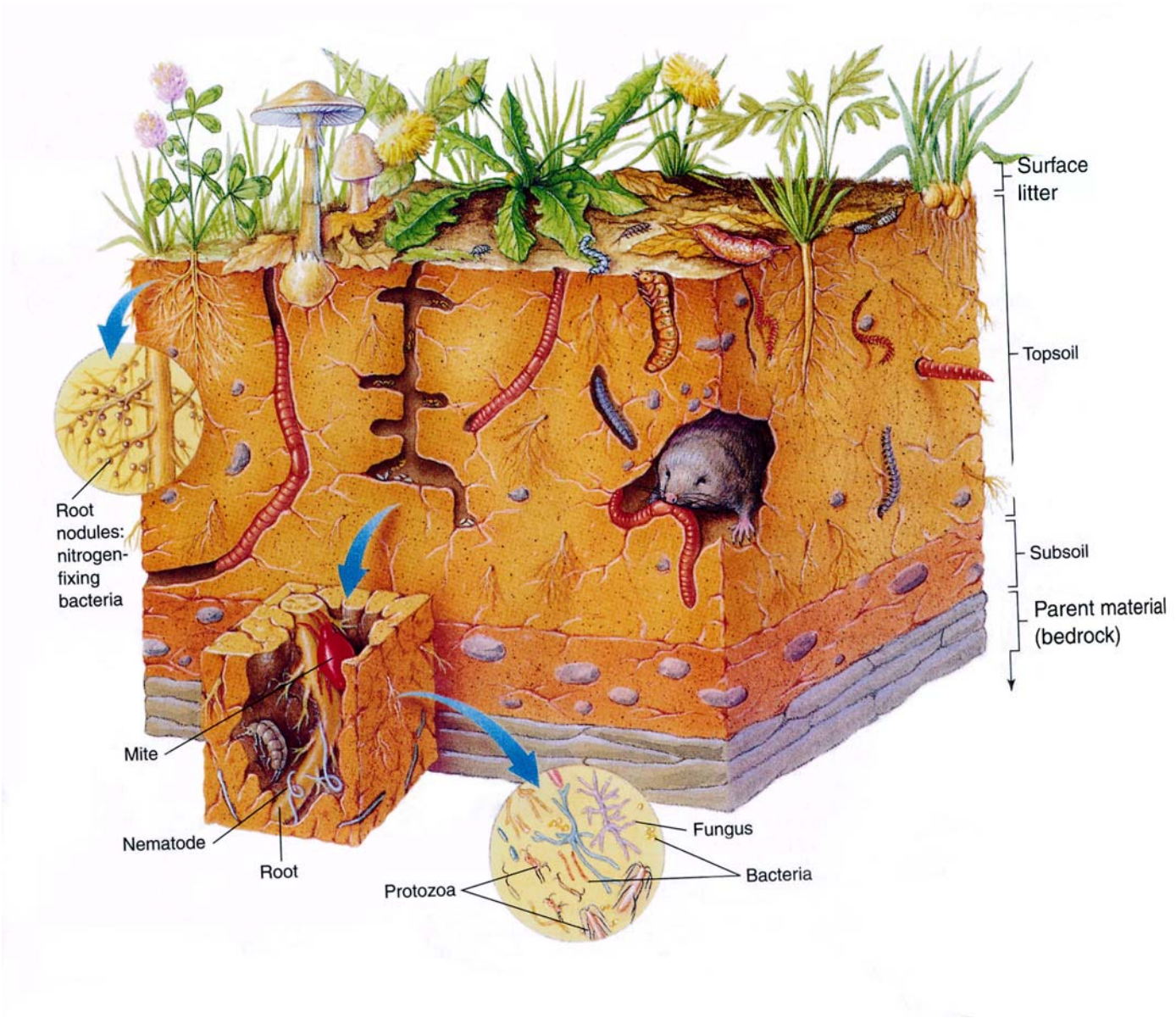


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Photo by Constance L. Falk

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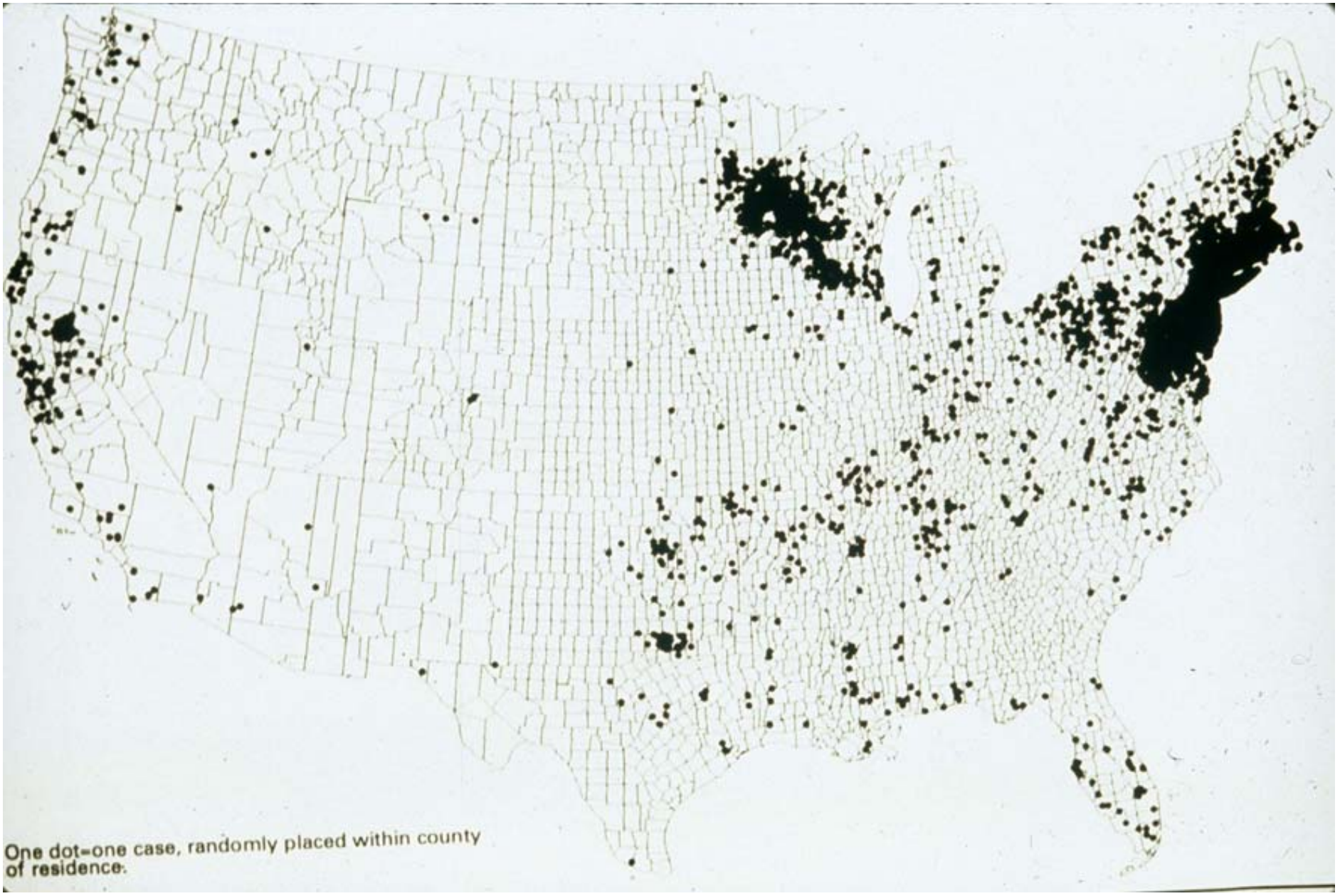

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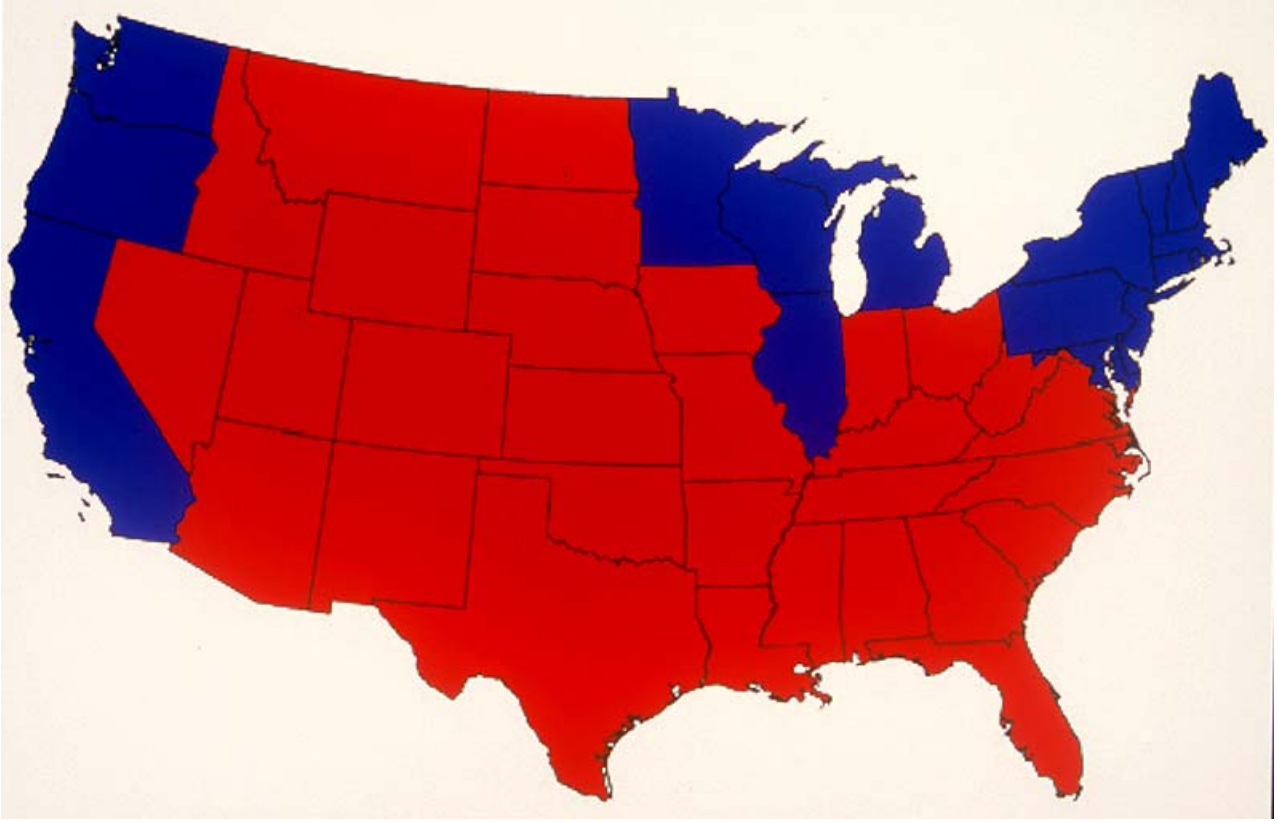

Developed by Michael Gastner, Cosma Shalizi, and Mark Newman at the University of Michigan

Courtesy of Johannes Otto Foerst, Bamberg, Germany