Unifying Biology

Author: FUTUYMA, DOUGLAS J.

Source: BioScience, 57(11) : 915

Published By: American Institute of Biological Sciences

URL: https://doi.org/10.1641/B571101

PUBLISHER
Richard T. O'Grady

EDITOR IN CHIEF
Timothy M. Beardsley

SENIOR EDITOR
Donna Daniels Verdier

PRODUCTION MANAGER / ART DIRECTOR
Herman Marshall

PEER REVIEW / EXTERNAL RELATIONS COORDINATOR
Jennifer A. Williams

EDITORIAL ASSISTANT
Laura C. Sullivan

Editors: Eye on Education: Samantha J. Katz (educationoffice@aibs.org); Feature articles: Cathy Lundmark (features@aibs.org); Washington Watch: Robert E. Gropp (publicpolicy@aibs.org).
Editorial Associate: Barbara J. Orton.
Editorial Board: Agriculture: Sonny Ramaswamy; Animal Behavior: Janice Moore; Animal Development: Paula Mabee; Botany: Kathleen Donohue; Cell Biology: Randy Wayne; Ecology: Scott Collins, Daniel Simberloff; Ecotoxicology: Judith S. Weis; Education: Gordon E. Uno; Environmental Policy: Gordon Brown, J. Michael Scott; Evolutionary Biology: James Mallet; Genetics and Evolution: Martin Tracey; History and Philosophy: Richard M. Burian; Invertebrate Biology: Kirk Fitzhugh; Landscape Ecology: Monica Turner; Microbiology: Edna S. Kaneshiro; Molecular Biology: David Hillis; Molecular Evolution and Genomics: David Rand; Neurobiology: Cole Gilbert; Plant Development: Cynthia S. Jones; Policy Forum: Eric A. Fischer; Population Biology: Ben Pierce; Professional Biologist: Jean Wyld; Sensing and Computation: Geoffrey M. Henebry; Statistics: Kent E. Holsinger; Vertebrate Biology: Harvey B. Lillywhite.
Editorial Correspondence: 1444 I Street, NW, Suite 200, Washington, DC 20005; telephone: 202-628-1500; fax: 202-628-1509; e-mail: bioscience@aibs.org. Instructions for preparing a manuscript for *BioScience* can be found at *www.aibs.org/bioscience/resources/Info_for_contribs.pdf.*
Advertising: For information on both display and line classified advertisements and deadlines, contact John Rasanen, American Geological Institute; telephone: 703-379-2480, ext. 224; fax: 703-379-7563; e-mail: jrasanen@aibs.org.
BioScience (ISSN 0006-3568) is published monthly except July/August combined by the American Institute of Biological Sciences. To subscribe, call 1-800-992-2427, ext. 29. Individual membership: sustaining, $90/yr; individual, $70/yr; family, $90/yr (includes $36 for *BioScience*); emeritus, $50/yr; K–12 teacher/administrator, $45/yr (includes $22 for *BioScience*); graduate and postdoctoral students, $40/yr (includes $21 for *BioScience*); undergraduate and K–12 students, $20/yr (includes $15 for *BioScience*); lifetime, $1400 (one-time fee). Institutional subscriptions: domestic, $337/yr; foreign, $404/yr. Single copies: $14 plus shipping and handling for up to 20 copies; volume discounts available for more than 20 (call 1-800-992-2427, ext. 29). Subscription renewal month is shown in the four-digit year–month code in the upper right corner of the mailing label.

POSTMASTER: Send address changes to *BioScience* Circulation, AIBS, 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101. Printed in USA.

BioScience

Organisms from Molecules to the Environment

American Institute of Biological Sciences

Unifying Biology

As a first-year graduate student in zoology in the 1960s, I faced a three-day written examination that would determine whether I continued in the program. The questions ranged from biochemistry and molecular biology to ecology and systematics. I faced this prospect with foreboding, but also with excitement: what a wonderful excuse to learn about animal development and physiological genetics and other areas of biology that were still new to me!

A graduate-school experience of that kind has long since gone the way of mimeographs and slide rules. In most universities, biology is divided among two or more departments (e.g., molecular and cell biology and ecology and evolutionary biology), and graduate-student training is often even more specialized. On some campuses, the undergraduate biology major has been giving way to specialized tracks or concentrations. This should be cause for alarm.

Specialization often increases efficiency, but at the same time, progress in science is often accelerated by interpenetration of diverse ideas, perspectives, and knowledge, just as genetic exchange between populations may provide new genetic substrates for natural selection. Fragmentation and specialization have costs. The least of these are lost opportunities to answer questions, for lack of knowledge or understanding that another biological subdiscipline might provide. The most severe costs have arisen when practitioners of one subdiscipline denigrate another area as unworthy of effort or support.

Paradoxically, curricula are becoming more specialized even as biology is entering an age of growing integration. More than ever, ecologists are drawing on biochemistry, molecular biology, and physiology; systematists have moved en masse to molecular data for phylogenetic analyses; and almost every subject in evolutionary biology uses molecular tools—whole disciplines of molecular evolution, evolutionary genomics, and evolutionary developmental biology have emerged. Conversely, these fields deepen understanding of molecular and developmental processes. Molecular biologists now routinely analyze the phylogeny of genes and gene families and use population genetic algorithms to detect the operation of natural selection on DNA sequences; developmental biologists gain insights from comparative patterns of gene expression; and comparative genomics illuminates the history and function of the human genome. Molecular and cell biologists are moving toward integration and systems biology, a perspective with which organismal biologists have had long experience.

The time has arrived to reassess how specialized the training of biologists—and of doctors—should be. Granted its traditional emphasis on organismal and ecological biology, AIBS, more than any other professional organization in the Unites States, has represented the full sweep of biology, "from molecules to the environment." Increasingly, AIBS is working toward the welfare and integration of the biological sciences. *BioScience* will soon feature articles on "21st-century Directions in Biology" that will illustrate cross-disciplinary linkages; the 2007 annual AIBS meeting featured a symposium called "Evolutionary Biology and Human Health" that included talks on genomics, cancer, and mitochondrial variation; and AIBS is now strengthening its interactions with other voices for biological science, including the Federation of American Societies for Experimental Biology and the American Society of Microbiologists, to explore ways in which biologists can work together for their communal benefit.

Under the inspiring leadership of incoming President Rita Colwell, AIBS will increasingly move toward the ideal of a truly integrated biology, the science of the 21st century.

DOUGLAS J. FUTUYMA
President, AIBS

doi:10.1641/B571101
Include this information when citing this material.