### Helping Your Child Learn Science



## Helping Your Child Learn Science

Here's a practical guide for stimulating a child's interest in science. Presenting safe and simple activities suitable for children from preschool through the early elementary grades, Helping Your Child Learn Science suggests activities with bubbles, bugs, plants, crystals, and television. Most of the activities cost little or nothing and require no special equipment.

This handy volume explores opportunities for learning science in such places as zoos, museums, planetariums, aquariums, and farms. It presents definitions and descriptions of science and provides suggestions for helping children understand and learn scientific ideas.

Appendices offer practical tips encouraging schools to develop good science programs, descriptions of nine scientific concepts, and a list of recommended science books and magazines. Originally available from the U. S. Department of Education.

#### Nancy Paulu and Margery Martin

76 pages (1993) Paperbound ISBN 0-8412-2626-1 **\$11.95** 

#### ORDERFROM

American Chemical Society Distribution Office Dept 65 1155 Sixteenth Street, NW Washington, DC 20036

Or CALL TOLL FREE

800-227-5558

(In Washington, DC, 872-4363) and use your credit card!

## **Biochemistry**

Biochemistry (ISSN 0006-2960) is published weekly except for the first week in January by the American Chemical Society at 1155 16th St., N.W., Washington, DC 20036. Second-class postage paid at Washington, DC, and additional mailing offices. POSTMASTER: Send address changes to Biochemistry, Member & Subscriber Services, P.O. Box 3337, Columbus, OH 43210. Canadian GST Reg. No. R127571347. Printed in the USA.

#### **American Chemical Society**

1155 16th St., N.W. Washington, DC 20036 (202) 872-4600

TDD (202) 872-8733; FAX (202) 872-4615

#### Member & Subscriber Services

American Chemical Society P.O. Box 3337, Columbus, OH 43210 (614) 447-3776; (800) 333-9511

#### Journals Department

American Chemical Society 2540 Olentangy River Road P.O. Box 3330, Columbus, OH 43210 (614) 447-3600, Ext 3171 TELEX 6842086; FAX (614) 447-3745

© Copyright 1993 by the American Chemical Society. Copyright permission: An individual may make a single reprographic copy of an article in this publication for personal use. Reprographic copying beyond that permitted by Section 107 or 108 of the U.S. Copyright Law is allowed, provided that the appropriate per-copy fee is paid through the Copyright Clearance Center, Inc., 27 Congress St., Salem, MA 01970. For reprint permission, please write to the Copyright Administrator, Publications Division, at the ACS Washington address. Bulk reprints: For quotes and information on placing an order, please call (202) 872-4539 or write to the Distribution Office at the ACS Washington address.

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

#### Editorial Information

Instructions to authors and copyright status form are printed in the first issue of each volume. Please conform to these instructions when submitting manuscripts.

Manuscripts for publication should be submitted to the Editor, Gordon G. Hammes, Duke University Medical Center, P.O. Box 3673, 081 Yellow Zone, Duke South, Durham, NC 27710. Correspondence regarding accepted papers and proofs should be directed to the Journals Department at the address above. Page charges of \$30.00 per page may be paid for papers published in this journal. Payment does not affect acceptance or scheduling of papers.

The American Chemical Society and its Editors assume no responsibility for the statements and opinions advanced by contributors.

Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

#### Subscription and Business Information

Subscriptions are available only on a calendar year basis. (For membership information, contact Office of Member Services at the ACS Washington address.)

New and renewal subscriptions should be sent with payment to American Chemical Society, Department L-0011, Columbus, OH 43268-0011. Rates do not apply to non-mber subscribers in Japan, who must enter subscription orders with Maruzen Company Ltd., 3-10 Nihonbashi 2-chome, Chuo-ku, Tokyo 103, Japan. Tel: (03) 272-7211.

1993 subscription prices including postage.

#### Publications Division

Robert H. Marks, Director

Journals Department: Charles R. Bertsch, Head

Editorial Office: Mary E. Scanlan, Manager; Kathleen E. Duffy, Anne C. O'Melia, and Joseph E. Yurvati, Journals Editing Managers; Deborah K. Miller, Senior Associate Editor; Daniel R. Kelsey, Barbara I. Taylor, and Beth A. Welch, Assistant Editors; Amy S. McKee and David L. Norris, Staff Editors

Advertising Office: Centcom, Ltd., 1599 Post Road East, P.O. Box 231, Westport, CT 06881

	U.S.	Canada, Mexico	Europe*	All Other Countries
Printed				
Members-1 yr	\$ 107	\$ 204	\$ 346	\$ 421
2 yr	\$ 192	\$ 386	\$ 670	\$ 820
Nonmembers	\$1186	\$1283	\$1425	\$1500
Microfiche				
Members-1 yr	\$ 107	\$ 107	\$ 155	\$ 155
2 yr	\$ 192	\$ 192	\$ 288	\$ 288
Nonmembers	\$1186	\$1186	\$1234	\$1234
Supplementary material on mic	\$ 45	\$ 75	\$ 75	\$ 75
* Air service include				

Printed edition single issue prices: current year, \$24.00; 1992, \$25.00; 1990-91, \$23.00; prior year, \$44.00. Foreign postage additional. Mail orders and requests for back volume prices should be sent to Microforms & Back Issues Office at the ACS Washington address.

Phone orders can be placed for printed, microfiche, and microfilm editions by calling the ACS TOLL FREE at (800) 333-9511 from anywhere in the United States and Canada. Phone orders can be charged to Visa, MasterCard, or American Express accounts.

Changes of address must include both old and new addresses with ZIP code and a recent mailing label. Send all address changes to Member & Subscriber Services. Please allow 6 weeks for change to become effective. Claims for missing numbers will not be allowed if loss was due to failure of notice of change of address to be received in the time specified; if claim is dated (a) North America, more than 90 days beyond issue date; (b) all other foreign, more than 180 days beyond issue date. Claims are handled by Member & Subscriber Services.

Supplementary material is noted in the table of contents with a 

. It is available as photocopy (\$10.00 for up to 3 pages and \$1.50 per page for additional pages, plus \$2.00 for foreign postage) or as 24× microfiche (\$10.00, plus \$1.00 for foreign postage). Canadian residents should add 7% GST. See supplementary material notice at end of journal article for number of pages. Orders must state whether for photocopy or for microfiche and give complete title of article, names of authors, journal, issue date, and page numbers. Prepayment is required and prices are subject to change. Order from Microforms & Back Issues Office at the ACS Washington address. Supplementary material except structure factors also appears in the microfilm

Cover: Based on  $\lambda$  repressor-DNA complex—courtesy of David Richardson.

# Biochemistry

**EDITOR: GORDON G. HAMMES** 

Duke University Medical Center, P.O. Box 3673, 081 Yellow Zone, Duke South, Durham, North Carolina 27710 [Phone (919) 681-3250; FAX (919) 681-8344]

#### ASSOCIATE EDITORS:

MARC G. CARON, DUKE UNIVERSITY

EARL W. DAVIE, UNIVERSITY OF WASHINGTON

PERRY A. FREY, UNIVERSITY OF WISCONSIN

JOSEPH J. VILLAFRANCA, THE PENNSYLVANIA STATE UNIVERSITY

LESLIE WILSON, UNIVERSITY OF CALIFORNIA, SANTA BARBARA

PAUL L. MODRICH, DUKE UNIVERSITY

WILLIAM W. PARSON, UNIVERSITY OF WASHINGTON

#### EDITORIAL ADVISORY BOARD

ROBERT H. ABELES **Brandeis University** DAVID S. AULD

Harvard Medical School

JOSEPH AVRUCH

Massachusetts General Hospital

GERALD T. BABCOCK

Michigan State University ROBERT L. BALDWIN

Stanford University STEPHEN J. BENKOVIC

The Pennsylvania State University

GUNTER BLOBEL

The Rockefeller University E. MORTON BRADBURY University of California, Davis

BILL R. BRINKLEY

Baylor College of Medicine

MINOR J. COON

The University of Michigan

Jackie Corbin

Vanderbilt University

DAVID DAVIES

NIADDK, National Institutes of Health

RUSSELL F. DOOLITTLE

University of California at San Diego

RAYMOND A. DWEK University of Oxford MICHAEL EDIDIN

Johns Hopkins University

MAURICE EFTINK

University of Mississippi JAMES H. FREISHEIM

Medical College of Ohio IRWIN FRIDOVICH

Duke University CARL FRIEDEN

Washington University PAUL A. FRIEDMAN Merck Sharp & Dohme

MARTIN GELLERT

National Institutes of Health

JOHN GERGELY

Boston Biomedical Research Institute

IRVING H. GOLDBERG Harvard Medical School

Jack Gorski

University of Wisconsin WILLIAM F. HARRINGTON Johns Hopkins University ROBERT HASELKORN University of Chicago

CARL-HENRIK HELDIN Ludwig Institute for Cancer Research,

Uppsala

CLAUDE HÉLÈNE

Museum National d'Histoire Naturelle,

**Paris** 

JOHN W. B. HERSHEY

University of California, Davis

GEORGE P. HESS

Cornell University, Ithaca

Peter C. Hinkle

Cornell University, Ithaca

BARRY HONIG

Columbia University FRANK M. HUENNEKENS

Scripps Clinic & Research Foundation

TONY E. HUGLI

Scripps Clinic & Research Foundation

RAINER JAENICKE

University of Regensburg

HANS JÖRNVALL

Karolinska Institute, Stockholm

H. RONALD KABACK

Howard Hughes Medical Institute, UCLA

NEVILLE R. KALLENBACH New York University YOSHITO KAZIRO University of Tokyo CLAUDE B. KLEE

National Cancer Institute

JOSEPH KRAUT

University of California at San Diego

JACK E. KYTE

University of California at San Diego

ROBERT J. LEFKOWITZ **Duke University** 

TOMAS LINDAHL Imperial Cancer Research Fund, London

GERHARD MEISSNER

University of North Carolina

HENRY METZGER

NIAMS, National Institutes of Health

ELIZABETH NEUFELD

University of California, Los Angeles

DEXTER B. NORTHROP

University of Wisconsin

JAMES OFENGAND

Roche Institute of Molecular Biology

BERT O'MALLEY

Baylor College of Medicine DEMETRIOS PAPAHADJOPOULOS

University of California, San Francisco

MARY LOU PARDUE

Massachusetts Institute of Technology

DAVID C. PHILLIPS University of Oxford JAMES C. POWERS

Georgia Institute of Technology

JAMES H. PRESTEGARD Yale University JAMES F. RIORDAN Harvard Medical School MICHAEL ROSSMANN Purdue University

DAVID W. RUSSELL University of Texas Southwestern

Medical Center

CLARENCE A. RYAN, JR. Washington State University

RANDY W. SCHEKMAN University of California, Berkeley

HAROLD A. SCHERAGA Cornell University, Ithaca

PAUL R. SCHIMMEL

Massachusetts Institute of Technology

JOACHIM SEELIG University of Basel G. GRAHAM SHIPLEY Boston University ANTERO G. SO University of Miami

JOANNE STUBBE

Massachusetts Institute of Technology

BRIAN SYKES University of Alberta Ignacio Tinoco, Jr.

University of California, Berkeley

BERT L. VALLEE Harvard Medical School

Martha Vaughan

National Institutes of Health

SALIH J. WAKIL

Baylor College of Medicine

ERNST-L. WINNACKER Universitat Munchen

Savio Woo

Baylor College of Medicine

PETER E. WRIGHT

Scripps Clinic & Research Foundation