



AMERICAN
ASSOCIATION FOR THE
ADVANCEMENT OF
SCIENCE

SCIENCE

31 AUGUST 1990

\$3.50

VOL. 249 ■ PAGES 961-1076

Now You Can Get the Full Text of SCIENCE Online Through BRS Colleague

Every day there are new information sources that can complicate your search for up-to-the-minute data. That's why BRS Colleague is so vital to today's biomedical professional. Colleague is a complete, online information service that compiles the world's key biomedical data and presents it in a format that's both simple and efficient to search.

Your Link to the Full-Text of SCIENCE

The Comprehensive Core Medical Library (CCML) database is the cornerstone of Colleague. The CCML contains the full text of more than 20 textbooks and over 70 major journals including *Science*. Now, with Colleague's new LINK command, a publication cited in MEDLINE can instantly be retrieved from the CCML. No other search service offers this feature.

Colleague's collection of biomedical databases — more than 40 in all — includes biomedical industry favorites like BIOSIS and MEDLINE. Some, like AIDS Knowledgebase from San Francisco General Hospital, furnish data that is often not available in other sources. As a menu-driven service, Colleague is designed to be easily used by anyone who needs current information. All that is required is a personal computer and a modem. Best of all, Colleague is available 22 hours per day, with significant discounts after 6:00 p.m.

Time is a Dwindling Resource

In today's changing world of science, every minute is precious. You can't afford to be without the fastest, most up-to-date resources for information. With BRS Colleague, you never will.

Call us today.

BRS COLLEAGUE

BRS Information Technologies, A Division of Maxwell Online, Inc.

8000 Westpark Drive, McLean, VA 22102 Tel: (703) 442-0900 Toll-free: (800) 955-0906

Achilles House, Western Avenue, London W3 0UA, England Tel: ((01) 992-3456 Toll-free: (0800) 289512 (UK Only)

P.O. Box 544, Potts Point, NSW 2011, Australia Tel: (02) 360-2691 Toll-free: (008) 22-6474

BOOKS FROM SCIENCE



Astronomy & Astrophysics

Edited by Morton S. Roberts

Provides a broad, coherent picture of the universe, from the solar system to the quasars at the edge of the cosmos. 1985; 384 pp.; color plates

#85-04H; hardcover; \$29.95 (members \$23.95)

#85-04S; softcover; \$17.95 (members \$14.35)

Biotechnology:

The Renewable Frontier

Edited by Daniel E. Koshland, Jr.

Presents topics at the forefront of biological research, including techniques, immunology, developmental biology and cancer, hormones and metabolism; biotechnology, virology, plant sciences, and behavior and sensory phenomena.

1986; 384 pp.

#85-26H; hardcover; \$29.95 (members \$23.95)

#85-26S; softcover; \$17.95 (members \$14.35)

Frontiers in the Chemical Sciences

Edited by William Spindel and Robert M. Simon

Selected articles from 1980 to 1985 deal with areas such as molecular reactivity, catalysis and synthesis, and analytical tool development.

1986; 624 pp.

#85-10H; hardcover; \$29.95 (members \$23.95)

#85-10S; softcover; \$17.95 (members \$14.35)

AIDS:

Papers from Science, 1982-1985

Edited by Ruth Kulstad

Frequently cited research papers and news reports on AIDS trace the history and scientific developments of the epidemic through September 1985. 1986; 654 pp.

#85-23S; softcover; \$19.95 (members \$15.95)

Science, Technology, and Society: Emerging Relationships

Edited by Rosemary Chalk

Offers 85 articles, editorials, and letters from *Science* magazine on the relationship between science and technology and society covering the period since World War II. 1988; 262 pp.

#88-12S; softcover; \$19.95 (members \$15.95)

Order from: AAAS Books, Dept. A17, PO Box 753, Waldorf, MD 20604. Phone orders (VISA/MasterCard only), call 301-645-5643 (9am-4pm ET) and ask for AAAS. Individuals must prepay or use VISA/MC; purchase orders, add \$3.50 shipping. Specify item #; allow 2-3 weeks for delivery. For shipments to CA, add sales tax.

AAAS

American Association for the
Advancement of Science

Agency for International Development

Announcement of

Malaria Vaccine Research & Development

Request for Applications

[RFA-ST/H-90-001]

Background. For more than 20 years, the United States Agency for International Development (A.I.D.) has supported a program of applied research in malaria vaccine development. Currently, the primary research foci of the Malaria Vaccine Research & Development Project include:

—the identification and characterization of malaria parasite antigens for development of experimental vaccines;

—the elucidation of the importance of identified antigens and B-cell and T-cell epitopes in providing a protective immune response in naturally acquired human malaria and in humans and relevant animal models, including appraisals of strain specificity of protective immunity;

—the elucidation of humoral and cellular effector mechanisms of protective immunity to malaria, especially protection from the pathological consequences of infection, and the development of *in vitro* correlates of protective immunity in humans;

—the modification of the structure and/or mode of presentation of antigens which have been shown to have a role in protection, in an attempt to increase their ability to induce a protective immune response.

Proposals. A.I.D. is soliciting proposals for Cooperative Agreements describing a program for malaria vaccine research. In general, the range of activities requested in the RFA is as outlined above. However, there is a special interest in proposals whose major emphasis is on development of vaccines that induce responses mimicking natural immunity (*i.e.*, a state characterized by protection from disease but not necessarily from infection) thus allowing restimulation of immunity through natural exposure to parasites. It is the intent of A.I.D. to support 3-year research programs. Only U.S. Institutions are eligible for these awards, but collaboration with scientists in malaria endemic areas is encouraged.

Applications. Proposals must be received by November 2, 1990. Forms and detailed instructions as well as programmatic information are available from:

Project Officer

**Malaria Vaccine Research & Development Project
A.I.D. Office of Health (SA-18; Room 705)**

Washington, DC 20523

fax: 703-875-5490

967 This Week in *Science*

Editorial	969 Accreditation and Diversity in Engineering Education: M. G. MORGAN
Perspective	970 Too Many Rodent Carcinogens: Mitogenesis Increases Mutagenesis: B. N. AMES AND L. S. GOLD
Letters	972 Pseudo Skua?: R. MARCUS AND A. MARCUS; D. G. AINLEY ■ Changing Science: R. M. SINCLAIR ■ Boron Neutron Capture Therapy: The Role of Peer Review: O. K. HARLING ■ Long-Term Potentiation: T. V. P. BLISS
News & Comment	974 Gene Therapy: Into the Home Stretch ■ ADA Gene Therapy Enters the Competition 977 A Violent Venus Seen from a Troubled Magellan 978 Bottom-Up Revolution in Science Teaching ■ Turning Teachers On to Science 980 What's Holding Up "Aversives" Report? 981 U.K. Science Responds to Terror 982 <i>Briefings</i> : Four Mathematicians Win Field Medals ■ From Crackhouse to Freakhouse ■ Recombinant Vaccine Finally Gets a Chance ■ Congress Cites Agent Orange Coverup ■ A Round of Applause (Sort of) for EOS ■ A Fishy Kind of Pollution Detector ■ A New Fight Over Fetal Tissue?
Research News	984 Alzheimer's Pathology Explored ■ The Nematode as a Guide to Human Brain Disease 987 Astronomers Try to Put Mauna Kea "into Space"
Policy Forum	989 Minorities at Majority Institutions: J. H. WYCHE AND H. T. FRIERSON, JR.
Articles	992 Principles of Design of Fluid Transport Systems in Zoology: M. LABARBERA 1000 In Situ Interfacial Mass Detection with Piezoelectric Transducers: M. D. WARD AND D. A. BUTTRY 1007 Cell Proliferation in Carcinogenesis: S. M. COHEN AND L. B. ELLWEIN
Research Articles	1012 Regulation of an Enzyme by Phosphorylation at the Active Site: J. H. HURLEY, A. M. DEAN, J. L. SOHL, D. E. KOSHLAND, JR., R. M. STROUD

- **SCIENCE (ISSN 0036-8075)** is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1333 H Street, NW, Washington, DC 20005. Second-class postage (publication No. 484460) paid at Washington, DC, and additional mailing offices. Copyright © 1990 by the American Association for the Advancement of Science. The title SCIENCE is a registered trademark of the AAAS. Domestic individual membership and subscription (51 issues): \$80. Domestic institutional subscription (51 issues): \$150. Foreign postage extra: Canada \$46, other (surface mail) \$46, air mail via Amsterdam \$85. First class, airmail, school-year, and student rates on request. **Change of address:** allow 6 weeks, giving old and new addresses and 11-digit account number. **Postmaster:** Send change of address to *Science*, P.O. Box 1723, Riverton, NJ 08077. **Single copy sales:** Current issue, \$3.50; back issues, \$5.00; Biotechnology issue, \$6.00 (for postage and handling, add per copy \$0.50 U.S., \$1.00 all foreign); Guide to Biotechnology Products and Instruments, \$20 (for postage and handling add per copy \$1.00 U.S., \$1.50 Canada, \$2.00 other foreign). Bulk rates on request. **Authorization to photocopy** material for internal or personal use under circumstances not falling within the fair use provisions of the Copyright Act is granted by AAAS to libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$1 per copy plus \$0.10 per page is paid directly to CCC, 27 Congress Street, Salem, Massachusetts 01970. The identification code for *Science* is 0036-8075/83 \$1 + .10. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.
- The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objectives are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, to advance education in science, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



COVER A surface fire, near Crown King, Arizona. Low-intensity surface fires have burned repeatedly through ponderosa pine forests of the southwestern United States. Chronologies of fire scars in the tree rings reveal an association between wildfire occurrence in this region and the El Niño–Southern Oscillation during the past three centuries, demonstrating that global-scale climatic patterns affect the frequency of fires and their effects on the ecosystem. See page 1017. [Photograph by John H. Dieterich]

Reports

- 1017 Fire–Southern Oscillation Relations in the Southwestern United States: T. W. SWETNAM AND J. L. BETANCOURT
- 1020 Triassic Vertebrates of Gondwanan Aspect from the Richmond Basin of Virginia: H.-D. SUES AND P. E. OLSEN
- 1023 Alteration of $\alpha 1 \text{ Na}^+, \text{K}^+$ -ATPase $^{86}\text{Rb}^+$ Influx by a Single Amino Acid Substitution: V. L. M. HERRERA AND N. RUIZ-ÓPAZO
- 1026 Sexual Role Reversal in Mate-Finding Strategies of the Cabbage Looper Moth: P. J. LANDOLT AND R. R. HEATH
- 1028 The Minimal Number of Class II MHC–Antigen Complexes Needed for T Cell Activation: S. DEMOTZ, H. M. GREY, A. SETTE
- 1030 Adhesion of Human B Cells to Germinal Centers in Vitro Involves VLA-4 and INCAM-110: A. S. FREEDMAN, J. M. MUNRO, G. E. RICE, M. P. BEVILACQUA, C. MORIMOTO, B. W. MCINTYRE, K. RHYNHART, J. S. POBER, L. M. NADLER
- 1033 Molecular Cloning and Functional Expression of Glutamate Receptor Subunit Genes: J. BOULTER, M. HOLLMANN, A. O'SHEA-GREENFIELD, M. HARTLEY, E. DENERIS, C. MARON, S. HEINEMANN
- 1037 Stereoscopic Depth Discrimination in the Visual Cortex: Neurons Ideally Suited as Disparity Detectors: I. OHZAWA, G. C. DEANGELIS, R. D. FREEMAN
- 1041 Activation of Extrastriate and Frontal Cortical Areas by Visual Words and Word-Like Stimuli: S. E. PETERSEN, P. T. FOX, A. Z. SNYDER, M. E. RAICHLE
- 1044 Electrostatic and Steric Contributions to Regulation at the Active Site of Isocitrate Dehydrogenase: A. M. DEAN AND D. E. KOSHLAND, JR.
- 1046 Presence of a Potent Transcription Activating Sequence in the p53 Protein: S. FIELDS AND S. K. JANG
- 1049 Transcriptional Activation by Wild-Type But Not Transforming Mutants of the p53 Anti-Oncogene: L. RAYCROFT, H. WU, G. LOZANO

Book Reviews

- 1052 Bad Year Economics, reviewed by B. WINTERHALDER ■ Asteroids II, L. L. WILKENING ■ Organic Superconductors, J. M. WILLIAMS ■ Perspectives on Plant Competition, T. E. MILLER ■ Books Received

Board of Directors

Richard C. Atkinson
*Retiring President,
Chairman*
Donald N. Langenberg
President
Leon M. Lederman
President-elect

Mary Ellen Avery
Francisco J. Ayala
Eugene H. Cota-Robles
Robert A. Frosch
Joseph G. Gavin, Jr.
John H. Gibbons
Beatrix A. Hamburg
Florence P. Haseltine
William T. Golden
Treasurer
Richard S. Nicholson
Executive Officer

Editorial Board

Elizabeth E. Bailey
David Baltimore
William F. Brinkman
E. Margaret Burbidge
Pierre-Gilles de Gennes
Joseph L. Goldstein
Mary L. Good
F. Clark Howell
James D. Idol, Jr.
Leon Knopoff
Oliver E. Nelson
Yasutomi Nishizuka
Helen M. Ranney
David M. Raup
Howard A. Schneiderman
Larry L. Smarr
Robert M. Solow
James D. Watson

Board of Reviewing Editors

John Abelson
Don L. Anderson
Stephen J. Benkovic
Gunter K-J Blobel
Floyd E. Bloom
Henry R. Bourne
James J. Bull
Kathryn Calame
Charles R. Cantor
Ralph J. Cicerone
John M. Coffin
Robert Dorfman
Bruce F. Eldridge
Paul T. Englund
Fredric S. Fay
Harry A. Fozzard

Theodore H. Geballe
Roger I. M. Glass
Stephen P. Goff
Corey S. Goodman
Stephen J. Gould
Eric F. Johnson
Stephen M. Kosslyn
Konrad B. Krauskopf
Charles S. Levings III
Richard Losick
Joseph B. Martin
John C. McGiff
Anthony R. Means
Mortimer Mishkin
Roger A. Nicoll
William H. Orme-Johnson III
Carl O. Pabo
Yeshayau Pocker

Dennis A. Powers
Erkki Ruoslahti
Thomas W. Schoener
Ronald H. Schwartz
Terrence J. Sejnowski
Robert T. N. Tjian
Virginia Trimble
Emil R. Unanue
Geerat J. Vermeij
Bert Vogelstein
Harold Weintraub
Irving L. Weissman
Zena Werb
George M. Whitesides
Owen N. Witte
William B. Wood
Keith Yamamoto

**THE ROBERT A. WELCH FOUNDATION
CONFERENCE ON CHEMICAL RESEARCH XXXIV
FIFTY YEARS WITH TRANSURANIUM ELEMENTS**

**OCTOBER 22-23, 1990
THE WESTIN OAKS HOTEL, HOUSTON, TEXAS**

**PROGRAM
Monday, October 22, 1990**

SESSION I

GLENN T. SEABORG, Presiding Scientific Advisory Board Member

JACK S. JOSEY, Welcoming of Guests

GLENN T. SEABORG, Introductory Remarks

**THE DISCOVERY OF NEPTUNIUM
PHILIP H. ABELSON**

**THE DISCOVERY OF PLUTONIUM
ARTHUR C. WAHL**

**THE DISCOVERY OF ELEMENTS 95-106
ALBERT GHIORSO**

SESSION II

L.O. MORGAN, Discussion Leader

**TOWARDS SUPERHEAVY NUCLEI: THE DISCOVERY OF ELEMENTS 107 TO 109
GOTTFRIED MÜNZENBERG**

**TRANSMENDELEVium ELEMENTS: THE PRESENT AND THE FUTURE
Y.T. OGANESSIAN**

**SUPERHEAVY ELEMENTS
WALTER LOVELAND**

Tuesday, October 23, 1990

SESSION III

JOSEPH J. KATZ, Discussion Leader

**BULK-PHASE CHEMICAL STUDIES ON THE EDGE OF MATTER:
AMERICAN-EINSTEINIUM
JOSEPH R. PETERSON**

**CHEMISTRY OF THE TRANSACTINIDE ELEMENTS
DARLEANE C. HOFFMAN**

**NEW, HEAVY TRANSURANIUM ISOTOPES
E. KENNETH HULET**

Luncheon

JOHN D. ROBERTS, 1990 WELCH AWARDEE

WILLIAM von EGGERS DOERING, 1990 WELCH AWARDEE

SESSION IV

LESTER R. MORSS, Discussion Leader

**TRANSURANIUM ELEMENTS IN NATURE
GÜNTHER HERRMANN**

**ACTINIDES IN THE ENVIRONMENT
DAVID E. HOBART**

**ACTINIDE RESEARCH AT THE EUROPEAN INSTITUTE FOR TRANSURANIUM
ELEMENTS
JEAN FUGER**

ADVANCE REGISTRATION FORM

(There is no registration fee)

_____ I will attend the conference.

_____ I will attend the complimentary luncheon on Tuesday, October 23, 1990
(PLEASE PRINT OR TYPE)

Dr. Mr.

Mrs. Ms. _____
(LAST) (FIRST) (MIDDLE)

Position _____

Organization _____

Department _____

Address _____

Advance registration will be acknowledged and accepted in order of their receipt, to within the capacity of the available space.

Make your hotel reservations directly with The Westin Oaks Hotel, Telephone No. 1-800-228-3000 or 713-960-8100 x6990, prior to October 5, 1990.

Please return by October 5 to: **Kimberly Nelson**

The Robert A. Welch Foundation

4605 Post Oak Place, Suite 200, Houston, Texas 77027

**AIDS
TARGETED
INFORMATION/ATIN**

**TARGETS
YOUR
LITERATURE
SEARCH**

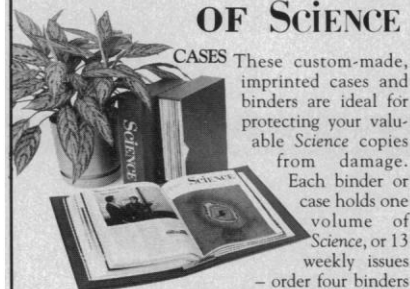
Expand your base of knowledge about AIDS/HIV with *AIDS Targeted Information/ATIN*. Every month, *ATIN* not only provides abstracts but also in-depth evaluations of the current published scientific literature on AIDS. Written by clinicians and researchers for clinicians and researchers, *ATIN* provides an authoritative command of the world's literature on AIDS. Published by Williams & Wilkins. Indexed. 12 issues per year. \$125.

To order call

1-800-638-6423

Sponsored by the American Foundation for AIDS Research (AmFAR).

**SAVE YOUR COPIES
OF SCIENCE**



CASES These custom-made, imprinted cases and binders are ideal for protecting your valuable *Science* copies from damage. Each binder or case holds one volume of *Science*, or 13 weekly issues – order four binders or cases to hold a complete year of issues. Constructed from reinforced board and covered with durable, leather-like red material and stamped in gold, the cases are V-notched for easy access; binders have a special spring mechanism to hold individual rods which easily snap in.

Cases	1 – \$7.95	2 – \$14.95	4 – \$27.95
Binders	1 – \$9.95	2 – \$18.95	4 – \$35.95

SCIENCE
Jesse Jones Industries, Dept. SCE
499 East Erie Ave., Philadelphia, PA 19134

Enclosed is \$_____ for _____ Cases;
Binders. Add \$1 per case/binder for postage & handling. Outside USA \$2.50 per case/binder (US funds only). PA residents add 6% sales tax.

Print Name _____

Address _____

City _____ No P.O. Box Numbers Please

State/Zip _____

CHARGE ORDERS (Minimum \$15): Am Ex, Visa, MC, DC accepted. Send card name, #, Exp. date.

CALL TOLL FREE 7 days, 24 hours 1-800-972-5858

— SATISFACTION GUARANTEED —

This Week in **SCIENCE**

Fluid flows

ALTHOUGH the number of different forms in the biological world may be extraordinary, external constraints arising from the physical laws of the universe, and internal constraints that are inherently biological in nature restrict the diversity of geometries that evolution can produce. LaBarbera shows how the architecture of internal fluid transport systems (for example, circulatory systems) follow certain well-defined laws (page 992). In order to convey materials such as nutrients, the fluids carrying them must move at low velocities in the transfer regions; this condition is coupled with the problem that transfers can only take place over small distances (for example, food particles must come into direct contact with a whale's filter to be captured). By responding to these and other constraints, including the drag that arises from the viscosity of the fluids, and by preserving the economy of the construction and maintenance of the systems, animals from sponges to humans have convergently evolved similar basic architectures in their internal systems of fluid flow.

Micromass detection

IN the converse piezoelectric effect, an alternating current applied across electrodes plated on the surface of a crystal induces a characteristic frequency of oscillation in the material; changes in mass at either electrode alter this vibrational frequency. The dependency of frequency on mass has been exploited extensively for mass measurements in vacuums and gases; Ward and Buttry discuss advances in piezoelectric methods, which now allow measurements of mass changes of less than a billionth of a gram per square centimeter under a variety of conditions, including at a solid-liquid interface (page 1000). Several research groups have investigated piezoelectric "biosensors," where an easily recognizable mass increase at the transducer surface reflects the binding of, say, a specific protein to an antibody layer. Detection of a sugar in solution has been achieved with the

binding of glucose to hexokinase contained in a film on a transducer; this potential clinical application is made even more attractive by the simplicity, small size, and low cost of the sensors.

Global climate and forest fires

THE influence of daily weather on the breakout of wildland fires has been well-studied; however, the roles of seasonal and longer-term climate and the effects of global climate changes are less certain. In an analysis of three centuries worth of fire scars in tree rings and fire statistics of the southwestern forests of the United States, Swetnam and Betancourt show that the occurrence of repeated, low-intensity seasonal wildfires (cover) is associated with variations in sea surface pressure and temperature in the tropical Pacific (the Southern Oscillation, or SO) (page 1017). El Niño conditions, when the central Pacific experiences low pressure and warm temperature anomalies, are associated with moist spring weather in the southwestern United States, which enhances tree growth and suppresses fires. Archival evidence from Peru indicates that 8 of the 10 years in which no fire scars were observed over the last 300 years were El Niño events of strong or moderate intensity; the strength of these global teleconnections apparently depends on the amplitude of the SO. In the 20th century, area burn in the southwest closely tracks the SO; thus predicting the behavior of the SO may help in yearly fire preparedness and scheduling of prescribed burning.

North-south link

MORE than 200 million years ago, as the supercontinent Pangea was preparing to break up, terrestrial creatures also were going through a transition. Faunas dominated by synapsids (mammal-like creatures from the late Paleozoic era) gave way to a population dominated by archosaurian reptiles including dinosaurs. The question remains as to exactly how this change came about. Incomplete evidence

of the geographic distribution of many vertebrates makes it difficult to assess how one kind of fauna became dominant over another. One concept of faunal distributions during the Carnian and Norian stages of the Late Triassic, or about 225 million years ago, was that creatures in the Northern Hemisphere (Laurasia) were different than those in the Southern Hemisphere (Gondwana). New evidence indicates these presumed biogeographic differences to be apparent rather than real, due to a lack of fossil sites of early and middle Carnian age in the Northern Hemisphere (page 1020). Through a detailed analysis of fossils found in the Richmond basin of east-central Virginia (one of the oldest sites in the Northern Hemisphere from the late Triassic period) Sues and Olsen show that similar fossils from the same period occur in the Northern and Southern Hemispheres.

Sexual role reversal

ONE way to help control crop-attacking pests involves exploiting the insects' mating habits by luring them to traps baited with pheromones. Typically, mate-finding behavior involves a stationary female producing a male attractant, while males release pheromones (possibly aphrodisiacs) during courtship interactions. Female sex pheromones for many insects have been well-identified; however, a high ratio of sexually active males to females in many species populations limits the effectiveness of the use of the female pheromones. Cabbage looper moths show an additional strategy, where females are also attracted to males. Landolt and Heath find that the female moths are attracted to males over a distance once the males have been exposed to the odor of a resource plant (cabbage, for example) or to a female sex pheromone (page 1026). They have isolated the components of the female-attracting substance, and determined that the males release it into the airstream after exposure to plants or female pheromones. Such behavior suggests a mating strategy based on the resource, with host plants as natural sexual rendezvous sites.

■ PAT JANOWSKI

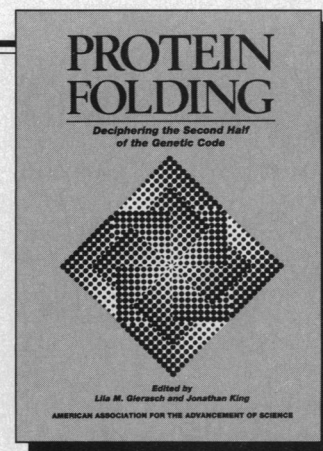
New from AAAS

Protein Folding

Deciphering the Second Half of the Genetic Code

Edited by Lila M. Gierasch and Jonathan King

This volume explores new experimental techniques and discoveries that are dramatically enlarging our understanding of the process of protein folding. Based on a seminar at the AAAS Annual Meeting, the book emphasizes new interactions between theory and experiment and looks closely at the process of tailoring proteins and their fragments for the testing of folding hypotheses. It is especially valuable to researchers in the biotechnology industry and to those involved in interpreting the growing data base of DNA sequences.



1990; 352 pp.; index
#89-18S - softcover; \$39.50
(AAAS members \$31.50)

Contents:

I. Structural themes in native proteins:

Origami of proteins; loops in globular proteins; helix signals in proteins; the water structure surrounding proteins; higher-order structure in fibrous proteins; an hydration-mediated free energy driving force for protein folding and assembly.

II. Interactions and conformations of amino acids in peptides:

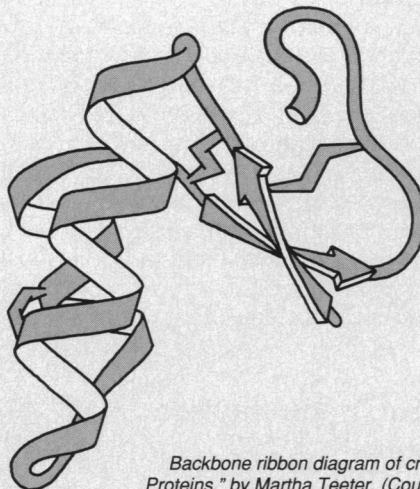
Peptide conformations in crystals; α -helix formation by short peptides in water; folding of peptide fragments in water; structure-function relationships in lipid-protein interactions.

III. Recovering active proteins:

Expression and stabilization of bovine pancreatic trypsin inhibitor folding mutants in *E. coli*; design, synthesis, and characterization of a protein folding intermediate analogue; folding of bovine growth hormone; inclusion bodies from proteins produced at high levels in *E. coli*; folding of a multidomain oligomeric protein: the beta subunit of *E. coli* tryptophan synthase.

IV. Intermediates in protein folding:

Understanding folding pathways and mechanisms; de novo design of helical proteins; possible intermediates in the unfolding transition of two-chain, coiled-coil proteins; the alpha subunit of tryptophan synthase: probing the multistate folding mechanism by mutagenesis; proline isomerization and folding of yeast cytochrome c.



Backbone ribbon diagram of crambin, from the chapter, "The Water Structure Surrounding Proteins," by Martha Teeter. (Courtesy of Jane Richardson; modifications by Marc Whitlow.)

V. Protein folding within the cell:

Conformations and interactions of signal peptides: elucidating the role of signal sequence in protein secretion; modulation of folding pathways of exported proteins by leader sequence; identification of amino acid sequences influencing intracellular folding pathways using temperature sensitive folding mutations; folding of collagen molecules containing mutant chains.

VI. Modeling protein folding and structure:

Theoretical studies of protein structure; polypeptide segment prediction using conformational search; supercomputing opportunities for protein sciences; diffusion-collision model of protein folding.

VII. Protein design: what can we get away with?

Diacylaminoepindolidiones as templates for β -sheets; engineering enzyme specificity by "substrate-assisted catalysis"; the use of gene fusions to study membrane protein topology.

Order from: AAAS Books, Dept. SM, P.O. Box 753, Waldorf, MD 20604 (FAX: 301-843-0159). To order by phone (VISA/MasterCard orders only), call 301-645-5643 (9am-4pm ET) and ask for AAAS. Individuals must prepay or use VISA/MasterCard. For institutional purchase orders, add \$3.50 postage & handling. Please specify item #89-18S, and allow 2-3 weeks for delivery. For shipments to California, add applicable sales tax.

American Association for the Advancement of Science