American Association for the Advancement of Science

SCIENCE

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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

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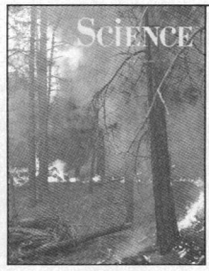
■ The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objectives are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion 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

Book Reviews

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
GÜNTER 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.

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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

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

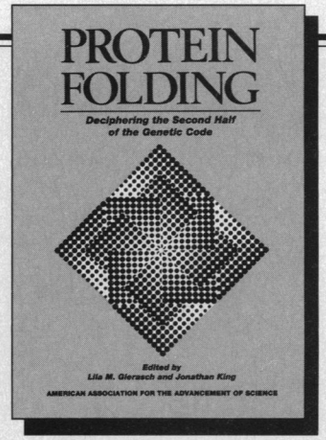
MORE than 200 million years ago, as the supercontinent Pangea was preparing to break up, terrestrial creatures also were going through a transition. Faunas dominated by synapsids (mammal-like creatures from the late Paleozoic era) gave way to a population dominated by archosaurian reptiles including 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)

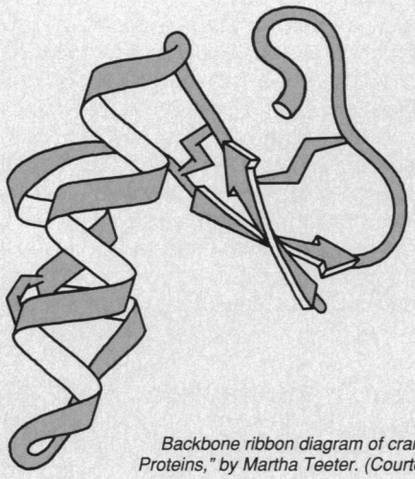
Contents:

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.

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