

767 This Week in *Science*

## Editorial

769 Regularizing "Pork": M. G. MORGAN

## Letters

772 Modern Human Origins: M. H. WOLPOFF, J. N. SPUHLER, F. H. SMITH, J. RADOVČIĆ, G. POPE, D. W. FRAYER, R. ECKHARDT, G. CLARK; C. STRINGER AND P. ANDREWS

## News & Comment

777 Chimps and Research: Endangered?

778 AIDS Report Draws Tepid Response

779 Reformers Seek Broader Military Role in Economy ■ Can the Pentagon Fight Trade Wars?

781 Soviet Biotechnology Meets Glasnost

782 ADAMHA Still Seeking to Consolidate Its Identity

784 Senate Spares USDA Grants  
DOE Asks for Two Weapons Reactors  
Human Frontier

## Research News

785 Ozone Hole Bodes Ill for the Globe

787 Seeing Chaos in a Simple System

788 Study Raises Estimate of Vietnam War Stress

789 Was Newton Wrong?

790 Secrets of an Unremarkable Star

## Articles

791 The Deficit Is Not a Well-Defined Measure of Fiscal Policy: L. J. KOTLIKOFF

795 Forces Between Surfaces in Liquids: J. N. ISRAELACHVILI AND P. M. MCGUIGGAN

800 From Epinephrine to Cyclic AMP: A. LEVITZKI

## Research Articles

806 Phase Determination by Multiple-Wavelength X-ray Diffraction: Crystal Structure of a Basic "Blue" Copper Protein from Cucumbers: J. M. GUSS, E. A. MERRITT, R. P. PHIZACKERLEY, B. HEDMAN, M. MURATA, K. O. HODGSON *et al.*

812 Signal Transduction and Transcriptional Regulation by Glucocorticoid Receptor-LexA Fusion Proteins: P. J. GODOWSKI, D. PICARD, K. R. YAMAMOTO

- SCIENCE is published weekly on Friday, except the last week in December, and with an extra issue in February 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 at an additional entry. Now combined with *The Scientific Monthly*® Copyright © 1988 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): \$70. Domestic institutional subscription (51 issues): \$110. Foreign postage extra: Canada \$32, other (surface mail) \$32, air-surface via Amsterdam \$85. First class, airmail, school-year, and student rates on request. Single copies \$3.00 (\$3.50 by mail); back issues \$4.50 (\$5.00 by mail); Biotechnology issue, \$5.50 (\$6 by mail); classroom rates on request; Guide to Biotechnology Products and Instruments \$16 (\$17 by mail). **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. 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, 21 Congress Street, Salem, Massachusetts 01970. The identification code for *Science* is 0036-8075/83 \$1 + .10. **Postmaster:** Send Form 3579 to *Science*, 1333 H Street, NW, Washington, DC 20005. *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 objects 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, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



**COVER** Dune crest in Kelso dunefield, Mojave Desert, California. Foreground ripples illustrate self-organization of fine sand bed into 10-centimeter wavelength ridges oriented perpendicular to wind during saltation. Upper lee face shows grain fall deposition of saltating grains, and subsequent failure as grain flow during later wind event, with wind blowing toward observer. See page 820. [Robert S. Anderson, California Institute of Technology, Pasadena, CA 91125]

## Reports

- 817 A Molecular Shift Register Based on Electron Transfer: J. J. HOPFIELD, J. N. ONUCHIC, D. N. BERATAN
- 820 Simulation of Eolian Saltation: R. S. ANDERSON AND P. K. HAFF
- 823 Relaxation of Isolated Ventricular Cardiomyocytes by a Voltage-Dependent Process: J. H. B. BRIDGE, K. W. SPITZER, P. R. ERSHLER
- 825 Cloning and Expression of the Human Interleukin-6 (BSF-2/IFN $\beta$  2) Receptor: K. YAMASAKI, T. TAGA, Y. HIRATA, H. YAWATA, Y. KAWANISHI, B. SEED, T. TANIGUCHI, T. HIRANO, T. KISHIMOTO
- 828 A Monoclonal Antibody to the  $\alpha$  Subunit of G $_K$  Blocks Muscarinic Activation of Atrial K $^+$  Channels: A. YATANI, H. HAMM, J. CODINA, M. R. MAZZONI, L. BIRNBAUMER, A. M. BROWN
- 832 Site of G Protein Binding to Rhodopsin Mapped with Synthetic Peptides from the  $\alpha$  Subunit: H. E. HAMM, D. DERETIC, A. ARENDT, P. A. HARGRAVE, B. KOENIG, K. P. HOFMANN
- 835 Requirement for Glycine in Activation of NMDA-Receptors Expressed in *Xenopus* Oocytes: N. W. KLECKNER AND R. DINGLEDDINE
- 837 Legless, a Novel Mutation Found in PHT1-1 Transgenic Mice: J. D. MCNEISH, W. J. SCOTT, JR., S. S. POTTER
- 840 Two Anonymous DNA Segments Distinguish the Wilms' Tumor and Aniridia Loci: L. M. DAVIS, R. STALLARD, G. H. THOMAS, P. COUILLIN, C. JUNIEN, N. J. NOWAK, T. B. SHOWS
- 842 Inactivation and Block of Calcium Channels by Photo-released Ca $^{2+}$  in Dorsal Root Ganglion Neurons: M. MORAD, N. W. DAVIES, J. H. KAPLAN, H. D. LUX

## Technical Comments

- 845 Expression of Transducin in Retinal Rod Photoreceptor Outer Segments: D. J. ROOF AND C. A. HETH; M. R. BRANN

## AAAS Meetings

- 848 AAAS Science and Security Colloquium ■ Advance Registration and Housing Form

## Book Reviews

- 852 Academic Scientists and the Pharmaceutical Industry, reviewed by D. P. JONES ■ Anti-Idiotypes, Receptors, and Molecular Mimicry, E. SERCARZ ■ Plant Strategies and the Dynamics and Structure of Plant Communities, C. B. FIELD ■ Quantum Field Theory and Quantum Statistics, B. L. HU ■ Some Other Books of Interest, K. LIVINGSTON ■ Books Received

## Products & Materials

- 857 Journal Contents on Disk ■ Freeze Dryer ■ Remote-Control Stirring Systems ■ Carbon Dioxide Incubators ■ Antibodies ■ Protein-Free Cell Culture Medium ■ Literature

### Board of Directors

Sheila E. Widnall  
*Retiring President,  
Chairman*

Walter E. Massey  
*President*

Richard C. Atkinson  
*President-elect*

Floyd E. Bloom  
Mary E. Clutter  
Eugene H. Cota-Robles  
Mildred S. Dresselhaus  
Joseph G. Gavin, Jr.  
John H. Gibbons  
Beatrix A. Hamburg  
Donald N. Langenberg  
William T. Golden  
*Treasurer*  
Alvin W. Trivelpiece  
*Executive Officer*

### Editorial Board

Elizabeth E. Bailey  
David Baltimore  
William F. Brinkman  
E. Margaret Burbidge  
Philip E. Converse  
Joseph L. Goldstein  
F. Clark Howell  
James D. Idol, Jr.  
Leon Knopoff  
Oliver E. Nelson  
Helen M. Ranney  
Robert Dorfman  
Howard A. Schneiderman  
Larry L. Smarr  
Robert M. Solow  
James D. Watson

### Board of Reviewing Editors

John Abelson  
Qais Al-Awqati  
Don L. Anderson  
Stephen J. Benkovic  
Floyd E. Bloom  
Henry R. Bourne  
James J. Bull  
Charles R. Cantor  
Ralph J. Cicerone  
John M. Coffin  
Robert Dorfman  
Bruce F. Eldridge  
Paul T. Englund  
Theodore H. Geballe  
Roger I. M. Glass

Stephen P. Goff  
Robert B. Goldberg  
Corey S. Goodman  
Jack Gorski  
Stephen J. Gould  
Richard M. Held  
Gloria Heppner  
Eric F. Johnson  
Konrad B. Krauskopf  
Charles S. Levings III  
Richard Losick  
Karl L. Magleby  
Philippa Marrack  
Joseph B. Martin  
John C. McGiff  
Mortimer Mishkin  
Jiri Novotny  
Gordon H. Orans

Carl O. Pabo  
Yeshayau Pocker  
Michael I. Posner  
Jean Paul Revel  
Russell Ross  
James E. Rothman  
Daniel V. Santi  
Ronald H. Schwartz  
Vernon L. Smith  
Otto T. Solbrig  
Robert T. N. Tjian  
Virginia Trimble  
Geerat J. Vermeij  
Harold Weintraub  
Irving L. Weissman  
George M. Whitesides  
Owen N. Witte  
William B. Wood

**American Association for the Advancement of Science** serves its readers as a forum for the presentation and discussion of important issues related to the advancement of science, including the presentation of minority or conflicting points of view, rather than by publishing only material on which a consensus has been reached. Accordingly, all articles published in *Science*—including editorials, news and comment, and book reviews—are signed and reflect the individual views of the authors and not official points of view adopted by the AAAS or the institutions with which the authors are affiliated.

**Publisher:** Alvin W. Trivelpiece

**Editor:** Daniel E. Koshland, Jr.

**Deputy Editors:** Philip H. Abelson (*Engineering and Applied Sciences*); John I. Brauman (*Physical Sciences*)

#### EDITORIAL STAFF

**Managing Editor:** Patricia A. Morgan

**Assistant Managing Editor:** Nancy J. Hartnagel

**Senior Editors:** Eleanore Butz, Ruth Kulstad

**Associate Editors:** Martha Coleman, R. Brooks Hanson, Barbara Jasny, Katrina L. Kelner, Edith Meyers, Linda J. Miller, Phillip D. Szuroni, David F. Voss

**Letters Editor:** Christine Gilbert

**Book Reviews:** Katherine Livingston, *editor*; Deborah Field Washburn

**This Week in Science:** Ruth Levy Guyer

**Contributing Editor:** Lawrence I. Grossman

**Chief Production Editor:** Ellen E. Murphy

**Editing Department:** Lois Schmitt, *head*; Mary McDaniel,

Patricia L. Moe, Barbara E. Patterson

**Copy Desk:** Joi S. Granger, Beverly Shields, Anna Victoreen, Barbara Wittig

**Production Manager:** Karen Schools

**Assistant Production Manager:** James Landry

**Graphics and Production:** Holly Bishop, James J. Olivari, Yolanda M. Rook

**Covers Editor:** Grayce Finger

**Manuscript Systems Analyst:** William Carter

#### NEWS STAFF

**News Editor:** Barbara J. Culliton

**News and Comment:** Colin Norman, *deputy editor*; William Booth, Gregory Byrne, Mark H. Crawford, Constance Holden, Eliot Marshall, Marjorie Sun, John Walsh

**Research News:** Roger Lewin, *deputy editor*; Deborah M. Barnes, Richard A. Kerr, Jean L. Marx, Robert Pool, Leslie Roberts, M. Mitchell Waldrop

**European Correspondent:** David Dickson

#### BUSINESS STAFF

**Business Staff Manager:** Deborah Rivera-Wienhold

**Classified Advertising Supervisor:** Karen Morgenstern

**Membership Recruitment:** Gwendolyn Huddle

**Member and Subscription Records:** Ann Ragland

**Guide to Biotechnology Products and Instruments:**

Shauna S. Roberts

#### ADVERTISING REPRESENTATIVES

**Director:** Earl J. Scherago

**Traffic Manager:** Donna Rivera

**Traffic Manager (Recruitment):** Gwen Canter

**Advertising Sales Manager:** Richard L. Charles

**Employment Sales Manager:** Edward C. Keller

**Marketing Manager:** Herbert L. Burkland

**Sales:** New York, NY 10036: J. Kevin Henebery, 1515 Broadway (212-730-1050); Scotch Plains, NJ 07076: C. Richard Callis, 12 Unami Lane (201-889-4873); Chicago, IL 60611: Jack Ryan, Room 2107, 919 N. Michigan Ave. (312-337-4973); San Jose, CA 95112: Bob Brindley, 310 S. 16 St. (408-998-4690); Dorset, VT 05251: Fred W. Dieffenbach, Kent Hill Rd. (802-867-5581); Damascus, MD 20872: Rick Sommer, 24808 Shrubbery Hill Ct. (301-972-9270); U.K., Europe: Nick Jones, +44(0647)52918; Telex 42513; FAX (0392) 31645.

**Information for contributors** appears on page XI of the 24 June 1988 issue. Editorial correspondence, including requests for permission to reprint and reprint orders, should be sent to 1333 H Street, NW, Washington, DC 20005. Telephone: 202-326-6500.

Advertising correspondence should be sent to Tenth Floor, 1515 Broadway, New York, NY 10036. Telephone 212-730-1050 or WU Telex 968082 SCHERAGO.

## Regularizing "Pork"

**D**espite the outcries of academic leaders, "pork barrel" science and engineering—the congressional practice of attaching pet projects to general agency appropriation bills—is becoming more common. Depending on definitions, estimates of the level of earmarked funding range from a quarter to over a third of a billion dollars a year, with between 40 and 50% attached to budgets of the Department of Energy.

Opponents argue against this behavior on the grounds that it circumvents the peer review process, may result in the funding of projects that do not deserve support on technical merit, and leads to serious inefficiencies in the allocation of scarce federal resources. They also complain that the practice has adverse consequences for federal agency research programs. Funds sufficient to cover the special projects are often not provided in appropriations. Thus, "pork barrel" projects must be supported by curtailing planned programs in the agencies.

Proponents argue that, like other federal capital programs, "pork barrel" science and engineering projects are a way to spread the wealth. Although there have been exceptions, most of these projects have involved the construction of buildings and other facilities. Never easy to obtain, in recent years capital for such facilities has become especially scarce. Proponents argue that without the facilities constructed with earmarked funds, many universities cannot write competitive proposals to secure research support through normal peer review channels. Hence, federal research monies continue to go to a few leading research centers, and the rest of the country languishes. Given the economic importance now attached to science and technology, members of Congress are not prepared to sit back while the few regions of the country with the most accomplished research groups skim, what these legislators argue are, vital regional development resources.

Both arguments have merit. The practice shows no sign of abating. This suggests that it is time to move the discussion to a different level. If "pork barrel" science and engineering cannot be stopped politically, and arguably serves positive social ends, we should be trying to regularize the practice in a formal program, not terminate it. In recent months there have been several unsuccessful efforts to begin to do this. The University Research Facilities Revitalization Act (H.R. 1905), introduced by Representative Robert A. Roe (D-NJ), is stuck in committee. Similar language was inserted and passed in the trade bill that was vetoed. Both the House and Senate versions of the National Science Foundation (NSF) authorization act contain modest programs of competitive matching facilities grants, but so far funds have not been appropriated.

These efforts represent important first steps. But none of the current proposals will provide enough resources of the right kinds to stem the pork barrel tide. Ultimately we may need two programs, both requiring matching funds and supporting only capital costs. The first should fund facilities strictly on the basis of technical merit and could be appropriately administered by NSF. The second should fund facilities on the basis of a mixed consideration of technical merit and regional need. While NSF could coordinate the technical reviews, the actual funding decisions for this second program should probably be made by an interagency group housed administratively in some other agency, perhaps the Department of Commerce. Decisions in this second program will necessarily contain a significant political dimension. Giving this responsibility to NSF runs too great a risk that political influences will spill over and contaminate other NSF decision processes.

Such a program would have the advantage of requiring Congress to make two explicit choices. First, it would have to choose the overall fraction of our nation's R&D expenditure that should be devoted to the construction of university research facilities. Second, it would have to choose what portion of these resources the nation should invest in the most cost-effective pursuit of research output, and what portion should serve the important additional goal of developing regional R&D infrastructure. Clearly these choices are too important to be made in the piecemeal way that we now make them. Having established such a program, Congress will have to enforce discipline on its members to prevent continued attachment of individual projects. There is reason to believe that if the program is successful, and large enough, such self-discipline would be possible.—M. GRANGER MORGAN, *Head, Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA 15213*