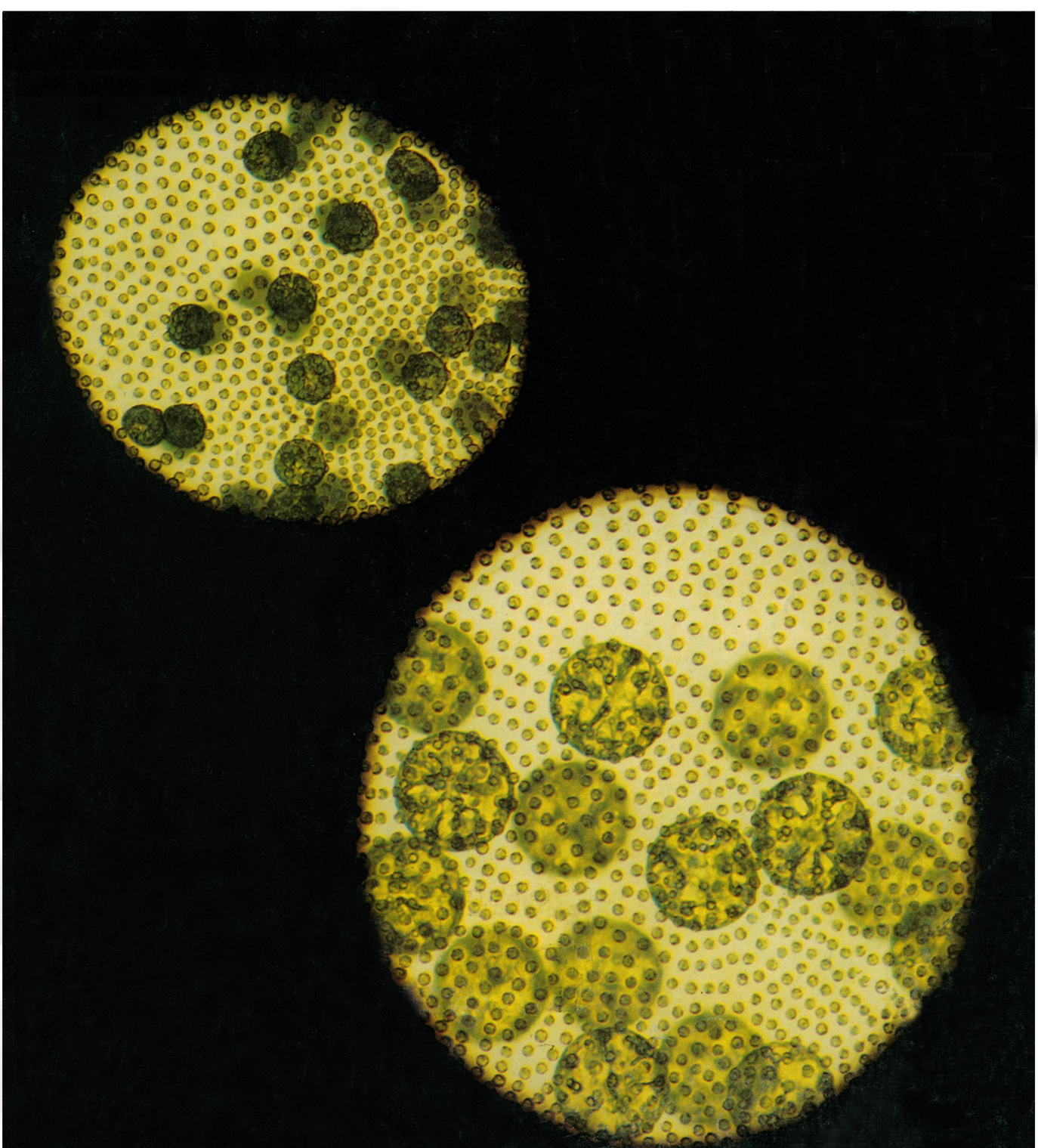
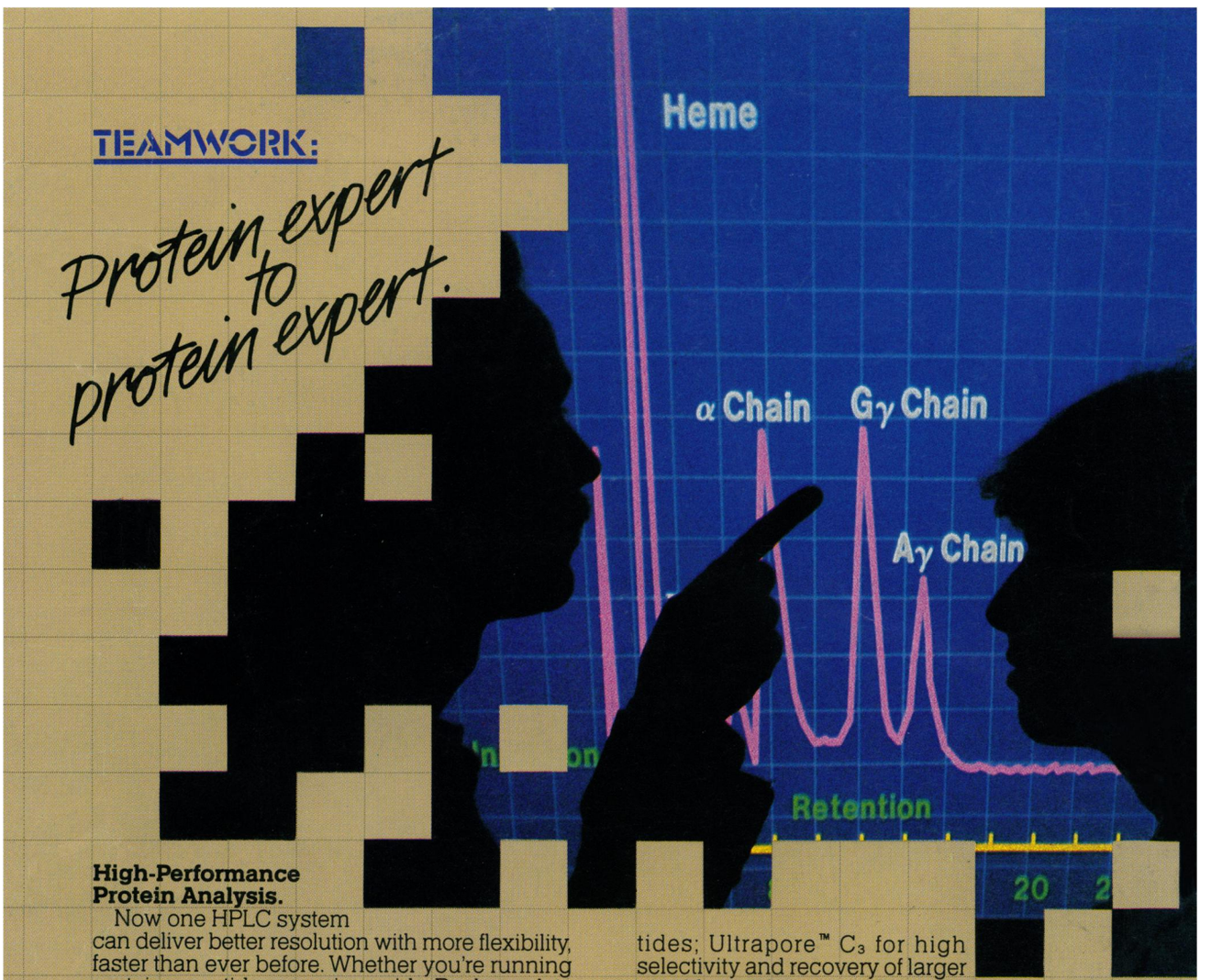
American Association for the Advancement of Science

SCIENCE

3 JANUARY 1986 $2.50
VOL. 231 ■ PAGES 1-92





TEAMWORK:

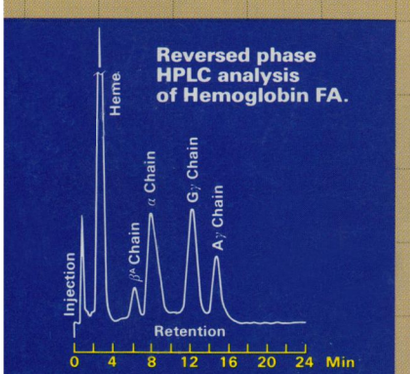
Protein expert to protein expert.

High-Performance Protein Analysis.

Now one HPLC system can deliver better resolution with more flexibility, faster than ever before. Whether you're running proteins, peptides or amino acids, Beckman lets you optimize for the precise results you want. Here's how...

Proteins: 4 methods on one flexible system.

Flexibility means being able to switch easily between reversed phase, hydrophobic interaction, ion exchange, or size exclusion chromatography. That's why our Series 340 chromatographs feature an easy-to-use programmable controller. Gradient changes are a snap! For isocratic SEC methods, our Model 114 pump assures outstanding flow control. And total flow range from 1μl - 30mL/minute for micro to semi-prep.



Peptides: Fast analysis and high recovery.

Exclusive Beckman/Altex columns for fast protein-peptide LC: Ultrasphere® C_{18} for high efficiency and resolution of small peptides; Ultrapore™ C_3 for high selectivity and recovery of larger peptides and proteins. Plus you can scale up to semi-prep with the same chemistries. 18 other chemistries. Over 100 columns in all!

Amino Acids: Versatile and economical HPLC.

Modular design means you can optimize for amino acids, too. Choose chemistries for pre- or post-column derivitization. Ion exchange or reversed phase methods. UV or fluorescence detection.

Let's Talk: One expert to another.

With 50 years of experience in the life sciences, Beckman gives you unparalleled support and expertise with our worldwide network of applications specialists, sales and service representatives. For help with bioresearch HPLC, expert-to-expert, call or write—

North America: Beckman Instruments, Inc., Altex Scientific Operations, 1716 Fourth Street, Berkeley, CA 94710 USA. Phone: 415/527-5900.

Europe: Beckman Instruments, International SA, 17 Rue des Pierres-Du-Niton, 1211 Geneva 6, Switzerland. Phone: 022/36 20 70.

BECKMAN

Circle No. 71 on Readers' Service Card

THE SIXTH ANNUAL CONGRESS FOR
RECOMBINANT DNA RESEARCH
JANUARY 26 - 29, 1986
BALTIMORE CONVENTION CENTER, BALTIMORE, MARYLAND

Co-Chairmen:

John D. Baxter, Univ. of California, San Francisco, CA • Walter L. Miller, Univ. of California, San Francisco, CA • Peter Gruss, Univ. of Heidelberg, West Germany

DNA PROGRAM

Keynote Addresses
Interferon Genes and Their Expression: Charles Weissmann, University of Zurich, Zurich, Switzerland
Gene Expression in Mammalian Cells: Phillip Sharp, Massachusetts Institute of Technology, Cambridge, MA

ONCOGENES
Session Chairman: Peter Gruss, University of Heidelberg, Heidelberg, West Germany
The Role of Papillomaviruses in Human Cancer: H. zur Hausen, University of Heidelberg, Heidelberg, West Germany
The neu Gene Product: Growth Factor Receptor and Tumor Antigen: Robert Weinberg, Massachusetts Institute of Technology, Cambridge, MA
Modulation of the Malignant Phenotype by the Expression of MHC Class I Genes: Gilbert Jay, National Institute of Health, Bethesda, MD
Expression of AIDS Retrovirus: Paul Luciw, Chiron Corporation, Emeryville, CA

TRANSCRIPTION
Session Chairwoman: Pamela Mellon, Salk Institute, La Jolla, CA
Expression of Gonadotropin Genes: Pamela Mellon, Salk Institute, La Jolla, CA
Mechanisms of Transcriptional control in Animal Cells: Steven McKnight, Carnegie Institute, Washington, DC
Factors and Mechanisms Involved in the Regulation of Eukaryotic Transcription: Robert Raeder, Rockefeller University, New York, NY
Mechanisms of Human β Interferon Gene Regulation: Thomas Maniatis, Harvard University, Cambridge, MA

MEDICAL MOLECULAR BIOLOGY
Session Chairman: Walter L. Miller, University of California, San Francisco, CA
Molecular Biology of Steriod Hormone Synthesis: Walter L. Miller, University of California, San Francisco, CA
Molecular Biology of HTLV-III: Basic Studies and Applications for Prevention of AIDS: Flossie Wong-Staal, National Institutes of Health, Bethesda, MD
Molecular Basis of Phenylketonuria and Potential Somatic Gene Therapy: Savio L.C. Woo, Baylor College of Medicine, Houston, TX
Models for Human Gene Therapy: Theodore Friedmann, University of California, San Diego, CA
Structure and Biology of Prions Causing Scrapie and Creutzfeld-Jakob Disease: Stanley Pruisner, University of California, San Francisco, CA

HORMONES
Session Chairman: John D. Baxter, University of California, San Francisco, CA
Hormonal Control of Growth Hormone Gene Expression: John D. Baxter, University of California, San Francisco, CA
Steriod Hormone Receptors as Trans-Acting Gene Regulators: Miguel Beato, Institute of Molecular Biology, Marburg, West Germany
Structure and Expression of the Human Glucocorticoid Receptor: Ron Evans, Salk Institute, La Jolla, CA
Steriod Regulation of Transcription in Avian Species: Bert O'Malley, Baylor College of Medicine, Houston, TX

PLANTS
Session Chairman: Frederick Ausubel, Massachusetts General Hospital, Boston, MA
Molecular Genetics of Symbiotic Nitrogen Fixation: Frederick Ausubel, Massachusetts General Hospital, Boston, MA
Transposable Elements in Maize: Nina Federoff, Carnegie Institute, Washington, DC
Phytochrome Mediated and Organ-Specific Expression of Monocot and Dicot Genes in Transgenic Plants: Nam Hai Chua, Rockefeller University, New York, NY

DEVELOPMENTAL BIOLOGY
Session Chairwoman: Shirley Tilghman, Fox Chase Cancer Center, Philadelphia, PA
Developmental Regulation of Cloned α – Fetoprotein Genes in Cells and Mice: Shirley Tilghman, Fox Chase Cancer Center, Philadelphia, PA
Molecular Probes for the Development and Plasticity of the Neural Crest: Richard Axel, Columbia University, New York, NY
RNA Localization in Transcription during Frog Embryogenesis: Douglas Melton, Harvard University, Cambridge, MA
Genetic and Mutational Analysis of Embryogenesis in Drosophilia: Eric Wieschaus, Princeton University, Princeton, NJ
Homeobox – Containing Mouse Genes and Their Expression During Mouse Developmental Processes: Peter Gruss, Univ. of Heidelberg, W. Germany

NEUROBIOLOGY
Session Chairman: James L. Roberts, Columbia University, New York, NY
The Identification of a New Brain Hormone: The Pro-GnRH Molecule and its Physiology: Peter Seeburg, Genentech, Inc., South San Francisco, CA
Gene Expression in Identified Aplysia Neurons: Richard Scheller, Stanford University, Palo Alto, CA
Expression of Opiate Peptide Genes in Heterologous Cell Systems: Edward Herbert, Oregon Health Sciences University, Portland, OR
Transcriptional Regulation of Gene Expression in Neuroendocrine Cells: James L. Roberts, Columbia University, New York, NY

YEAST
Session Chairman: Jack Szostak, Massachusetts General Hospital, Boston, MA
Behavior of Artificial Chromosomes in Yeast: Jack Szostak, Massachusetts General Hospital, Boston, MA
Positive Activation of the his 3 Promoter: Kevin Struhl, Harvard Medical School, Boston, MA
Genetic Recombination in Yeast: Rodney Rothstein, Columbia University, New York, NY
Ty Element Transposition: Jef Boeke, Johns Hopkins School of Medicine, Baltimore, Maryland

POSTER SESSIONS AND EXHIBITS

REGISTRATION FEES:

$400	On-site registration – includes a one year subscription or renewal to the journal, DNA.
$350	ADVANCE REGISTRATION – (Received by Dec. 1) – Includes a one year subscription or renewal to the journal, DNA.
$ 75	STUDENT REGISTRATION – Student status must be confirmed in writing by department chairman. Does not include journal subscription.
4-7	registrations received together from same organization $300 each. Includes 4 journal subscriptions only.
8-10	registrations received together from same organization $200 each. Includes 4 journal subscriptions only.

Larger group rates available upon request. Cancellations must be received in writing by Dec. 19, 1985.

Attendance will be limited. Make checks payable to: **Scherago Associates, Inc., DNA** S-1-3

☐ Please reserve _____ space(s): Registration Fee of $ _____ enclosed.
☐ Please send abstract form.

Name _____

Dept. _____ Organization _____

Street _____

City _____ State _____ Zip _____

Telephone: ( ) _____

Return to: **DNA; c/o Scherago Associates, Inc.,** 1515 Broadway, Dept. S-1-3, New York, NY 10036 • (212) 730-1050

Circle No. 3 on Readers' Service Card

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SCIENCE

ISSN 0036-8075
3 JANUARY 1986
VOLUME 231
NO. 4733

■ **SCIENCE 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 at an additional entry. Now combined with **The Scientific Monthly®** Domestic individual membership and subscription (51 issues): $60. Domestic institutional subscription (51 issues): $98. Foreign postage extra: Canada $24, other (surface mail) $27, air-surface via Amsterdam $65. First class, airmail, school-year, and student rates on request. Single copies $2.50 ($3 by mail); back issues $4 ($4.50 by mail); Biotechnology issue, $5.50 ($6 by mail); classroom rates on request. **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. **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 Two spheroids (individuals) of the green alga *Volvox carteri*. The lower spheroid is asexual, with sixteen large reproductive cells that divide to produce a new generation, which is normally asexual also. But when heat shocked, females produce egg-bearing sexual daughters (shown above) and males produce sperm-laden sexual sons. Then eggs and sperm combine to produce heat- and desiccation-resistant zygotes. See page 51. [David L. Kirk, Washington University, St. Louis, MO 63130]

Reports

AAAS News

Book Reviews

Products & Materials

Make Stat Magic

MORE! STATS, POWER IMPROVED! FILE HANDLING, REPORTING

Statistics, reports and plots happen magically with SPSS/PC+™ —*the* enhanced and expanded Statistical Package for IBM PC/XT/AT's.*

SPSS/PC+ is the most comprehensive statistical program for performing simple or complex tasks. For nearly 20 years, SPSS Inc.'s reputation and reliability as the leading producer of mainframe statistical and reporting software is unsurpassed. SPSS/PC+ carries this reputation into the PC environment.

SPSS/PC+ — Fully integrated: report writing, plotting, file management, communications with mainframes. Statistics: descriptives, crosstabulation, multiple regression, ANOVA. Simple facilities allow transfer of files between SPSS/PC+ and programs like Lotus 1-2-3, dBASE III, and SAS.®

SPSS/PC+ Advanced Statistics™ — Factor, cluster, discriminant and loglinear analyses, MANOVA.

SPSS/PC+ Tables™ — Presentation-quality tabular reporting. Produce stub and banner tables. Handle multiple response survey data. Control content and layout completely.

SPSS/PC+ documentation is rated Number One by both novices and experienced analysts. SPSS Inc. also offers a full training schedule and a customer support hot-line.

To order, contact our Sales Department at

312/329-3500

SPSS Inc., 444 N. Michigan Avenue, Chicago, IL 60611, 312/329-3500.
In Europe: SPSS Europe B.V., 4200 AC Gorinchem, The Netherlands, Phone: +31183036711 TWX:21019.

SPSS inc. PRODUCTIVITY RAISED TO THE HIGHEST POWER™

*SPSS/PC+ runs on the IBM PC/XT/AT with hard disk. Contact SPSS Inc. for compatible microcomputers.

Circle No. 70 on Readers' Service Card

This Week in
SCIENCE

Process of salt-finger evolution licked in lab

A close-packed array of rising and sinking columns of fluid (called salt fingers because the first ones were studied in salt solutions) forms when an interface separates a slow diffusing (upper) solute from one (lower) that diffuses more rapidly (page 39). Salt fingers are known to form in stars, in the ocean, and in the earth. Taylor and Veronis studied the formation of salt fingers in a thin glass chamber. As soon as a barrier between sugar (on top) and salt (on bottom) solutions was removed, salt fingers began to form, and a photographic record of the entire process of interdigitation was made. As a result of this analysis on a microscale, mathematicians should be able to put numbers to the phenomenon and make predictions about salt-finger evolution.

Monoclonal antibodies in malarial therapy

Human antibodies to a surface component of *Plasmodium falciparum* could have therapeutic value in malaria (page 57). In culture, the antibodies prevent parasites from entering red blood cells. Lymphocytes producing antibodies were taken from a person who showed strong immunity to the parasite and were transformed by virus and maintained in culture; single clones of cells making so-called monoclonal antibody to the Pf 155 surface antigen were eventually obtained. The antigen is part of the parasite's coat during several stages of its life cycle, is deposited in red blood cell membranes when the parasite invades such cells, and is considered a major vaccine candidate. In areas of Africa where *P. falciparum* malaria is widespread, the presence of antibody to the Pf 155 antigen correlates with immunity, suggesting that the antibody indeed plays a protective role. Udomsangpetch *et al.* found that the monoclonal antibodies reacted with the surfaces of infected red blood cells and with the surfaces of several forms of the parasite; they will be useful reagents for analyses of changes in the parasites and infected cells during various stages of the disease. More important, the antibodies prevented parasites from invading red blood cells in culture and can now be evaluated for this inhibitory activity in the body.

Heat shock induces sexuality in *Volvox*

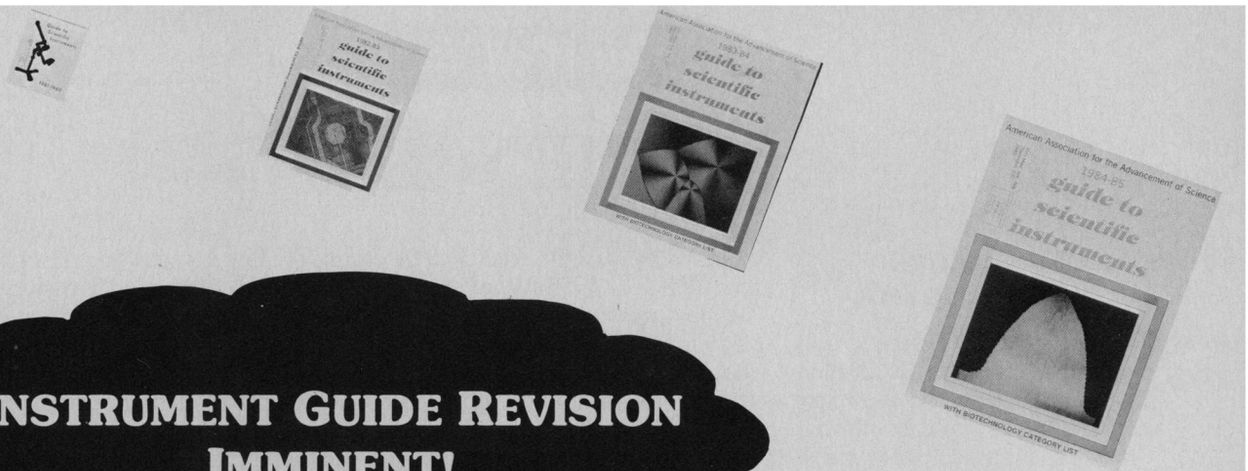
The protozoan *Volvox carteri* (cover) reappears each spring in temporary ponds (page 51). The successful overwintering of this species may result from a heat-shock response: asexual individuals release a heat-shock protein into the pond as the water warms up, the protein induces a sexual phase in females and males, and zygotes form within spores that remain dormant until the following spring. Perpetuation of the species is thus unimpaired by desiccation of the pond. Kirk and Kirk found that both asexual females and "sterile" males (normally unable to make the sexual inducer) released the inducer when exposed to heat. (Under conditions unrelated to heat shock, only sexual males produce the inducer.) After heat shock, inducer release was very rapid, 100 percent sexual granddaughters were produced, and typical zygotes formed. The inducer's activity could be destroyed by an antibody that also reacts with inducer molecules produced by sexual males. In the wild, *V. carteri* may thus survive seasonal changes by shifting from an asexual to a sexual phase before the summer sun dries up its habitat.

Smoking damages placental DNA

When a woman smokes during pregnancy, particles from the smoke bind to DNA in the placenta and form unusual compounds or adducts (page 54). Similar adducts have been found to form in association with smoking and other environmental pollutants and are thought to contribute to tumor formation in nonpregnant individuals. Everson *et al.* identified adducts in placental tissue using both an antibody test and autoradiographic analysis of fragmented placental DNA into which a radioactive label had been incorporated. Whereas 16 of 17 smokers had the peculiar compounds, only 3 of 14 nonsmokers did. Of the nonsmoker group, the one with the most intense adduct signal was a woman who, during her pregnancy, was exposed to smokers 16 hours a day. Smoking is known to alter the morphology of the placenta; some of these alterations may result from the formation of smoke-related adducts. In other fetal and maternal tissues, adducts may also be forming and producing developmental defects in the fetus and tumors in the fetus or mother.

Osmotic adaptation by bacteria

Complex sugars in the space between the outer and inner membranes of Gram-negative bacteria may regulate fluid uptake and prevent these organisms from filling with water and swelling in solutions of low solute concentration (page 48). In the periplasmic space, *Escherichia coli* have oligosaccharides (MDO) that are composed of 6 to 12 units of glucose linked by $(1 \rightarrow 2)$-beta- or $(1 \rightarrow 6)$-beta-bonds. In high osmolarity media, little MDO is synthesized, whereas in low osmolarity media, MDO may constitute 5 to 7 percent of the dry weight of the cell. Soil bacteria, *Agrobacterium* and *Rhizobium*, also contain complex sugars with $(1 \rightarrow 2)$-beta-linkages. Miller *et al.* show that these sugars in *A. tumefaciens* are also osmoregulated, consist of 17 to 23 glucose units, and are localized within the periplasmic space. Thus, Gram-negative bacteria from very different sources, the gut (*E. coli*) and the soil (*A. tumefaciens*), appear to share a mechanism—the diversion of cellular machinery to the synthesis of oligosaccharides—for adapting to low osmolarity environments.

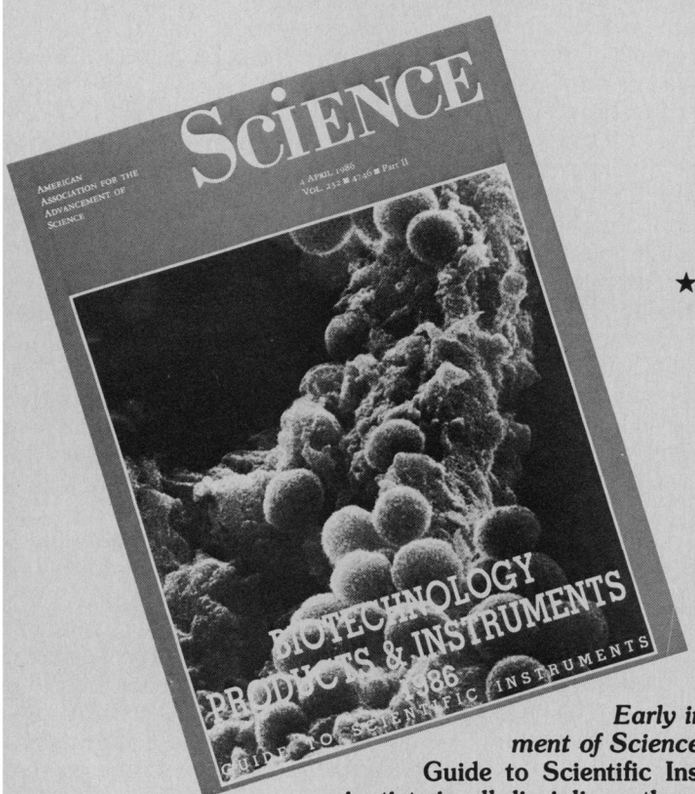


INSTRUMENT GUIDE REVISION IMMINENT!

Improved Coverage
with Emphasis on BIOTECHNOLOGY PRODUCTS

★ **MORE MANUFACTURER LISTINGS**

★ **CONVENIENT CATEGORY GROUPINGS**



★ **EDITORIAL INTRODUCTION TO TECHNIQUES**

★ **FREE TO AAAS MEMBERS**

★ **SPRING PUBLICATION DATE**

Early in April 1986, The American Association for the Advancement of Science will present an improved, revised edition of its popular Guide to Scientific Instruments. *Long the preferred purchasing reference for scientists in all disciplines, the new* Guide to Biotechnology Products & Instruments *will assume its place at the right hand of researchers. The new Guide will be part of a regular issue of* Science.

SCIENCE

3 JANUARY 1986
VOLUME 231
NUMBER 4733

A New Look

Acquiring a new appearance has elements of great expectations and callous ingratitude. Whenever I buy a new suit, I see the old suit lying there limply as if imploring me to remember how the pants got shiny in involuntary confinement behind a desk, the buttons came loose before the gale-force winds of irate authors, the sleeves got frayed in the abrasive friction of writing editorials. Only an ingrate would discard an old garment that had fought the good fight for so many years to take on the transient superficiality of a narrow lapel or a cuffless pant. Loyalty, however, is no match for a clever salesman opining that the new suit exudes youth, charm, authority, sophistication and, most important, successfully conceals the equatorial bulge.

Journal redesign evokes some similar emotional elements. The familiar format—the old type and logo, the recognized order of features, the friendly layout, and the clean white spaces—can be deserted only by what seems an act of treachery. Yet like old-fashioned suits, old formats can become unserviceable. New typefaces become available; readers' styles change; new features are called for. Neither the journal nor its readers and their environment stay constant. We at *Science* initiated an analysis of ways in which we could optimize ease of reading and improve the appearance of our news and research presentations. We were guided in this venture by an imaginative designer, Kathleen Wilmes Herring.

We have rearranged the order of departments so that the brief features through which readers may like to browse are in the front. The reader can inspect the Table of Contents, turn a page to This Week in *Science*, turn another to the Editorial, and another to Perspective (an occasional feature), and then continue to Letters.

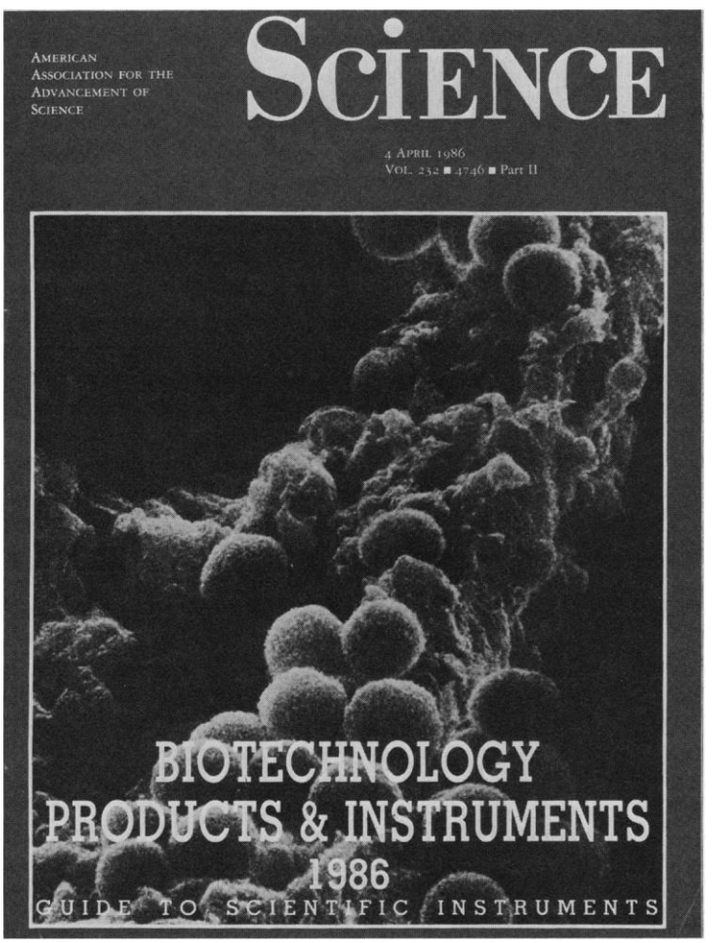
News occupies the first major section in the core of the magazine; it has the widest interdisciplinary content and readership. In 1986 we plan to expand coverage of science news and policy both in News & Comment and in Research News. We will also be expanding coverage of areas that have been underrepresented in *Science* in the past—the physical and social sciences.

Original contributions to research—Articles, Research Articles, and Reports—are grouped together in the next section. This allows us to introduce more color into these pages, thus providing an additional service to authors and readers. Book Reviews, AAAS News, and Products & Materials follow. A new typeface, Galliard, has been introduced to increase readability. Column widths vary to provide variety. New features will be added in time.

A design touch, the dot over the capital I, may elicit comment. To some it will represent the height of modernism, a sign that *Science* is becoming avant-garde and moving with the new era. To others, it will be the triumph of the typographical error over the forces of scholarship. To me, it represents a balloon rising above earthbound reality from which to look forevermore for distant intellectual horizons. It represents the light at the end of the tunnel, the globe whose environment we must study and protect, the hole in the argument that must be plugged. It is the beginning of the Big Bang, the first wheel, the peephole into the future, the period at the end of Q.E.D. It symbolizes imagination and the willingness of scientists to battle conformism, for these lie at the heart of all great science.

Cosmetic surgery does not change inner character; what is inside *Science* still reflects its truest self. Nevertheless, a new outfit transmits the message that the wearer intends to keep up with the times and is sensitive to the changing audience. " 'Beauty is truth, truth beauty,'—that is all ye know on earth, and all ye need to know." Keats' words understate the goals of our science journal. We strive to deliver truth, beauty, excitement, comprehensive news coverage, research at the cutting edge, incisive editorials, balanced viewpoints, erudite book reviews, and much more. As we admire that dashing figure in the mirror, we are convinced that we can do it all.—DANIEL E. KOSHLAND, JR.

WATCH FOR US THIS SPRING!



★ **REORGANIZED LISTINGS BY PRODUCT GROUPS**

★ **RAPID RESPONSE TELEPHONE NUMBERS WITH LISTINGS**

★ **MULTIPLE LOCATION LISTINGS FOR MANUFACTURERS**

★ **INTERDISCIPLINARY WITH EMPHASIS ON BIOTECHNOLOGY**

★ **EXPANDED OFFERING OF CHEMICAL MATERIALS**

★ **EASIER-TO-READ 4-COLUMN FORMAT**

★ **MANY NEWLY EXPANDED CATEGORIES**

Early in April, AAAS will present the 1986 Guide to Scientific Instruments. *As part of a regular issue of* Science, *it will be mailed to all AAAS members. This familiar, useful reference work is of value to any scientist, researcher or purchaser of scientific equipment and supplies. Past issues offered nearly 2,000 manufacturers and included 5,000 categories and cross references. The new revised* Guide *promises to be more comprehensive.*