American Association for the Advancement of Science

SCIENCE

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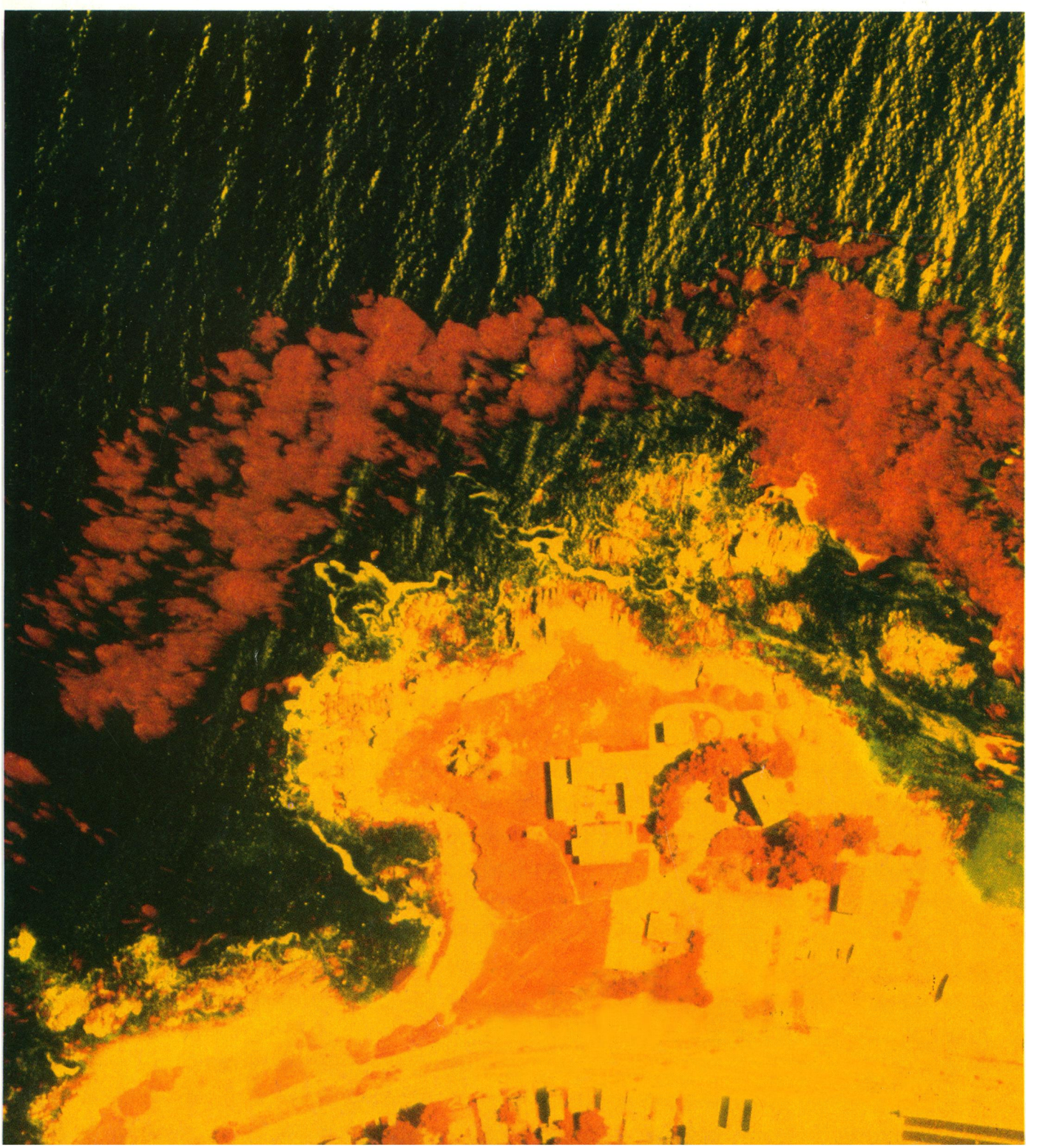

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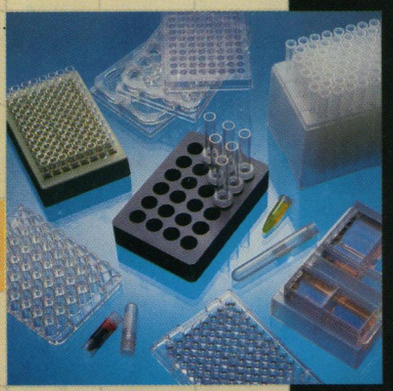

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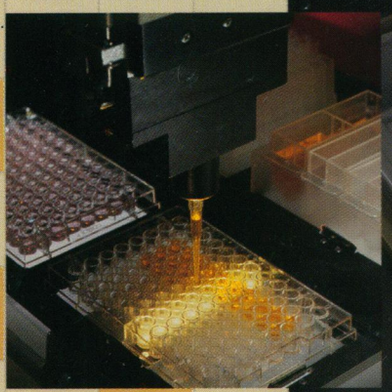

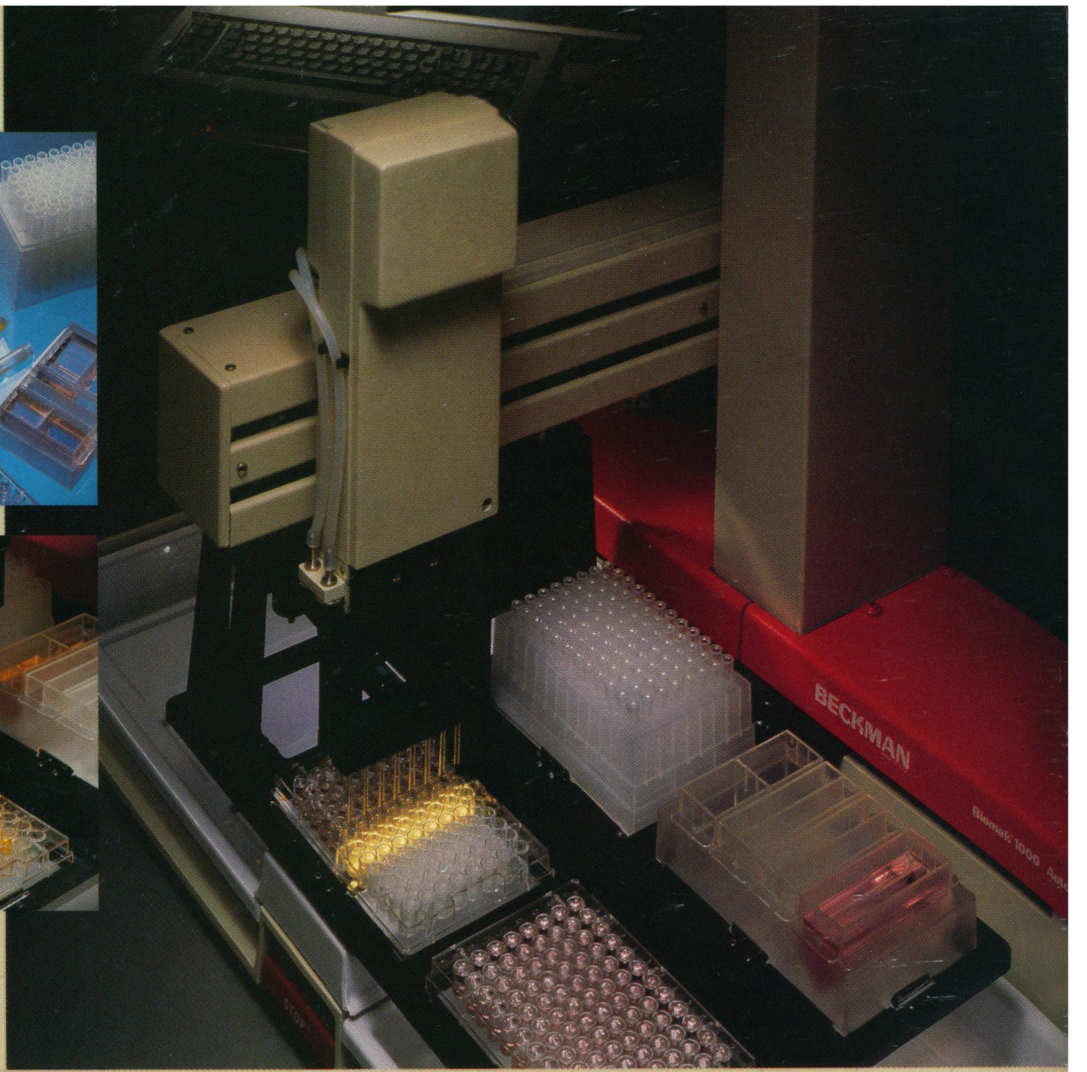

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SCIENCE

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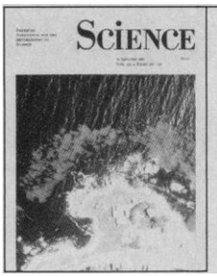
■ The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to foster scientific freedom and responsibility, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.



COVER Aerial photograph of the kelp forest fringing the rocky intertidal zone at Hopkins Marine Station on Monterey Bay, California. Infrared film renders the kelps red. Fish, living in this kelp forest, affect recruitment to the adjacent intertidal barnacle population showing that the dynamics of the two communities are coupled. See page 479. [Slide courtesy of the California Department of Fish and Game; print by R. Gilbert]

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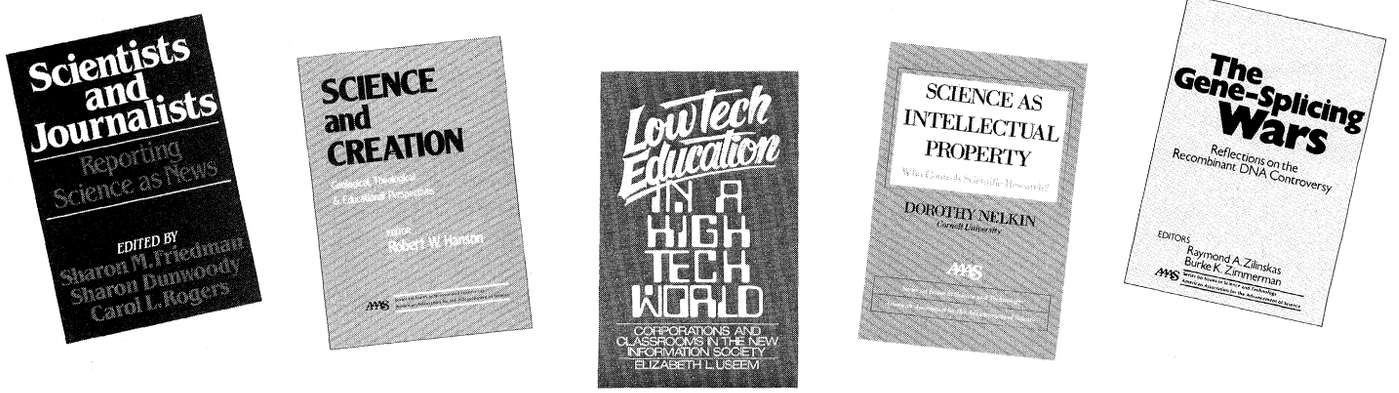

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Edited by Sharon M. Friedman, Sharon Dunwoody, and Carol L. Rogers

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Science and Creation: Geological, Theological, and Educational Perspectives

Edited by Robert W. Hanson

The creation/evolution controversy is examined by scientists, theologians, educators, and historians. These authors view the controversy as a false dichotomy and as an attempt to force a choice between two ideas that are not mutually exclusive. Includes case studies from several states.

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Low Tech Education in a High Tech World: Corporations and Classrooms in the New Information Society

Elizabeth L. Useem

Are students in the U.S. developing the skills necessary for a high technology society, or will it be technological boom, educational gloom? Useem examines education in California's "Silicon Valley" and Boston's Route 128, two of the country's leading high tech centers, and suggests ways for education and industry to forge a stronger partnership for the future.

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Science as Intellectual Property: Who Controls Scientific Research?

Dorothy Nelkin

Who controls research? A growing number of legal and administrative disputes raise critical issues of professional sovereignty, scientific secrecy, and proprietary rights. Nelkin offers cases illustrating the dilemmas that arise as the interests of scientists, the rights of citizens, and the security needs of government and industry come into increasing conflict.

1984, 130 pp., softcover; $10.00, AAAS members $8.00

The Gene-Splicing Wars: Reflections on the Recombinant DNA Controversy

Edited by Raymond A. Zilinskas and Burke K. Zimmerman

Questions of safety and ethics about recombinant DNA techniques continue to surface. This book takes a look at historical, political, industrial, scientific, and international aspects of these issues. The authors show how lessons learned from the experience can be used to cope with similar issues in the future.

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This Week in
SCIENCE

Angiogenesis

FORMATION of new capillary blood vessels or angiogenesis accompanies many normal and pathologic processes in the body—ovulation, wound healing, tumor growth, chronic inflammation, immune reactions, diabetic retinopathy, neovascular glaucoma, rheumatoid arthritis, and others (page 442). Sometimes a disease, called an angiogenic disease, appears to be the direct consequence of angiogenesis. The growth of blood vessels requires both cell proliferation and locomotion; it is promoted by angiogenic factors that either directly stimulate these processes or stimulate other factors that then induce vessel growth. Folkman and Klagsbrun discuss the history of angiogenesis research, the angiogenic factors that have been characterized (some have been cloned and sequenced, others are less well defined), and the methods that have been developed for analyzing this crucial physiologic process. Since angiogenic factors have been isolated from many tissues, the interesting question is raised as to how the process is, in the healthy body, kept under control so that rampant vessel growth does not occur at the wrong times but can be initiated rapidly when needed.

Crystallin gene expression

CRYSTALLIN proteins are stable structural components distributed nonuniformly in the vertebrate lens (page 456). Goring *et al.* used a "reporter" gene—the *lacZ* gene that produces a detectable enzyme, β-galactosidase—to study when the gene for the γ-crystallin protein had been active during development. A piece of DNA was constructed with the *lacZ* gene so situated that its regulation was controlled by the regulators of the γ-crystallin gene. The engineered DNA was inserted into fertilized eggs; several transgenic mice resulted whose DNA contained the integrated hybrid gene. Single cells expressing the β-galactosidase gene were detected; only cells in the nucleus of the lens, not the cortex and not epithelial cells at its anterior, had the reporter gene. Since growth of the lens involves migration of cells toward the center, centrally located cells are those that were active at the earliest time in development. This strategy can be used to study gene activation of other genes—of particular interest are those in the nervous system—to which the *lacZ* gene can be fused.

Local pollution: Gone with the wind

SCIENTISTS are often accused of having their heads in the clouds; some are actually doing experiments there (page 460). In 1985, Dickerson *et al.* flew several research aircraft in and out of a severe thunderstorm over Oklahoma, sampling trace gases (such as reactive nitrogen compounds) and recording other meteorologic parameters to investigate how the storm affected the dispersal of pollutants. The findings were supplemented with radar, satellite, and balloon sounding data. Generally, most anthropogenic pollutants (photochemicals, acids) remain in the lower part of the troposphere (below 1 kilometer) for brief periods, contributing to smoggy air and eventually being deposited as acid rain or snow. Movement of atmospheric gases and particles upward occurs slowly (in a matter of months), but computer simulations had suggested that, in a storm, upward movement by convection could be accelerated enormously (to a matter of hours); and, once transported to the upper troposphere, pollutants would then be dispersed more widely as a result of the higher wind speeds in that layer and because the lifetimes of gases are longer in the low temperatures and in the absence of rain. The experiments confirmed the prediction of rapid transport of atmospheric pollutants to the stratosphere. A role for the turbulent actions of thunderstorms must, therefore, be considered in models of how local pollution affects global pollution.

Validity of mixing-length theory

THE mixing-length theory of convection is used for calculating stellar and solar structures (page 465). The assumption is made that heat transfer occurs by the motion of packets of fluid that travel a distance—the mixing length—before they blend into the surroundings. The theory has been used for three decades, but experimental verification is not yet feasible, and the theory has not previously been tested mathematically. Chan and Sofia performed three-dimensional numerical simulations in situations where convection is deep and efficient. Although simplifying features of convective flow in stratified compressible media, the mixing-length approximation was found to have basic physical validity and to be adequate for roughly computing flux in such systems.

Coastal ecology

A good season for a central California coastal kelp and rockfish community signals a bad season for an onshore barnacle community (page 479). Large forests of kelp stretch offshore down the American Pacific coast (cover); forest size (sometimes as long as 8 kilometers) depends on local storm effects, currents (such as those caused by El Niño), and the presence of otters and other predators in the area. Living within the kelp forests are rockfish, with sometimes as many as 100 juveniles crowding into an area of 1 cubic meter. Inshore, barnacles cling to the rocky intertidal zone. Adult barnacles release larvae, the larvae are carried offshore, and new larval recruits to the rocks are those that successfully navigate from the offshore region through the kelp forest to the inshore rocks. Gaines and Roughgarden found that the larger the kelp and rockfish populations, the fewer larvae arrived at the rocks; larvae were found in the stomachs of the rockfish. The well-being of the onshore community is thus closely connected to that of the community offshore.

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Joseph Davie, Washington University, St. Louis, MO

SESSIONS

KEYNOTE ADDRESS (Sunday P.M.)
Genetics and Biochemistry of Retroviral Replication
Stephen Goff, Columbia University, College of Physicians and Surgeons
Left-Handed and Right-Handed DNA in Genetic Recombination
Alexander Rich, Massachusetts Institute of Technology

ACQUIRED IMMUNE DEFICIENCY SYNDROME (AIDS)
(Monday A.M. - P.M.)
Chairman: Erling Norrby, Karolinska Institutet, Stockholm, Sweden
Speakers: Luc Montagnier, Paris
Robert C. Gallo, Bethesda
Jay A. Levy, San Francisco
Simon Wain-Hobson, Paris
Flossie Wong-Staal, Bethesda
William Haseltine, Boston
Myron Essex, Boston
Robin Weiss, London
Dani P. Bolognesi, Durham
Bernard Moss, Bethesda

TRANSGENIC MICE AS TOOL IN IMMUNOLOGY (Tuesday A.M.)
Chairman: Davor Solter, The Wistar Institute
Speakers: Rudolf Grosschedl, U.C.S.F.
Ken-Ichi Yamamura, Kumamoto Univ. Medical School
Jean-Claude Weill, Institute Jacques-Monod
Barbara A. Knowles, The Wistar Institute

WORKING GROUP MEETINGS
This year we are planning two Working Groups:
A. IMMUNOTHERAPY – Chairman, Michael Mastrangelo
Thomas Jefferson University Hospital
B. IMMUNODIAGNOSIS – Chairman, Edgar Haber
Massachusetts General Hospital

ANTI-IDIOTYPE VACCINES (Tuesday P.M.)
Chairman: J. Donald Capra, University of Texas
Speakers: Katheryn Meek, Univ. of Texas Health Science Center At Dallas
Ronald C. Kennedy, Southwestern Foundation for Biomedical Research
Dorothee Herlyn, The Wistar Institute
Karl Erik Hellström, Oncogen Inc.
David Sacks, N.I.H.

THE USE OF HYBRIDOMAS IN DETERMINING CYTOKINE STRUCTURES AND FUNCTIONS (Wednesday A.M.)
Chairman: Robert Schreiber, Washington University
Speakers: Robert Coffman, DNAX Research Institute
Frank Fitch, Pritzler School of Medicine
Carl Pierce, Washington University School of Medicine
Robert Schreiber, Washington University

ANTI-CARBOHYDRATE MAB'S IN THE STUDY OF GLYCOLIPID-MEDIATED CELLULAR EFFECTS (Wednesday a.m.)
Chairman: Jan Thurin, The Wistar Institute
Speakers: David A. Cheresh, Scripps Clinic & Research Foundation
Tomas Brodin, The Wallenberg Laboratory
Bruce Fenderson, Fred Hutchinson Cancer Research Center
Nobuo Hanai, Fred Hutchinson Cancer Research Center

SUMMARY (Wednesday P.M.)
Chairman: Joseph Davie, Washington University School of Medicine

Working groups will meet in closed sessions. It is our intent to select participants actively involved in the above listed research for in-depth discussion of progress made recently. The consensus reached by working groups will be presented to the whole Congress and results of these discussions will be published in Hybridoma.

Investigators interested in participating in these Group Meetings should send a short summary to Dr. Zenon Steplewski, The Wistar Institute, Thirty Sixth Street At Spruce, Philadelphia, PA 19104. (215) 898-3924 by January 10, 1987.

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SCIENCE

23 JANUARY 1987
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Techniques and Strategies of Verification

In this issue of *Science* we publish a Policy Forum on one of the most important controversies of our time: the verification of arms control agreements. The format differs from that of previous Policy Forums in that the two participants were asked to answer specific questions rather than to present broad arguments. In the nomenclature of "hawks, doves, and owls," Sidney Drell would generally be identified as a dove, and Manfred Eimer would appear on the side of the hawks; both would qualify as owls because of their wisdom and extensive experience with arms control.

Not only is this Policy Forum likely to be informative to those who have an interest in, but little knowledge of, the techniques of verification, but it also illustrates an important principle of most public debates between experts—that there are basic areas of agreement as well as disagreement. Thus, both Drell and Eimer agree that construction of the Russian radar station at Krasnoyarsk violates the Antiballistic Missile Treaty; that the trustworthiness of treaty signatories is crucial, regardless of the military significance of a violation; that the asymmetry between the closed society of the Soviet Union and the largely open society of the United States puts special burdens on arms control verification; that the United States should not be involved in a disinformation strategy; that the Standing Consultative Commission can effectively resolve ambiguities but not deliberate violations; and that a proportionate response is the appropriate strategy for a confirmed treaty violation. This consensus is significant because it indicates a measure of stability and professionalism within this important area of national policy. Most negotiations that surface with great public clamor during the tenure of one president are actually the result of years of preparation involving several presidents and quite different public political images.

That there are areas of agreement does not imply that the disagreements are unimportant or minor. For example, Eimer states that the encryption of missile tests and the new Soviet SS-25 missile are clear violations of the Strategic Arms Limitation Talks II, whereas Drell considers them possible violations in view of allegedly imprecise data and the ambiguity of the treaty wording. Eimer concludes that the Soviets have a bad record on compliance and Drell argues that they have a satisfactory record. The disagreement here depends on how each interprets the seriousness of the deviations. Ultimately arms control will rely to some extent on deductions of the intentions and behavior of human beings as well as on differing interpretations of the evidence.

The analyses by these two experts points up the difficulties that will be faced in the future. Control of nuclear weapons has two main goals: the promotion of peace by removing the temptation to use nuclear weapons, and the limitation of the cost of an armament program. The advent of a mobile missile, which the Soviet Union and the United States are both developing and which many say may be a more cost-effective and feasible alternative than the Strategic Defense Initiative for preserving second strike capability, will certainly make arms control and verification of compliance more difficult. As both experts state, cooperation between the superpowers will be helpful as we enter this era of new weapons and new strategies. For example, on-site inspection may involve important political changes in two superpowers who eye each other with deep suspicion; it is the modern equivalent of an exchange of ambassadors in the era of large infantries and cavalries.

If we must choose between saving money and preventing war, it is clear that we must choose the latter. But there are scenarios in which preventing war and lowering costs can both be achieved if tough political decisions on verification can be made. There is hope that world leaders will recognize the mutual advantages of imaginative departures from past practices. If that hope becomes a reality, then the techniques of verification and a citizenry enlightened in its application will be an important first step toward a safer world.

—DANIEL E. KOSHLAND, JR.

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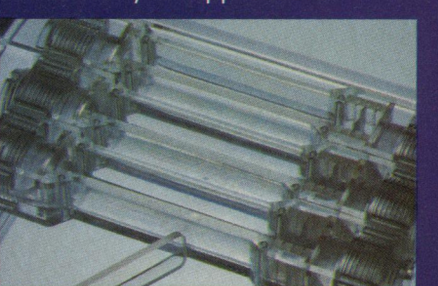

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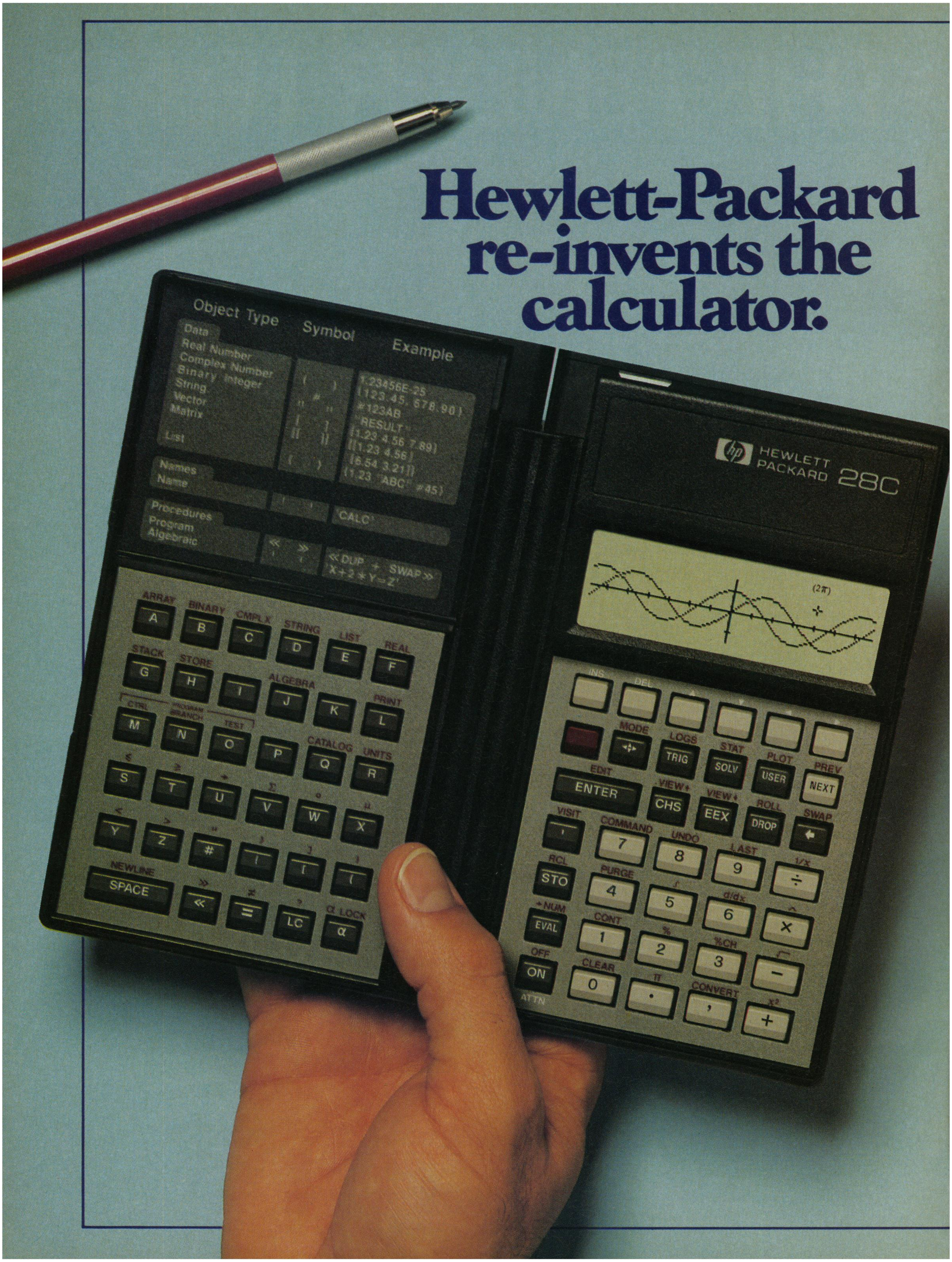
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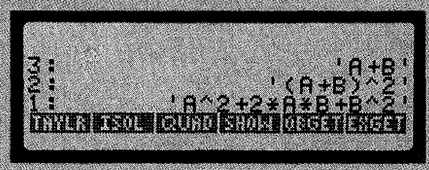

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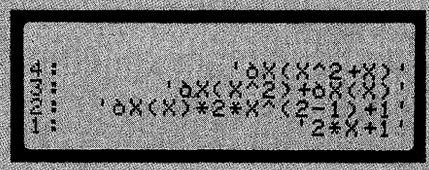

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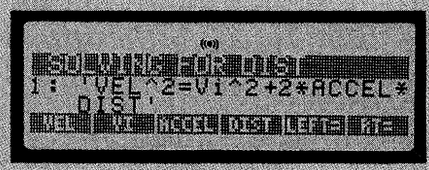

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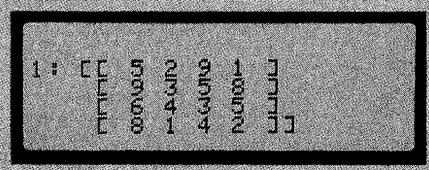

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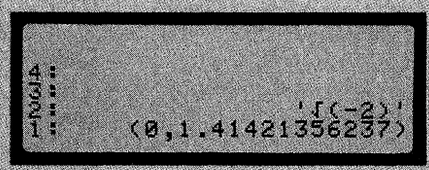

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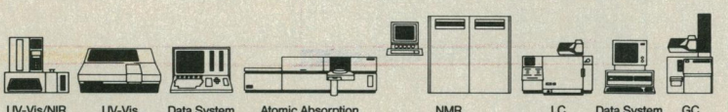

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A first report:

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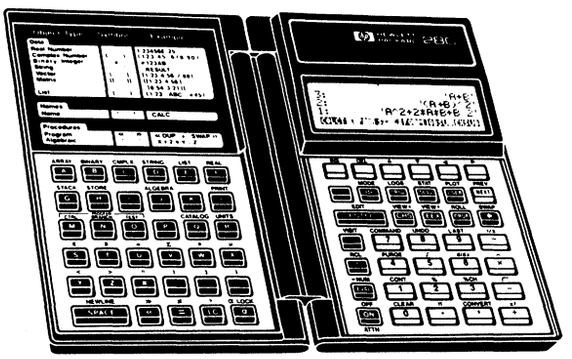

For a color picture, see HP ad in this issue, p.418 .

The HP-28C is first in a new generation. I haven't got room here to do it justice, there are so many interesting features and specs for it. I'll sketch it for you, though . . .

You'll have ON-SCREEN MENUS and SOFTKEYS, just like a PC—sensible access to hundreds of functions (128K ROM!) and high-level problem solving. Gamma function, random numbers, . . .

Complex numbers, matrices, vectors, lists, and algebraic expressions can be viewed, edited, and then used in calculations just as easily as ordinary numbers. Dot and cross products, determinant, . . .

You can choose RPN LOGIC for calculations OR use the built-in ALGEBRAIC LOGIC—with RPN its 4-line display shows your stack OR you'll see your equation displayed just as you would write it. You choose.

You'll do no programming to get solutions, either—it will solve for any unknown variable anywhere in your equation.

It will convert between different unit systems, too. The values of 120 units are built-in, and you can add your own. Are you ready for all this right now? (I have them in stock).

You'll use SEPARATE KEYBOARDS, the right hand one for NUMBERS and the left for LETTERS. Later, you can fold it to pop into your shirt pocket.

You can plot graphs of your functions, even two at a time. Then place the cursor near where the graphs cross and press a key to calculate the x-value of the crossing, correct to 12 digits. I was amazed.

Scatter plots of your statistical data are easy too. Imagine showing all this to your colleagues!

Plotting. Plot mathematical functions and statistical data; set plot scales, axes, and center; display graphics.

Statistics. Single- or multi-variable statistics: summation, deletion, mean, standard deviation, total, maximum, minimum, variance, covariance, correlation. Linear regression and predicted value. Normal, Students t, F, and Chi-square distributions.

A major leap in technology—you'll do SYMBOLIC ALGEBRA, even SYMBOLIC CALCULUS. You'll manipulate unknowns and letters as well as numbers, even differentiate functions to get their derivative functions. This is the first small machine capable of doing symbolic mathematics, like MACSYMA on a mainframe, and it can be yours right now.

Symbolic Algebra. All real and complex number functions; expand, collect terms; expression editor; subexpression recall and substitution, symbolic solve; quadratic equations.

Calculus. Symbolic differentiation of arbitrary expressions; symbolic integration of polynomials; numerical integration of arbitrary expressions; Taylor series.

Programmability is enormous—You can use all of the built-in functions with your own menus and softkeys, plus sophisticated utilities.

Binary Integer Operations. Decimal, octal, hexadecimal, and binary bases; arithmetic; variable wordsize; bit shift and rotate, byte shift and rotate, arithmetic shift; logical operators; floating-point/integer conversion.

Programming Features. User-defined functions, local variables, indefinite nesting and recursion, IF . . . THEN . . . ELSE, FOR . . .NEXT, DO . . . UNTIL, WHILE . . .REPEAT; halt, continue, abort, single-step, pause, read key, beep, display, error message, error number; set/clear/test 64 user flags; conditionals, logical operators; object type.

But you can't see the best part—Your HP-28C comes with a built-in InfraRed Printer Interface. This means no wires or cables to your portable thermal printer—just point your 28C at it and press a key for an instant record. Have your printer now, or get it later—your choice.

The HP-28C lists for $235. It will be the world's standard for years to come. You're sure to get one sooner or later. Why not now? I have them in stock, and I'll give you a discount savings of $45 now.

Hewlett-Packard has been the choice of engineers and scientists for the past 15 years. HP is simply the best. Yours will last you for years to come.

EduCALC is the World's Premier HP-Calculator Store. You can trust our years of experience and straightforward service.

Order by mail: each HP-28C is **$189.95**; save $29 on each InfraRed Printer at **$105.95** (Calif. residents add 6% tax). Add $4 for UPS delivery (no extra charge for multiple items). Allow 12 days for personal checks to clear, or send your MC/Visa number and card address.

For fastest service, call during west-coast business hours at **(714)582-2637**. Or, for all days/all hours call toll-free **(800)633-2252**, ext. 348, with your MC or VISA card. Of course, if you live in Southern California, drop by in person and pick up your new HP-28C.

I guarantee you'll be delighted with the HP-28C—or your money back within 15 days, no questions asked.

Jim Carter, Mgr.

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Call for Symposium Proposals

1988 AAAS Annual Meeting ✦ Boston ✦ 11 – 16 February

Please return this form no later than 1 April 1987 to:
AAAS Meetings Program; 1333 H Street, NW, Washington, DC 20005 • Telephone: (202) 326-6448

Principal Organizer (primary contact for correspondence):

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Telephone _____
(Area Code) (Number)

Title of Proposed Symposium _____

_____

Proposed Sponsor(s)
(AAAS Section, Office, or Affiliate **only**) _____ No. of 3-hr. Sessions Requested _____

1. Speaker _____
   Affiliation _____
   Topic _____
2. Speaker _____
   Affiliation _____
   Topic _____
3. Speaker _____
   Affiliation _____
   Topic _____
4. Speaker _____
   Affiliation _____
   Topic _____
5. Speaker _____
   Affiliation _____
   Topic _____

Please attach synopsis of objectives of proposed symposium (approximately 200 words).

Instructions: AAAS members are invited to submit symposium proposals for the next Annual Meeting in Boston, 11–16 February 1988. Please complete the form above, attach a "Synopsis of Objectives" (about 200 words), and send it to us **no later than 1 April 1987.**

We are particularly interested in symposia dealing with the latest developments in science and technology, and the implications of these developments for society. Coordinated contributed paper sessions are also welcome; inquire for details with this submission.

All symposium proposals are subject to review. If the information submitted is inadequate for reviewing, the proposal will be returned. Endorsement (sponsorship) by a AAAS Section Committee expedites the review process. It is therefore in the interest of the proposer to **send a copy** of the proposal to the appropriate Section Secretary (see "AAAS News" section in *Science*, first issue of each month, for names) for endorsement at the same time the original is sent to the AAAS Meetings Office.

Speakers should *not* be confirmed at this time; however, sufficient information about probable speakers and their topics should be provided to allow for evaluation of the proposal. Please note that AAAS does not pay honoraria to speakers.

Some Deadlines: June—You will be notified about the acceptability of your proposal. **July**—Preliminary programs with confirmed speakers are due. **September**—Final program copy, suitable for publication, is due.

"In order to easily scale up from analytical separations, there is a need for families of packings in different particle sizes, but with the same surface chemistry. Manufacturers should work on this problem."

—**Klaus Unger** to the 1986 Pittsburgh Conference

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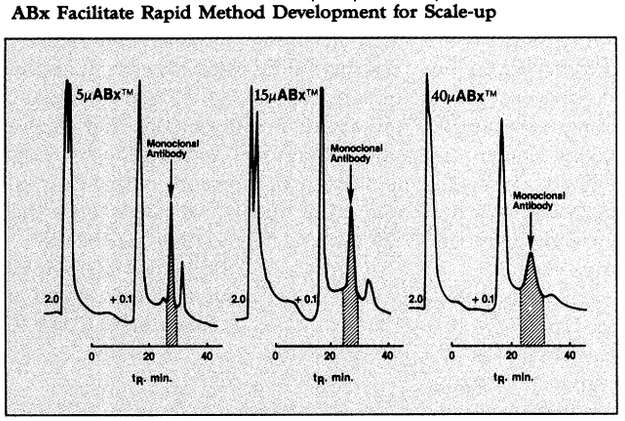

+ Please note scale changes. The void volume peaks of non-retained proteins represent 90-95% of all non-immunoglobulin proteins. Detector sensitivity for all other peaks has been increased twenty-fold to better visualize retained proteins and monoclonal antibodies.

ANALYTICAL CONDITIONS:

Column:	7.75 x 100 mm BAKERBOND ABx™, 5 micron, 15 micron, 40 micron
Mobile Phase:	Buffer A = 10mM MES, pH 5.6 Buffer B = 1M NaOAc, pH 7.0
Gradient:	0% B to 100% B; 60 min.
Flow Rate:	1.0 ml/min.
Detection:	UV at 280 nm: 2.0, 0.1 AUFS
Peaks:	Void Volume: albumins, transferrins, proteases, phenol red Arrow: monoclonal antibody
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