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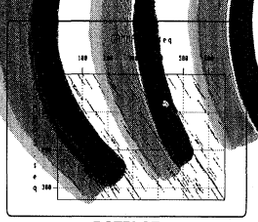

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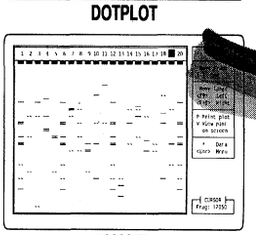

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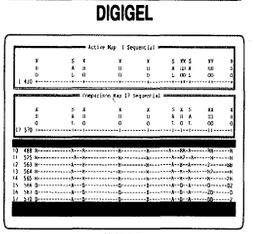

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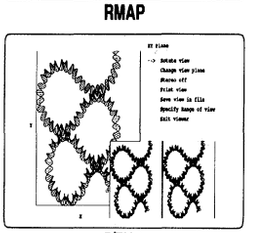

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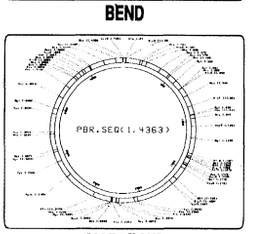

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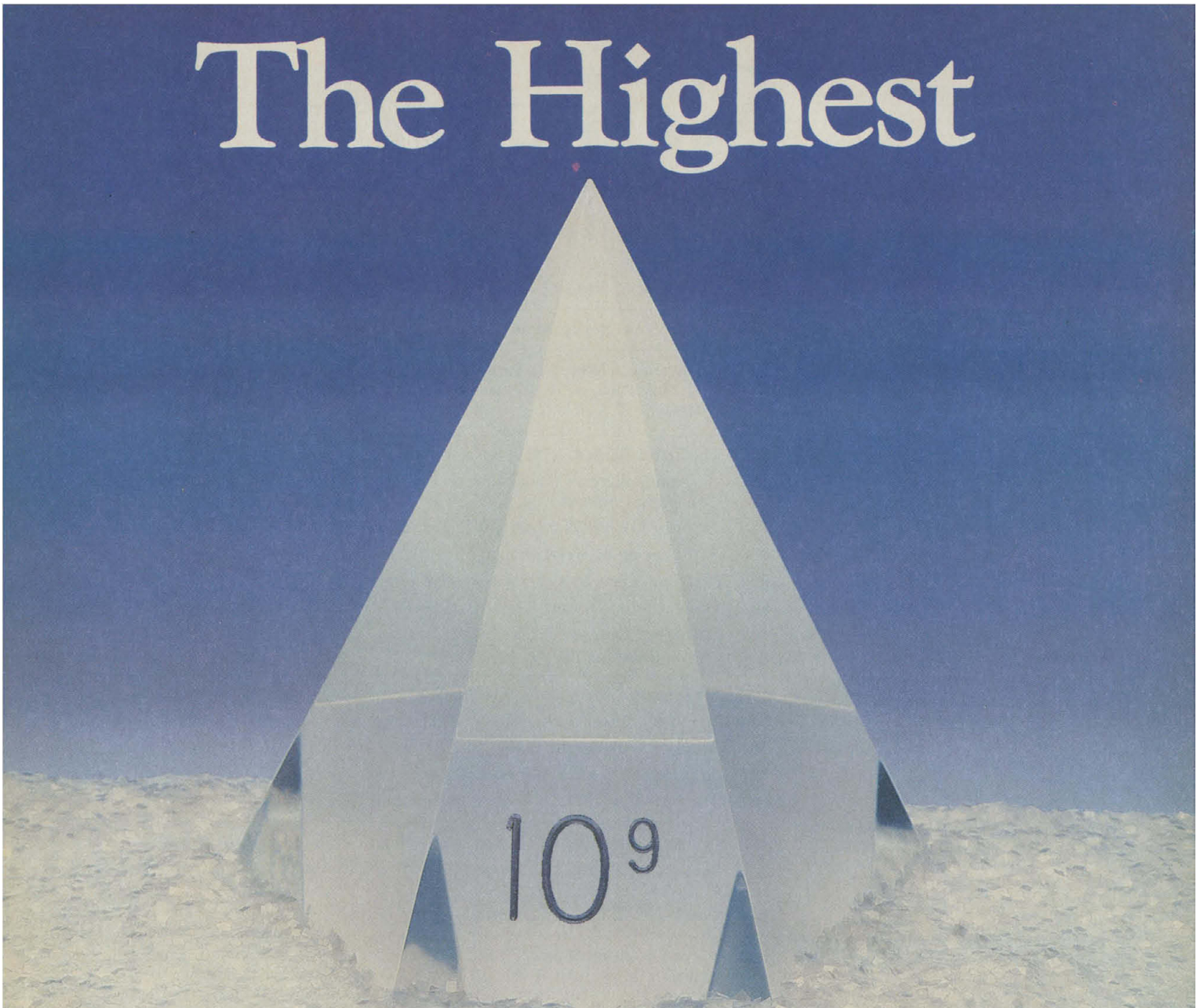

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COVER The backbone structure of human c-H-*ras* oncogene protein. The flow of the backbone is represented by a continuous ribbon using a program BSRIBBON. The guanosine diphosphate molecule is shown as a dot-surface using the program PSFRODO. See page 888. [A. M. de Vos *et al.*, Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720]

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Advances in liquefaction of coal

PROSPECTS for economically processing coal into liquid fuel were once black as pitch; this is no longer so (page 873). Coal is a plentiful resource in the United States, and liquefaction costs have been falling: the price per barrel dropped about 60% since 1983. The chemistry of coal is being worked out, substitutions can be made at various steps in the liquefaction process (new catalysts, new sources of coal, and new reagents including even biologics), and yields are increasing. In addition, milder reaction conditions (lower temperatures and pressures) and more efficient hydrogen usage (hydrogen is one of the costliest items) add to the savings. Lumpkin describes recent advances in liquefaction technology in the United States; Japan, Germany, and Great Britain have also been developing improved methods but there has been little international cooperation. Although coal liquefaction has yet to become competitive in the world fuel marketplace, depending on future oil economics, it may one day become a viable alternative, particularly in the United States, for generating needed fuel supplies.

Cell movements: common cause

THE same mechanism may drive such seemingly different processes as animal cell motility, the splitting of an egg in two during cleavage or of other types of cells during division, the elongation of axons from neuron cell bodies, and the formation of caps on antigen-bearing cells that have encountered specific antibodies (page 883). Bray and White propose that the directed flow of actin filaments inside the cell below the cell membrane (in the cell's cortical region) accounts for each of these processes and that the driving force behind actin movements is a gradient of tension; because of this tension, cortical components are pulled between regions of relaxation and regions of contraction in the plane of the cell surface. A rudimentary form of this model was proposed at the end of the 19th century, but computer simulations and decades of research on the nature and properties of the cortical layer, the interactions of actin and myosin filaments to convert chemical energy into contractions, and the behaviors of various types of cells now lend experimental support to the model.

Information in glasses

HOW does compression of a glass—a kinetically frozen liquid—affect its structure (page 902)? Infrared spectra of various silicate and aluminum glasses were measured by Williams and Jeanloz; glasses were selected that, in composition and structure, simulated silicate glasses and melts (the higher temperature forms) that are found within the earth. Under ambient conditions of temperature and pressure, four ions of oxygen combine (coordinate) with each silicon ion in a tetrahedral arrangement in silicate glasses. Under higher pressure, more ions of oxygen in the glasses form bonds with each silicon ion. The effect of pressure on glass structure is steady; (this contrasts with crystals for which coordination changes occur only at discrete pressures). When pressures are reduced, ions in glasses once again are tetrahedrally coordinated. These observations are relevant to the silicate magmas that are found deep within the earth (where pressure increases with depth) and may add insight into how the mantles of the earth and other terrestrial planets evolved.

Feline immunodeficiency virus

CATS can develop and die of immunodeficiency disease within 3 to 4 weeks of receiving an injection of a cloned hybrid virus (page 906). "Variant form" viruses that appear in the bone marrow of cats right before the onset of disease were isolated from fresh tissues; these viruses were unable to replicate on their own in vitro but could be "rescued" for replication by "common form" viruses (that typically cause viremia but not immunodeficiency disease). The most pathogenic-defective variant viruses had subtle sequence changes in the extracellular glycoprotein gene and the long terminal repeat associated with the envelope gene when compared with minimally pathogenic helper type viruses. Overbaugh *et al.* suggest that some highly pathogenic human immunodeficiency viruses might also, by analogy, be replication-deficient and that the AIDS viruses commonly studied may represent only a selected subpopulation, those capable of in vitro replication and not toxic for host cells. If AIDS virus isolates could be obtained and evaluated directly from fresh human tissues rather than after in vitro propagation, it might be possible to better understand their structures and activities.

Insect juvenile hormone action

ACCESSORY glands of male insects mature and function properly because of juvenile hormones (JH) (page 916). The glands then synthesize and secrete proteins that travel in seminal fluid to females during mating; in the females, the proteins are crucial for proper reproductive behavior. In vitro studies of the actions of JH on male accessory glands of *Drosophila melanogaster* show that calcium ions are essential for optimum hormone functioning. Mutant flies unable to synthesize proteins in response to JH were found to be defective in kinase C enzyme activity; when kinase C is activated by certain other substances, calcium ions are also required. Yamamoto *et al.* therefore propose that when JH is released under normal physiologic conditions, during copulation, from the brain structure called the corpus allatum, calcium ions are stimulated; these ions serve as second messengers and, along with activated kinase C, promote protein synthesis. This sequence of biochemical events accounts for the burst in protein synthesis that accompanies fruit fly mating.

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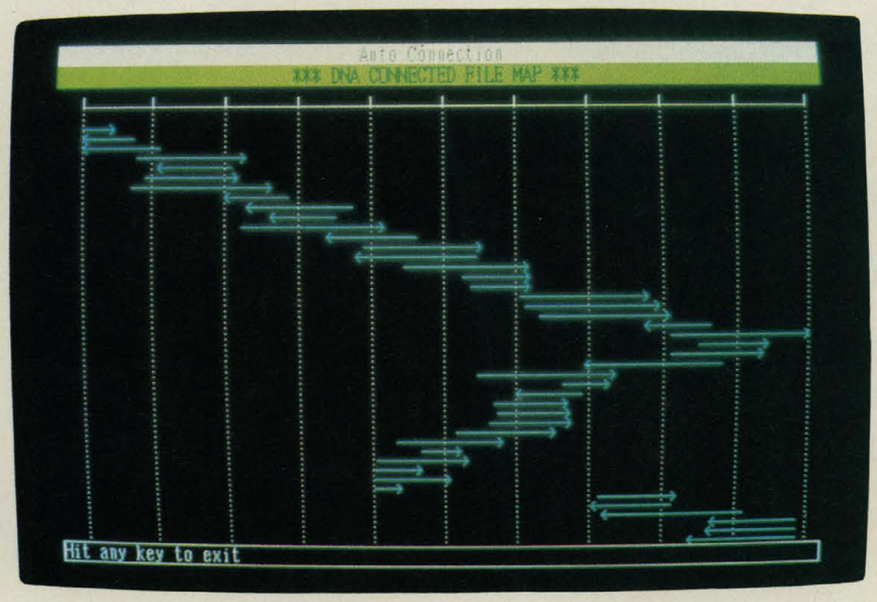

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SCIENCE

19 FEBRUARY 1988
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NUMBER 4842

To Retire or Not to Retire, That Is the Question

"Workaholics of the world, unite—you have nothing to lose but your leisure!" Such might be the battle cry of the increasingly aging and increasingly healthy older population. To retire or not to retire, that is the question. The answer is quite different to those who like their jobs and to those who do not. The first group, including many professionals, consider "retirement" to be a dirty word, something to be avoided at all costs. The second group, including many blue collar workers, think retirement is a nirvana to be sought as an escape from a boring daily routine.

In the past, both labor and management encouraged mandatory retirement for many workers. As the number of the elderly increases, however, the financial burden that this growing retired population places on young and middle-aged workers also increases. (Deductions for Social Security have never paid for the system, and new cures keep extending the life span. Decreased cigarette smoking, for example, may well bankrupt Social Security.)

One argument against letting the elderly add to national productivity is that it takes away jobs from young people. That has been the argument used against immigrants, who supposedly take jobs away from "real Americans," or women, who take them away from men. In fact, the influx of those two groups into the labor market has not been accompanied by an increase in unemployment, suggesting that individuals create jobs as well as occupy them.

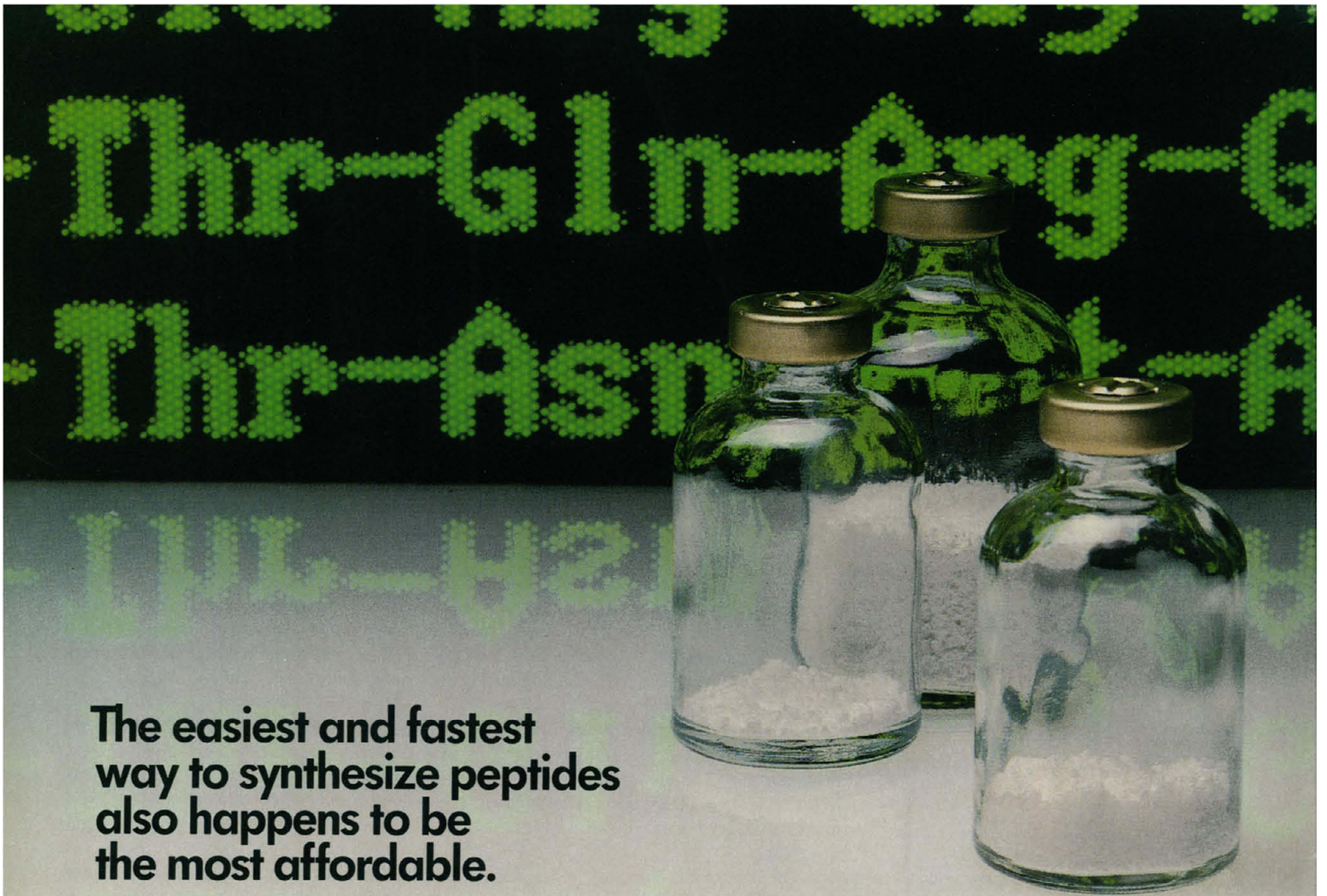
Moreover, the able elderly are now continuing to work, often through a shift of employer. A nuclear engineer becomes an expert witness on nuclear power, a tenured professor moves to fill a post at a less prestigious university, a lawyer leaves a large law firm to set up practice on his own. In each case, the elderly person is potentially taking away a job from a younger person, but this is concealed because the retiree is not staying in the same situation.

The movement to new jobs has some virtues; it involves an objective selection of the physically and mentally vigorous from the tired and the inflexible. But mandatory retirement has largely disappeared, and the attempts of universities, for example, to be given a special exemption seems unlikely to work. Just before a recent court decision, the airline industry settled out of court over mandatory retirement in the case of air traffic engineers. If airplane personnel, judges, and doctors cannot be forced to retire, the first disgruntled professor who takes his case to court is likely to prove age discrimination without too much trouble.

The challenge to society, therefore, is to develop some scheme of retirement based on performance not age, and one that does not block the advancement of younger people. Research productivity is probably the easiest to evaluate, since distant committees in Washington develop priority scores for individuals in other localities. Local duties such as teaching and administration are a little more difficult, since the subjectivity of evaluating a colleague will inevitably intrude. Ad hoc committees to consider retirement as ad hoc committees consider promotion are certainly feasible. Mentally young but chronologically old individuals could lighten the teaching load of assistant professors starting an academic career. Retired executives can serve as consultants for young venture capital companies that have scientific expertise but little business sophistication. Commissions and boards that have a hard time competing for the time of a young scientist might be more appropriately manned by experienced professionals who have seen more of the complexities of life.

Age by itself does not bring wisdom, nor does youth automatically bring a fresh viewpoint: some individuals are born doctrinaire, and others embrace new ideas until the day they die. Each profession will have to think of the criteria that justify continued employment. Early retirement for some and late retirement for others may well average out to a more productive society. To begin such a system it is probably wise to set some quotas and devise a system of priority scores. That would change the question from, "Is old Jake good enough to continue work?" to "Of the hundred individuals who are up for retirement, which twenty are we going to ask to continue working, and what are we going to ask them to do?"

The population changes mean that there will be more people, not fewer, who prefer work to chronological welfare. A society that can make supercomputers should be able to solve the problem.—DANIEL E. KOSHLAND, JR.



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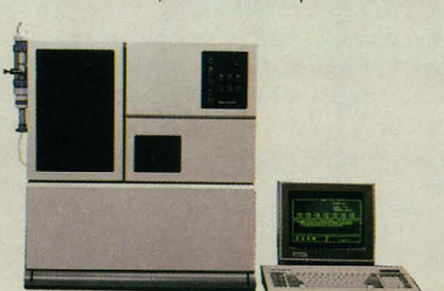

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Letters

Anonymous Charges

M. B. Mittleman (Letters, 8 Jan., p. 127) states that a "proposed guideline of the National Conference of Lawyers and Scientists (NCLS) for 'bringing charges anonymously' " of scientific fraud is disturbing and contrary to basic legal principles. As the American Bar Association liaison to the NCLS and one who has attended all recent meetings of the NCLS as well as the Workshop on Fraud in Science, let me assure Mittleman and others that no such guideline has been proposed by the NCLS.

The report in *Science* (AAAS News, 6 Nov., p. 813) stated that one individual indicated his experience as a whistleblower had extremely unpleasant consequences and that "NCLS workshop participants agreed that establishing guidelines, including the provision for bringing charges anonymously, is critical to protecting the whistleblower. . . ." Some workshop participants did favor such a guideline, but the workshop did not agree or attempt to agree upon any guideline. It was a wide open discussion exploring many facets of the problem in which the participants attempted to establish some basis for further consideration. It is hoped that there will be two more workshops considering the same matter, and whether guidelines will be proposed or approved by NCLS has not yet been determined.

As a lawyer with many years of experience, I agree that there are grave dangers in acting upon anonymous charges. However, I would not presume to predict what the NCLS may ultimately decide to do with respect to this problem, if anything. Expressions of viewpoints such as that of Mittleman are useful, but alarm about the content of prospective guidelines is unwarranted at this time.

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Stratospheric Ozone

The Upper Atmosphere Research Program of NASA recognizes the importance of both measuring and interpreting trends in stratospheric ozone. Kenneth Bowman, one of many researchers supported by this program, reports (1 Jan., p. 48) a trend in global ozone based on TOMS (Total Ozone Mapping Spectrometer) data from the Nimbus-7 satellite. Donald Heath of Goddard Space Flight Center has publicized, but not yet published, similar trends in ozone derived from satellite observations. Unfortunately, the TOMS and SBUV (Solar Backscattered Ultraviolet) instruments used in both Bowman's and Heath's analyses are known to suffer from a drift in the absolute calibration, as noted in Bowman's report. The slow degradation of the instrument in space, the magnitude of which is uncertain, leads to the apparent measurement of a downward trend in total ozone that may or may not coincide with true atmospheric change.

A major review of trends in ozone as observed by different satellites and ground-based programs is currently under way and will be presented to Congress and the Environmental Protection Agency on 15 March 1988. This study will assess not only the magnitude of recent trends in global ozone but also the uncertainty of any such trends. An important part of this assessment involves analysis and modeling of the possible causes of perturbations to ozone over the past few decades, including both natural cycles and human activity.

At present, the TOMS data set can be used to discern large changes in ozone, such as a 30% decrease in Antarctic ozone, but it cannot be used to detect smaller trends on the order of 1 to 2% per year, without cross-calibration involving other satellite and ground-based instruments.

ROBERT T. WATSON
Upper Atmosphere Research Program,
National Aeronautics and Space Administration,
Washington, DC 20546
MICHAEL J. PRATHER
Upper Atmosphere Theory and Data Analysis Program,
National Aeronautics and Space Administration

Response: I learned of the NASA review of the various satellite and ground-based ozone data sets shortly before my report appeared. Had I known of the forthcoming trends panel review, I would have awaited their results, instead of using NASA's older estimates of the instrumental drift cited in my report. A new comparison of SBUV data with the Dobson network (*1*) has yielded estimates of recent changes in global total ozone that are slightly smaller than mine. Reinsel *et al.* found that during the period from November 1978 through September

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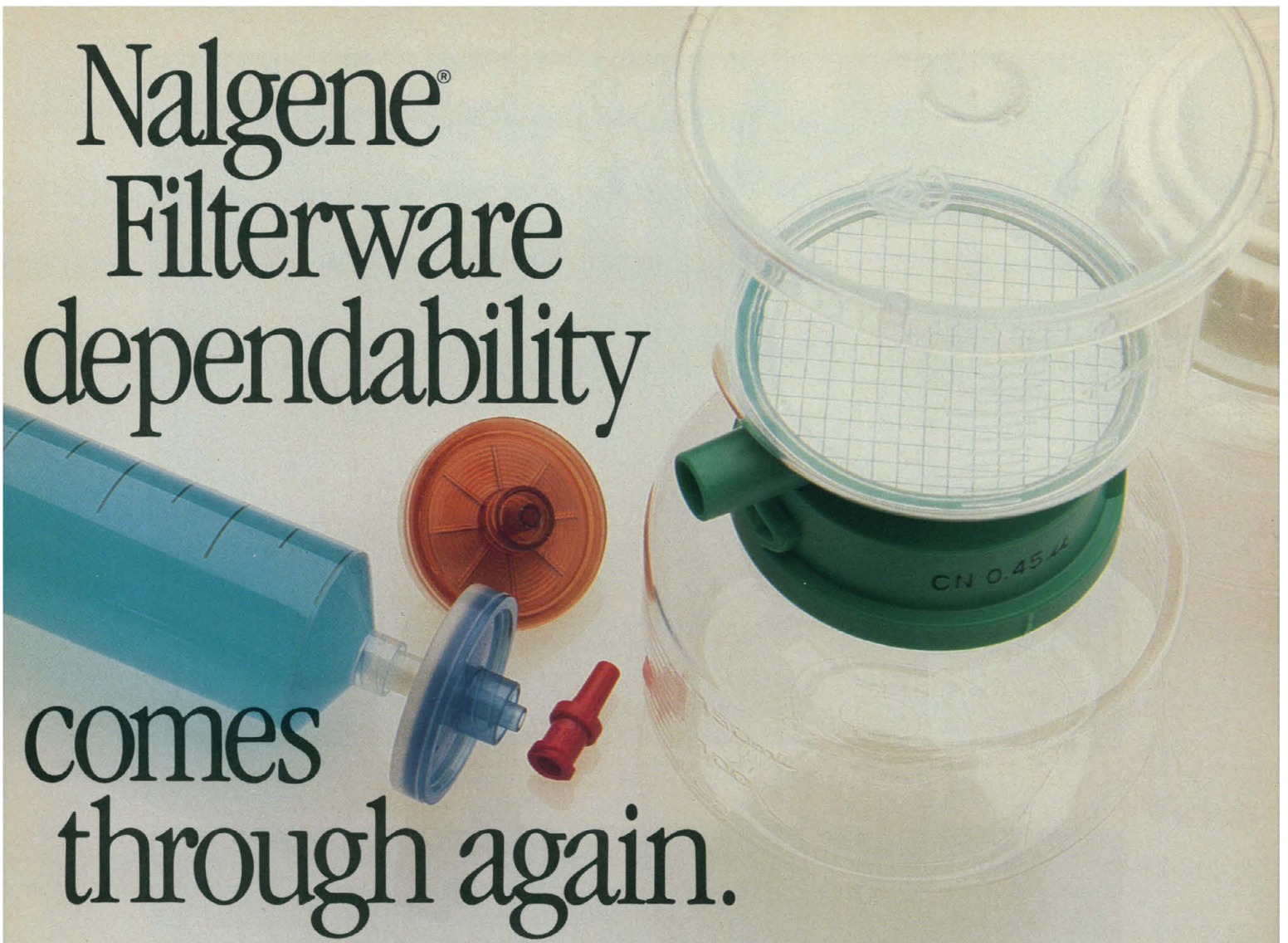

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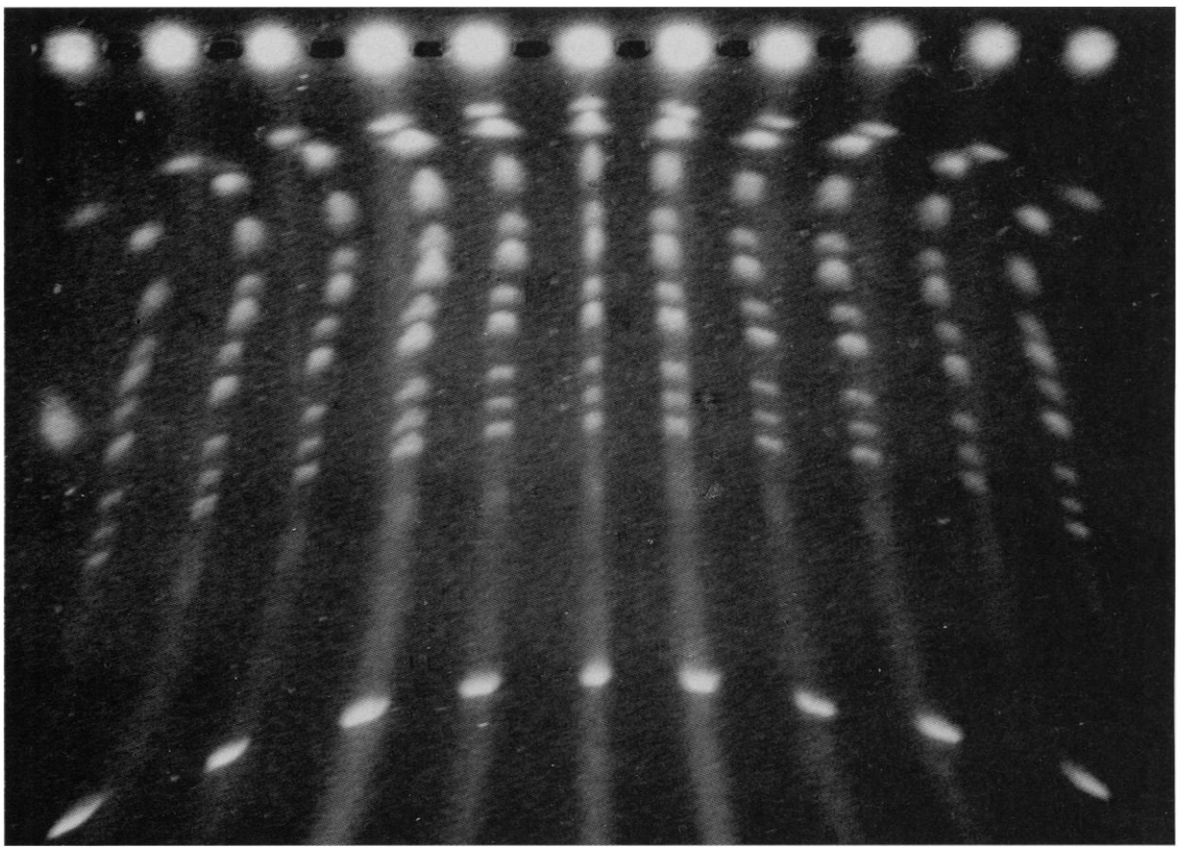
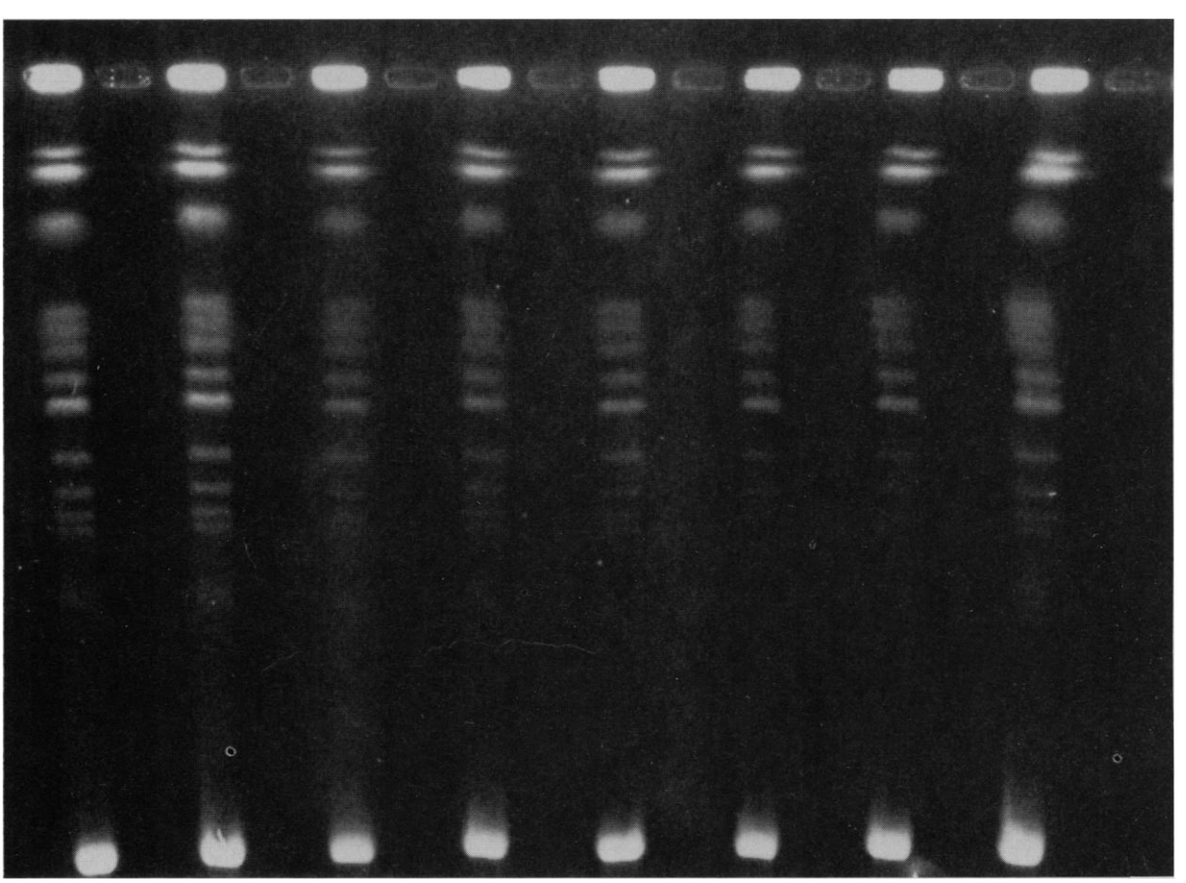


A good idea—the conventional point electrode result shown above is DNA from S. cerevisiae strain CF 21 run on a 1% agarose, 1×TBE buffer gel.



Keeps growing—the new hexagonal electrode kit result shown above shows straight lanes for S. cerevisiae strain CF 22.

From 1 good idea to 9 million base pairs

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How so? PFG electrophoresis uses two alternating electric fields, applied at different angles for different time periods, to stretch coiled molecules across a horizontal plane. Agarose gel block embedding, using whole cells, protect the vital integrity of the DNA molecules. Novel enzymes and reagents are then employed to digest the chromosomal proteins and other cell components.

Control of the pulse times predetermine the size of molecular separations. Control of the electric field shape increases the resolution by sharpening the separated bands. The result is not only high-resolution separation of large molecules, but also dramatically improved resolution in the separation of smaller DNA fragments.

The new Pulsaphor Plus Control Unit permits programming of the precise pulse and run times that will produce straight lanes for clear, accurate analysis. And up to 9 separate run procedures can be stored in memory for future separations.

Choose between two electrode kits, the conventional point electrode or the new hexagonal, for the flexibility to run present and future variations of the PFG method.

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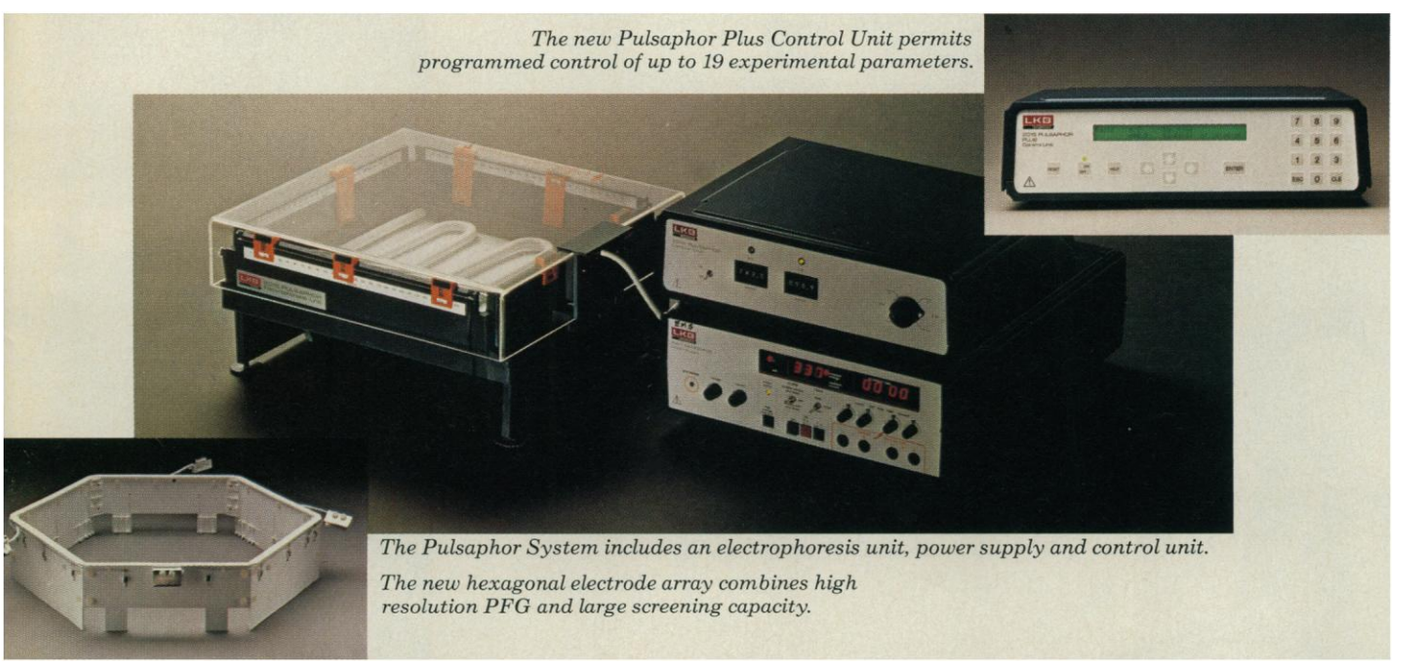

The new Pulsaphor Plus Control Unit permits programmed control of up to 19 experimental parameters.

The Pulsaphor System includes an electrophoresis unit, power supply and control unit.

The new hexagonal electrode array combines high resolution PFG and large screening capacity.

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- ☐ Biocompatible, non-metallic fluid path is non-reactive with labile biomolecules. Unaffected by salt or organic buffers. ☐
- ☐ Easy to maintain, non-intimidating hardware, with manual or automated control of simple or multi-step purification protocols. ☐
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- Versatile methods optimization using linear or non-linear gradients with up to four solvents. ☐
- Isolation of micrograms to grams of purified protein using flow rates from 0.1 to 45 ml/min (up to 80 ml/min optional). ☐
- Full range of UV wavelength detection options—programmable, tunable, or fixed. Wide choice of data options, with the ability to interface with other Waters instrumentation. ☐

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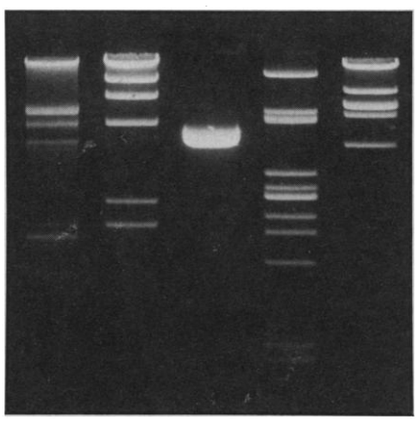

1 μg in each lane 1.5% agarose gel. *Hind* III/*Eco* RI-λ, *Hind* III-λ, *Eco* RI-pIBI, *Pst* I-λ, *Eco* RI-λ.

IBI introduces the perfect tool for bench-top documentation of nucleic acid or protein gels – The **IBI QUICKSHOOTER PHOTOSYSTEM.** This photosystem ends trips to a common darkroom and focusing or adjusting complicated photographic equipment. Simply snap one of the five available hoods onto the camera, place it over your gel, and SHOOT! You'll never need to focus or even turn off the lights. Within seconds, you'll have a **high quality, permanent record** of your data.

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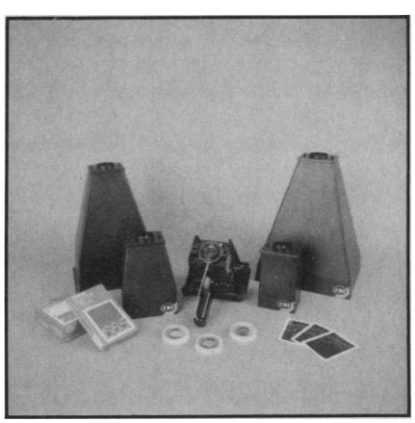

Hoods (ordered separately) are available in five sizes, suitable for gels ranging from less than 5 × 7 cm to 21 × 26 cm. Each lightweight hood has a special built-in lens, so the gel is automatically in focus.

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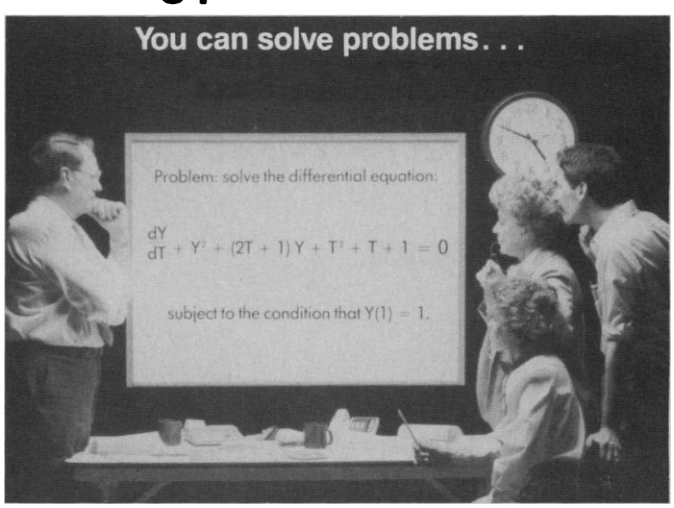

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Symbolically. . .

```
(C1) DEPENDS(Y,T)$
(C2) DIFF (Y,T) + Y ^ 2 + (2*T + 1)*Y + T ^2 + T + 1;
```

$$(D2) \quad \frac{dY}{dT} + Y^2 + (2T + 1)Y + T^2 + T + 1$$

```
(C3) SOLN:ODE(D2,Y,T);
```

$$(D3) \quad Y = -\frac{\%C\,T\,\%E^T - T - 1}{\%C\,\%E^T - 1}$$

```
(C4) SOLVE(SUBST([Y = 1, T = 1],D3),%C),NUMER;
(D4)     [%C = 0.5518192]
(C5) SPECIFIC_SOLN:SUBST(D4,SOLN);
```

$$(D5) \quad Y = -\frac{0.5518192\,T\,\%E^T - T - 1}{0.5518192\,\%E^T - 1}$$

and Numerically.

```
(C6) FORTRAN(D5)$
      Y = -(0.5518192*T*EXP(T) - T - 1)
     1      /(0.5518192*EXP(T) - 1)
```

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NEW ENGLAND BIOLABS

Molecular Biology and Biotechnology

Summer Workshop

WHEN:
June 5-June 18, 1988

WHERE:
Smith College
Northampton, MA

FACULTY:

Dr. Steven A. Williams
Dept. of Biological Sciences, Smith College, Northampton, Massachusetts; and Program in Molecular and Cellular Biology, University of Massachusetts.

Dr. Molly Fitzgerald-Hayes
Dept. of Biochemistry and Program in Molecular and Cellular Biology, University of Massachusetts.

Dr. Barbara Osborne
Dept. of Veterinary and Animal Sciences and Program in Molecular and Cellular Biology, University of Massachusetts.

Dr. Paul D. Riggs
New England Biolabs, Inc.

TO APPLY
for this workshop, please submit a recent curriculum vitae and a brief statement of motivation to:

Dr. Steven A. Williams
Dept. of Biological Sciences
Smith College
Northampton, MA 01063

PRESENTED AND SPONSORED BY: **New England Biolabs, Inc.** Beverly, MA

We are pleased to announce the third annual New England Biolabs' Molecular Biology and Biotechnology Summer Workshop to be held at Smith College, Northampton, MA, from June 5-June 18, 1988.

INTENSIVE BENCH EXPERIENCE. This intensive, two week course emphasizes hands-on molecular biology laboratory work. About six hours each day will be spent working at the bench.

EXPERIMENTS WILL INCLUDE: purification of DNA, restriction enzyme digestion, gel electrophoresis, construction of recombinant DNA molecules, cloning in plasmid and phage vectors, cloning strategies, bacterial transformation and transfection, Southern and Northern transfer and hybridization, radioactive labeling of DNA, and DNA sequencing. Lectures, seminars and discussion sessions (at least three hours each day) will deal with all of the above topics and how these methods are applied in molecular biology research.

INTENDED FOR BEGINNERS IN MOLECULAR BIOLOGY. No previous experience in molecular biology is required or expected. Thirty participants will be selected from a variety of disciplines and academic backgrounds. Last year's participants included principal investigators, directors of programs, post-doctoral fellows and research assistants. Their fields of research included biochemistry, medical physiology, immunology, microbiology and others. They came from large universities, small colleges, hospitals and industry.

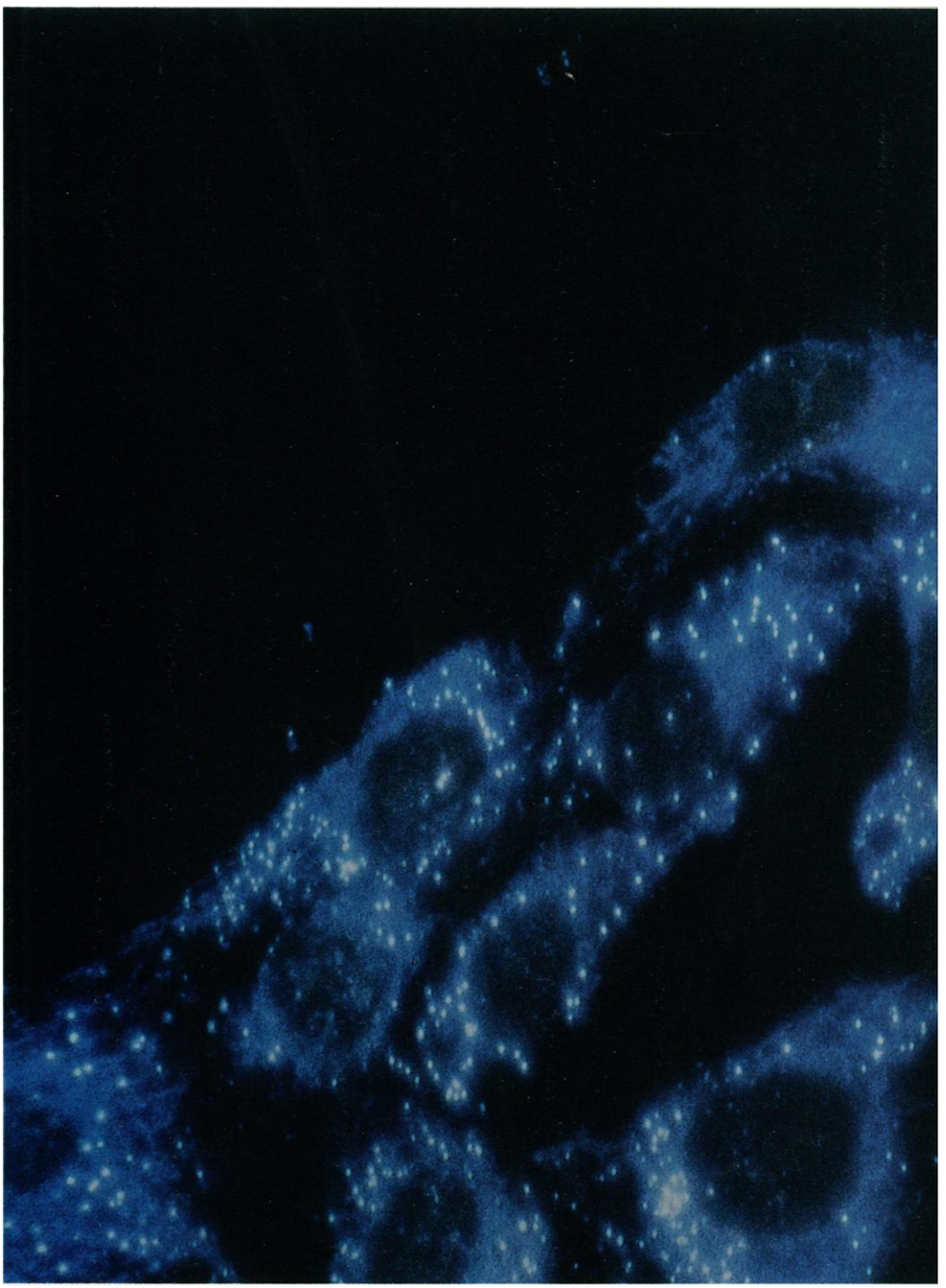
FEE: $1600 per participant includes lab manual and use of all equipment and supplies. Room and board will be available at the college for $500. This will include the use of all campus athletic facilities including indoor and outdoor tennis courts, pool, weight room, track, etc.

NEW ENGLAND Biolabs Inc.

APPLICATIONS MUST BE RECEIVED BY April 16, 1988. Notification of acceptance will be mailed by April 27, 1988. Payment in full will be due by May 11, 1988. **For additional information, please contact Dr. Steven A. Williams at (413) 585-3857.**

32 Tozer Road, Beverly, MA., 01915-5510, (617) 927-5054

Unlocking the unknown.



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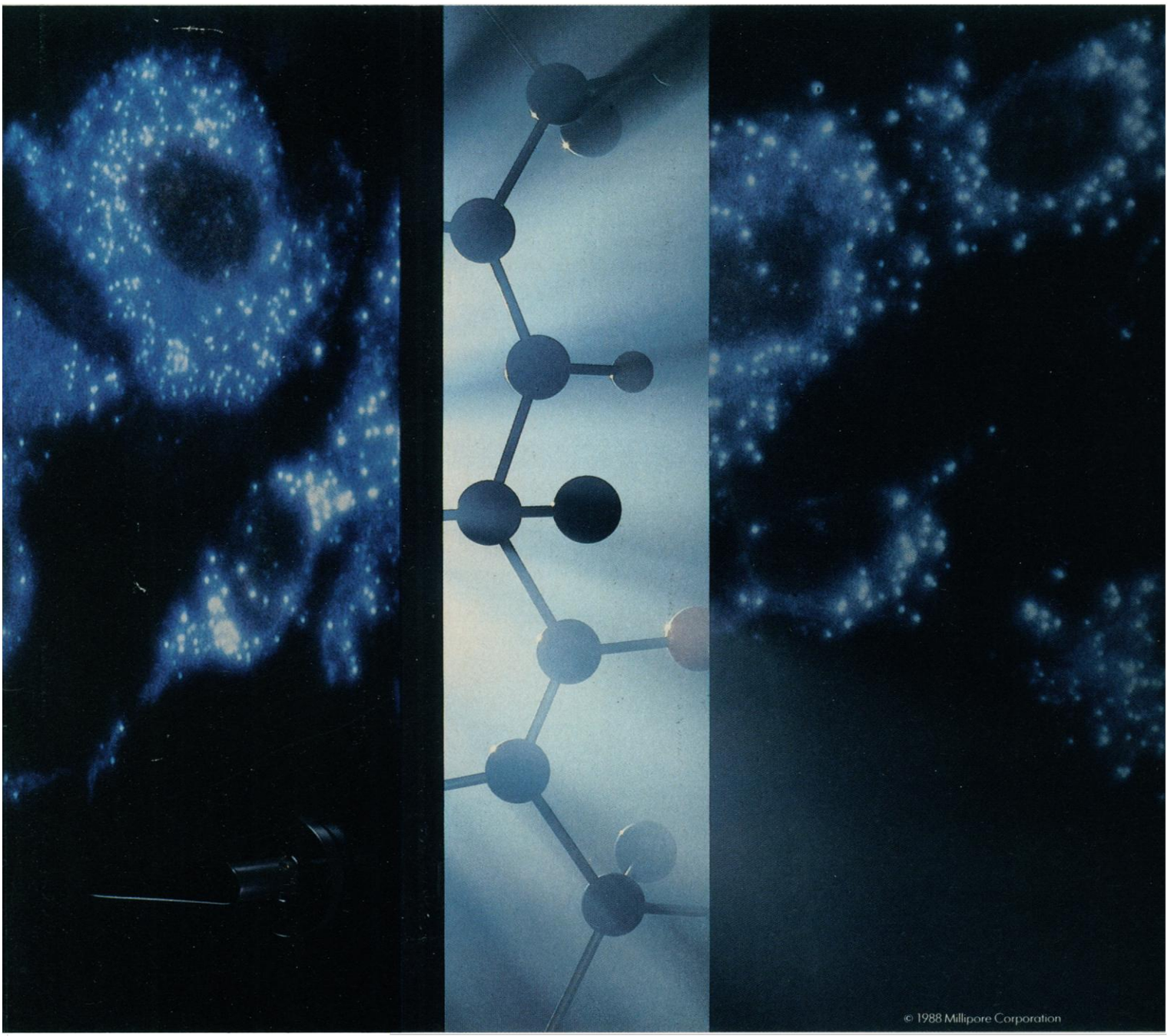

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13th AAAS R&D Colloquium
Washington, D.C.
14–15 April 1988

Advance Registration Form
SR1

The Capital Hilton, 16th & K Streets, N.W., Washington, D.C.

Please Print or Type Clearly

Name _____ (last) _____ (first and initial)

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$145 Partial (publications only) _____

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Separate Meal Tickets

$ 25 Lunch, Thursday (14 Apr.) _____

$ 8 Breakfast, Friday (15 Apr.) _____

$ 25 Lunch, Friday (15 Apr.) _____

TOTAL AMOUNT: $ _____

Packets will be mailed to preregistrants on about 24 March; registrations received after 24 March will be held at the AAAS Registration Desk in the Capital Hilton. **Refund Policy:** Advance registration fees and meal tickets will be refunded for cancellations received by 8 April; no refunds will be made on cancellations received after this date.

Registration fees include all sessions and publications; meals are included only with payment of full registration fee. All registrants receive *AAAS Report XIII: Research and Development, FY 1989* before or at the Colloquium, published *Proceedings* after the meeting, and a supplementary report, *Congressional Action on R&D in the FY 1989 Budget,* in the fall.

Mail registration form to: AAAS Meetings Office, R&D Colloquium, 1333 H Street, N.W., Washington, D.C. 20005

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