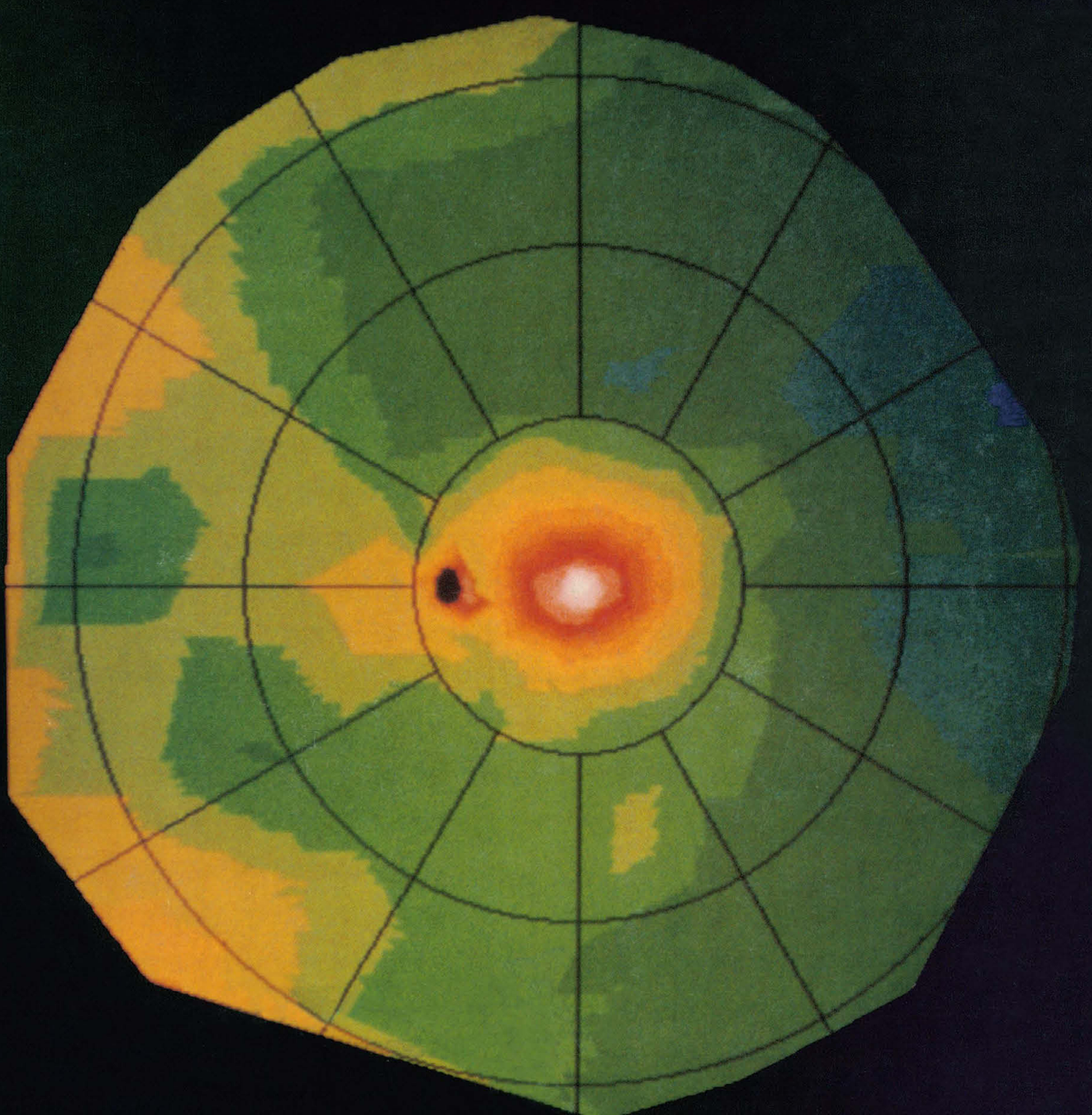
American Association for the Advancement of Science

SCIENCE

1 MAY 1987
VOL. 236 ■ PAGES 497–644
$2.50



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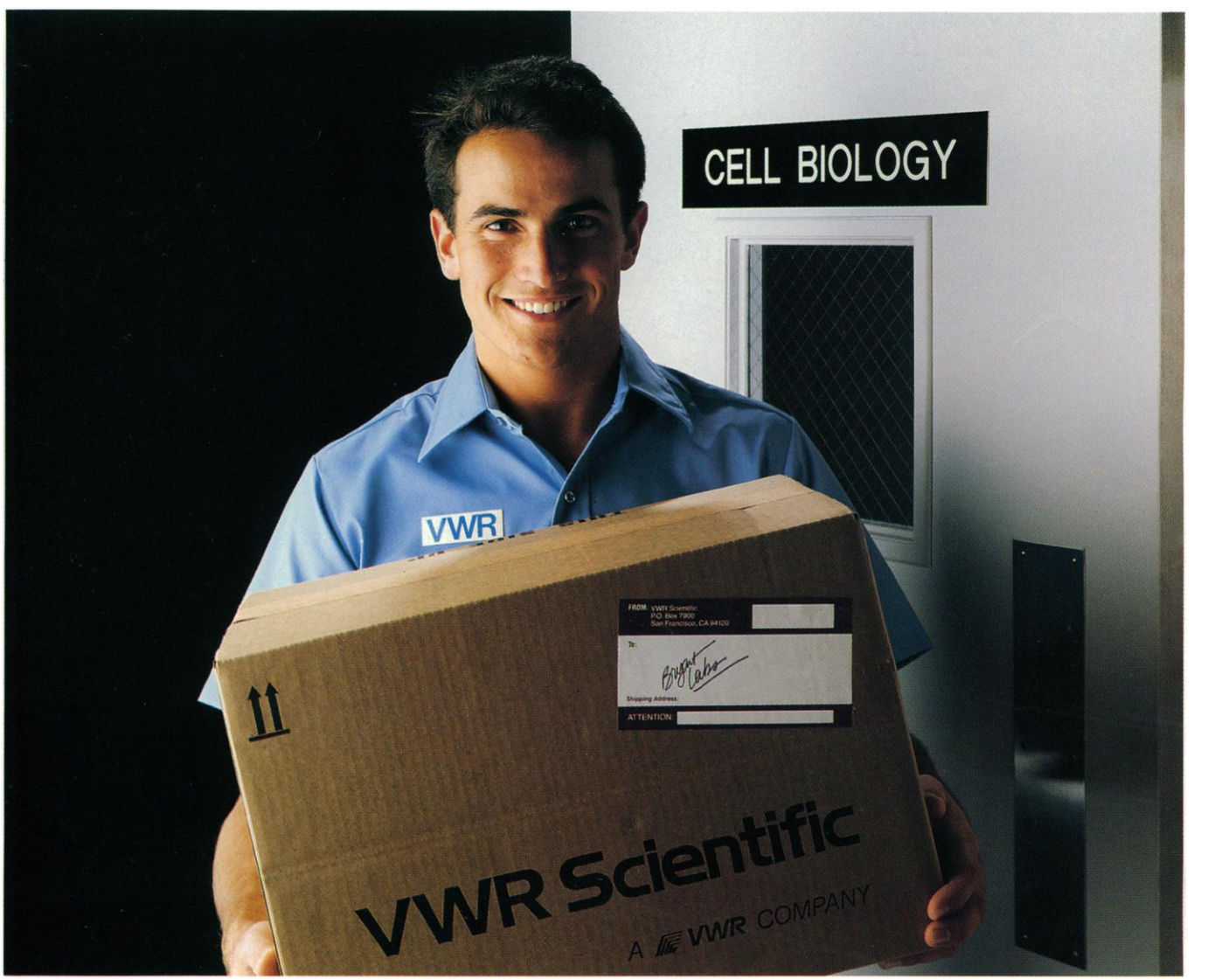

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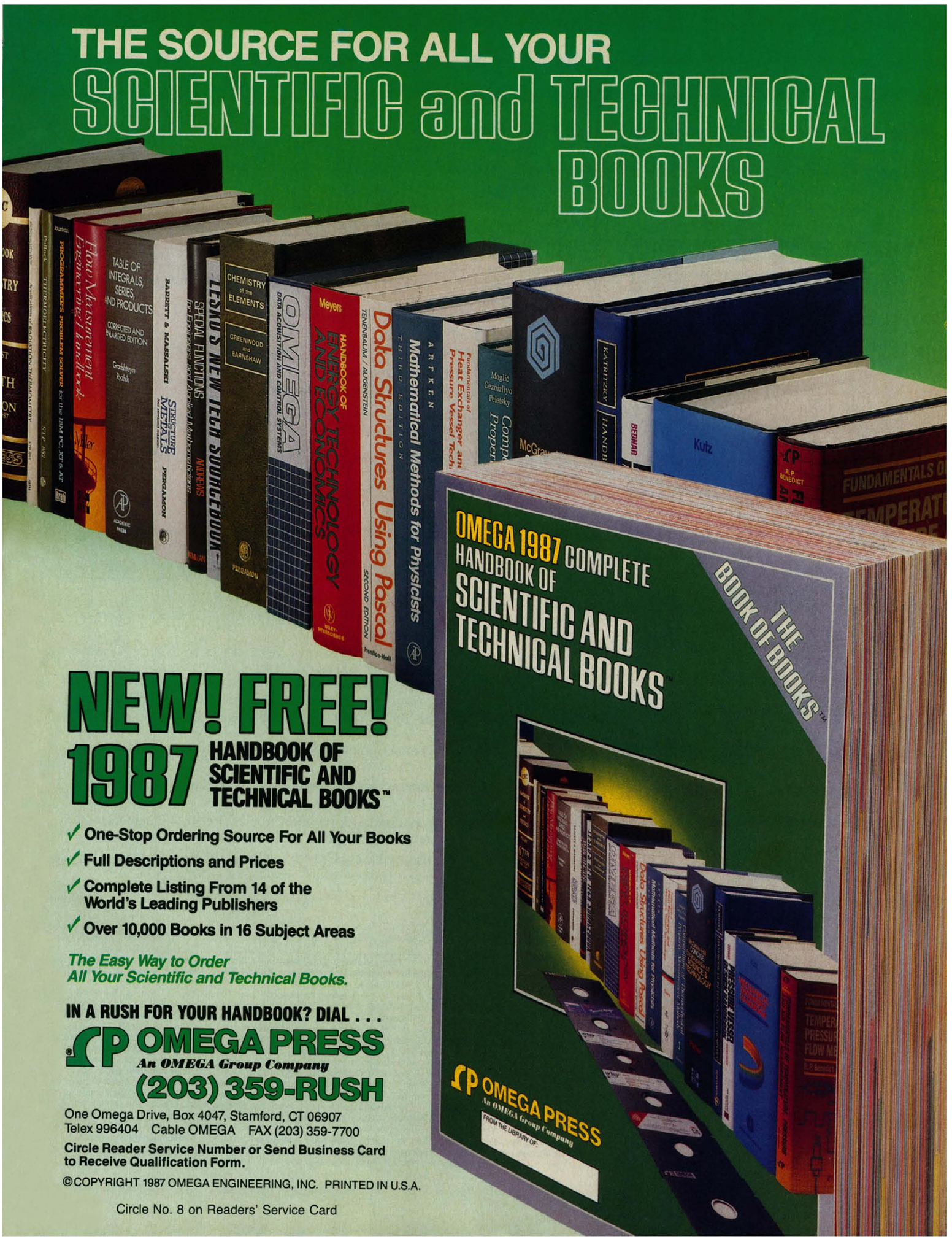

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NUMBER 4801

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■ **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®** Domestic individual membership and subscription (51 issues): $65. Domestic institutional subscription (51 issues): $98. Foreign postage extra: Canada $32, 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; 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. **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.

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COVER Distribution of human cone photoreceptors revealed by computer reconstruction of a whole mounted retina. Black oval represents optic disk in nasal retina. Warm colors indicate high cone density, and cool colors low cone density. Foveal density (white) is so high it is off scale. Isodensity contours are elongated horizontally and shifted nasally in peripheral retina. See page 579. [Computer graphics and photography by Kenneth R. Sloan, Jr., University of Washington, Seattle, WA 98195]

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This Week in
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Phosphorescence from proteins

At room temperature in physiologic solutions, most proteins phosphoresce (page 568). However, because oxygen quenches phosphorescence and is almost always present in solutions, phosphorescent emissions have generally been difficult to detect. Vanderkooi *et al.* bubbled inert gases into solutions and thereby reduced the oxygen content to subnanomolar levels. Under these conditions, most proteins (of 39 tested) had measurable phosphorescence. The emissions followed photoexcitation; the tryptophan residues of the protein molecules entered a "triplet state" and then decayed. This new strategy for detecting phosphorescence is expected to have a major impact on studies of the structure, dynamics, and interactions of protein molecules. Almost all proteins with tryptophans probably emit phosphorescence with lifetimes ranging from 30 microseconds to 5 seconds. Phosphorescence data will complement data being obtained in studies of protein fluorescence, which is a more easily measured, shorter emission.

Primate cone topography

Cones, the cells responsible for vision in bright light, are distributed in a qualitatively similar manner in the retinas of humans and of macaque monkeys (page 579). Curcio *et al.* used special microscopic techniques and computer reconstructions to map the distribution of cones in four human and two monkey retinas (cover). The densest concentration of cones was in all cases at the fovea, the all-cone region responsible for acute vision. Out from the fovea, cones were less dense and distributed with radial asymmetry in both the human and the macaque samples. Foveal cone density was tremendously variable between individuals; peripheral regions of the retinas showed less variability. The almost threefold range in maximum cone density in human foveas may contribute to the great differences in visual acuity that are known to exist between individuals. These comparative studies confirm earlier investigations performed with single retinas, extend the data into an evaluation of variability among organisms, and further validate the use of macaque monkeys as models for understanding how the human visual system operates.

Sugars and the spread of tumors

Tumor cells that have large branched antenna-like carbohydrates attached to asparagine (amino acid) residues have a greater potential to spread throughout the body than do their counterparts with less-branched structures (page 582). Studies by Dennis *et al.* of malignant mouse cells indicate that the surface glycoprotein gp130 provides the main targets for β1–6–linked branched sugar antennae. Experiments with metastatic, nonmetastatic, mutant, and revertant tumor cells showed that metastatic potential is directly associated with the extent of β1–6 branching and confirmed that when sugars are lost so is the spreading potential. Exactly how metastasis is affected by sugars remains to be determined.

X-chromosome inactivation

In cells of normal females, one of the X chromosomes is randomly inactivated at an early stage in development; results of genetic engineering and breeding experiments lend credence to a theory that has been proposed to explain how this inactivation takes place (page 593). The theory states that inactivation is initiated at a site on an X chromosome and propagated along that chromosome by signals contained in specific sequences distributed at intervals. Male transgenic mice that had an X chromosome carrying 11 copies of the chicken transferrin gene were mated with female mice that had one normal X chromosome and one with a Searle's translocation; the latter is an X chromosome that, if inactivated, causes cell death. All female progeny received the transferrin-bearing X chromosome from their fathers; some also received the Searle's X chromosome from their mothers. In these animals, the paternal X chromosome in viable cells would necessarily be inactivated. Analysis of these animals' liver cells (in which the transferrin genes are well expressed) showed that the paternal X chromosome was not completely inactivated: the chicken transferrin genes continued to be expressed. Goldman *et al.* suggest that the transferrin genes may escape inactivation even though they are on a chromosome that is being inactivated because they are situated in a domain which does not contain one of the sequences that regulates and spreads inactivation.

Fish for compliments: male swordtails

There is something about the courtship display of male *Xiphophorus nigrensis* swordtails that causes female *Xiphophorus pygmaeus* swordtails to prefer them to *X. pygmaeus* males (page 595). Currently *X. nigrensis* and *X. pygmaeus* occupy different geographic areas. Should they ever come to cohabit an area, the preference of *X. pygmaeus* females for interbreeding might obliterate the barrier between these two species; this would be an uncommon outcome of sexual selection, which more often promotes speciation. Ryan and Wagner placed a *X. pygmaeus* female in the center of a partitioned aquarium; a male was placed at each end. After an acclimation period, the female could move out of the central section and inspect each of the males. The females consistently moved toward the bending, vibrating, heterospecific males rather than toward the conspecific males. The *X. nigrensis* males were also the choice of *X. nigrensis* females. Through the use of different combinations of males, variables besides courting displays (body size, body form, presence or absence of a swordtail) were ruled out as the major determinants affecting the females' choices.

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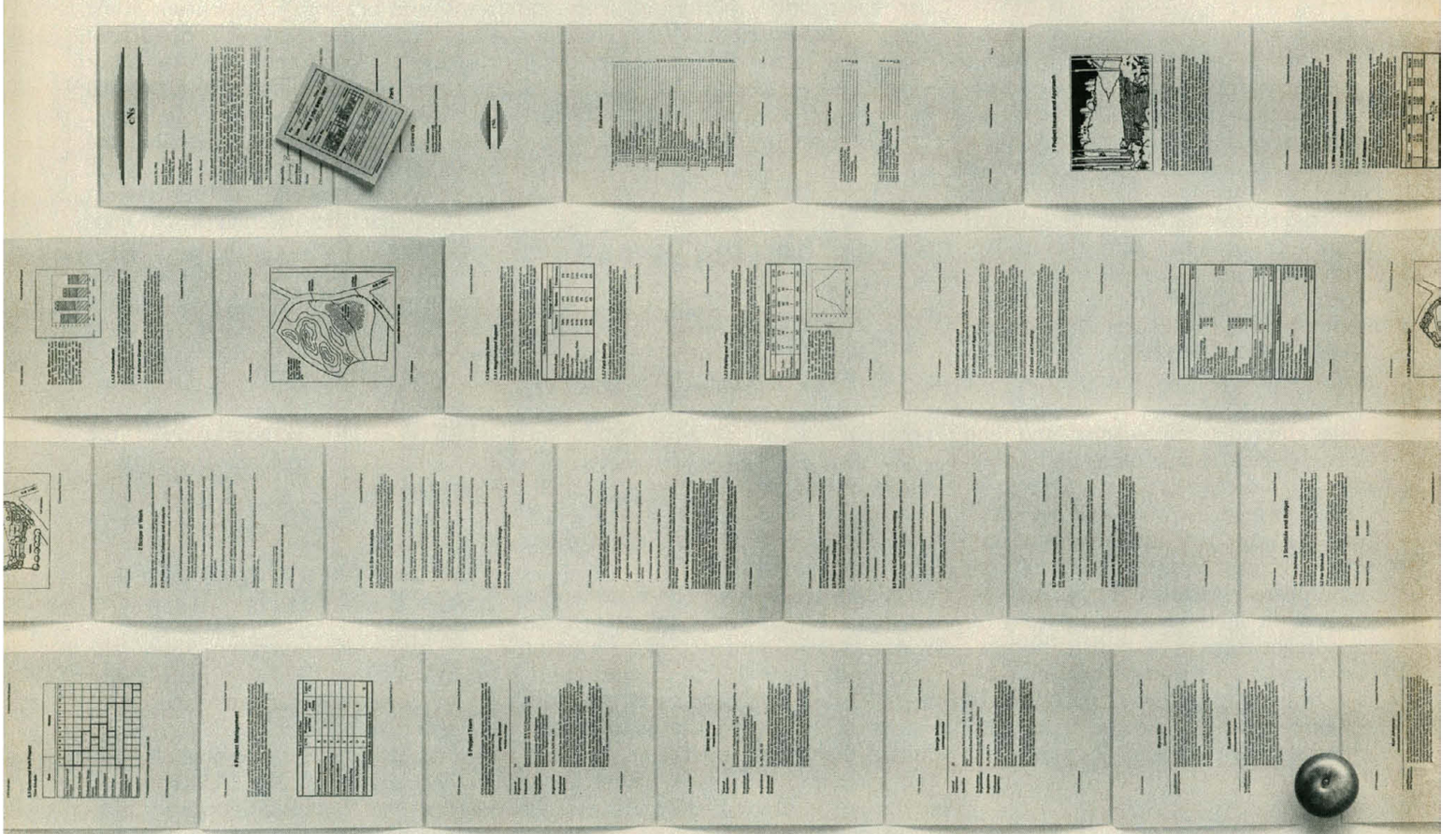

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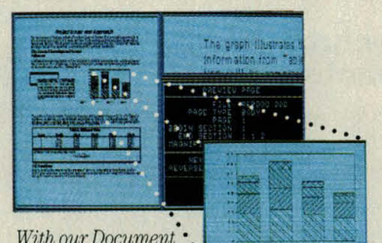

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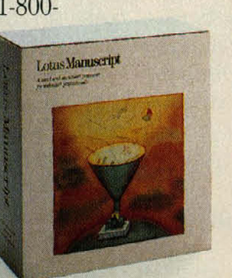

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1 MAY 1987
VOLUME 236
NUMBER 4801

Sequencing the Human Genome

A molecular biologist might say, "The proper study of mankind is the bacterium." The developmental biologist would say, "The proper study of mankind is the fruit fly." The cancer expert says, "The proper study of mankind is the rat." The poet said, "The proper study of mankind is man." All are, of course, partly right and partly wrong. The universality of the genetic code and of metabolic systems means that very different forms of life reveal principles and facts that are relevant to human health and illness. Although each species is interesting in itself, the major reason that research in other species is so strongly supported by Congress is its applicability to human beings. Therefore, the obvious answer as to whether the human genome should be sequenced is, "Yes. Why do you ask?"

The more pertinent question about sequencing is how fast and how much. Major portions of the human genome will be uncovered in bits and pieces with laboratories operating in conventional ways. Yet this sequencing is being done inefficiently because each laboratory must learn the methods, develop its own cloning libraries, and operate with techniques and equipment that could be vastly improved. A massive assault—developing new techniques, creating systematic libraries, coordinating data—would inevitably produce the answer sooner. Large segments of repetitive and "junk" DNA, which may have little use according to current concepts, would be sequenced, but even so the gains in new techniques would more than compensate for the delays of uninteresting stretches.

The next question is who should do the job. The National Institutes of Health has funded most of the scientists who have made the project possible, but it would be in danger of a Big Science–Little Science conflict. The Department of Energy has only a few scientists in the proper leadership area, but has had experience with large projects and offers a political arrangement that could ensure that the program is an add-on, not a subtraction from Little Science.

For this project to command the respect and support of the biological community, acknowledged experts are needed on the governing board of the project. (A National Academy of Sciences committee now studying the whole problem is a blue-ribbon list for selection of such a board.) The program and individual grant requests should be peer reviewed continuously, following the excellent procedures of NIH and the National Science Foundation. Leaders from NIH, NSF, the Howard Hughes Medical Institute, and foreign scientists should play prominent roles in the organization. A DOE program should be expected to use national laboratory personnel for some of the work but to act more as a nerve center, both monitoring and administering a large number of smaller grants to investigators located all over the world. This effort should be international with contributions from different countries in terms of grants, investigators, and leadership advice. A plan in which DOE recognizes the importance of peer review and decentralized administration would thus be a compromise, but it would ensure proper quality and avoid a budget situation that placed Big Science and Little Science in dangerously direct financial competition. An alternative would be to try to set up within NIH a special institute for sequencing. Political memories are short, however, and soon that allocation would be thought of as "NIH funds," creating the unwanted competition between "big" applied and "little" investigator-initiated research. It would appear that DOE could find the leadership excellence more easily than NIH could provide the budgetary insulation.

The implications of sequencing the human genome are staggering. The recent discoveries of genes identified with muscular dystrophy, manic depression, cystic fibrosis, and Alzheimer's disease are illustrative aspects of the potential. Human subjects have been a source of information, medically, psychologically, and evolutionarily for centuries. They offer a wealth of information in regard to basic biology that is not duplicated by any other species. Hereditary defects may be able to be diagnosed more efficiently and eventually eliminated. Moreover, developing the successful methodology for sequencing the human genome means that understanding other species will also be accelerated. The opportunities are enormous. We have been "walking along the chromosomes" long enough. It is time to start running.—DANIEL E. KOSHLAND, JR.

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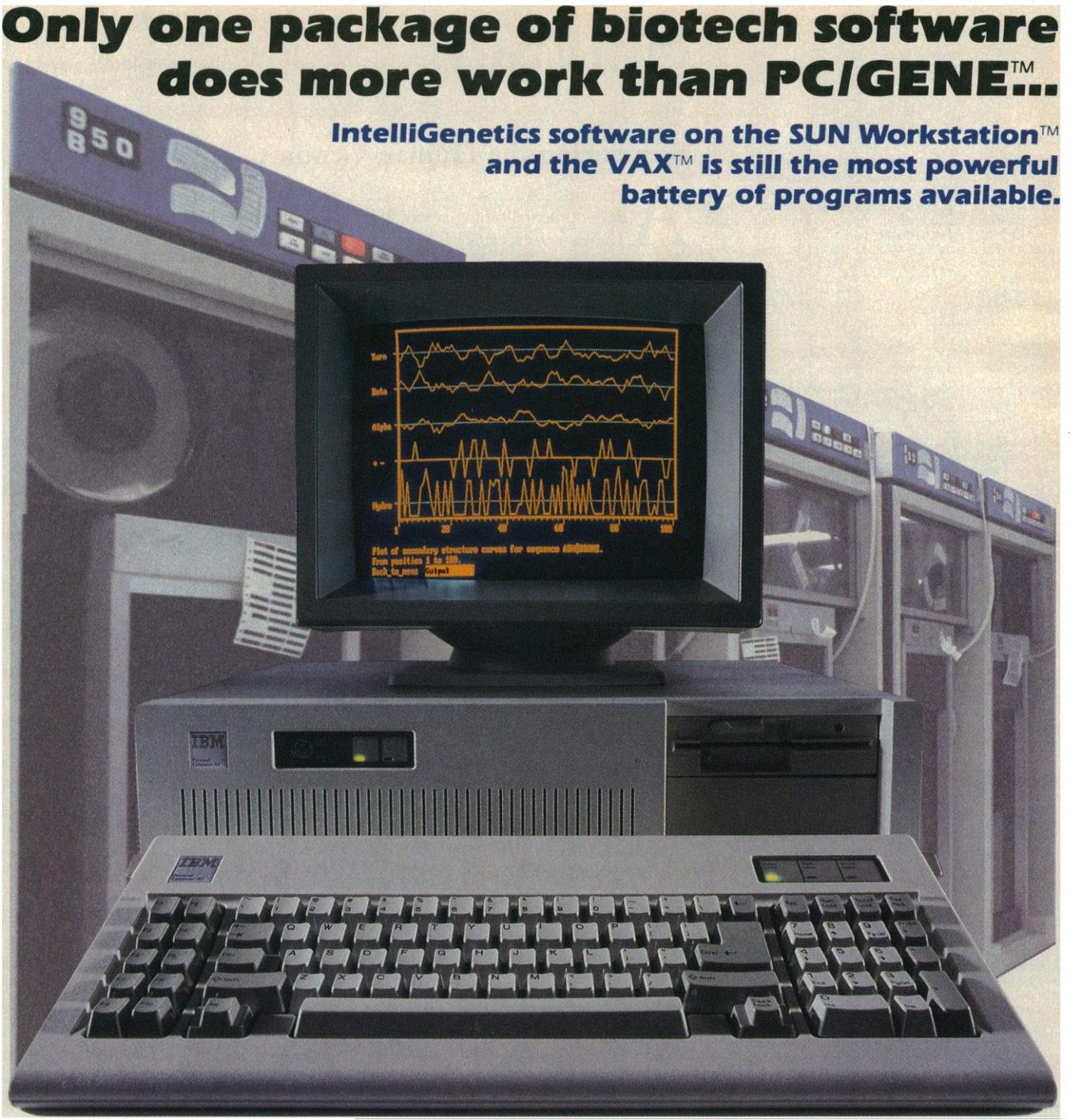

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Bibliographic Databases

The software review on bibliographic databases by Ruth E. Wachtel (27 Feb., p. 1093) will undoubtedly be useful for users of MS-DOS computers and does give slight mention to some other possibilities, but it offers no help for Macintosh users. Indeed, as far as I know, there is no commercially produced bibliographic program for the Macintosh. The good news, though, is that none is needed because other, general purpose, database programs are available that can be readily adapted to bibliographic purposes. Among these I am most familiar with Filemaker (from Forethought Inc.), but there are several others that apparently do a comparable job. When Filemaker is evaluated by the list of desirable features chosen by Wachtel, it does not match exactly any of the reviewed programs, but earns more "yes" entries than some of them. Furthermore, its list price is as low as the lowest of them; and as a general database manager, it can be used for many more purposes than just bibliographic management. Double-sided floppy disks used in the Macintosh will hold 800 kilobytes and permit more than twice as many references per disk as 360-kilobyte floppy disks, thus postponing the step-up to a hard disk for a little longer.

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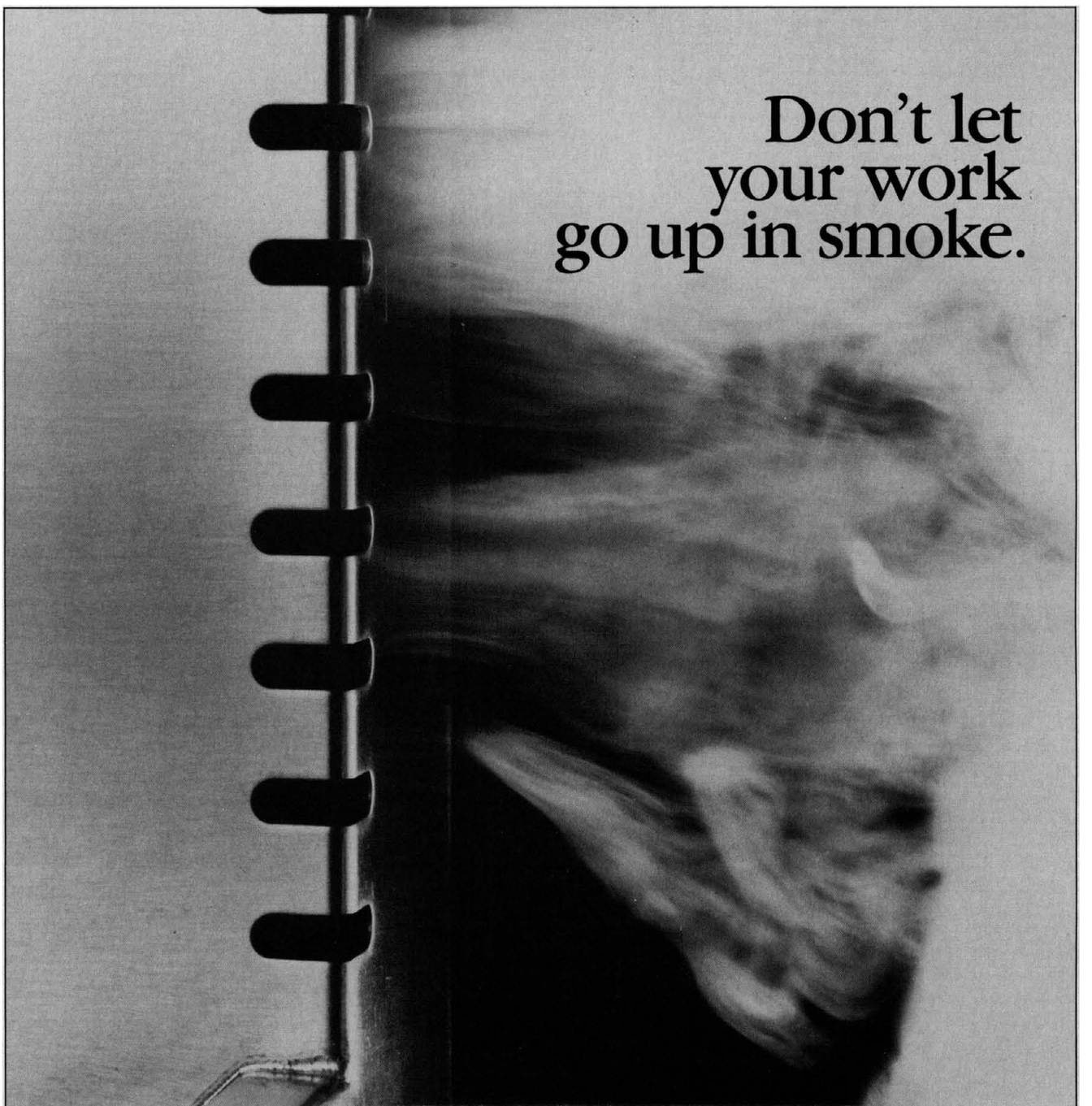
Department of Biochemistry, University of Massachusetts, Amherst, MA 01003

Erratum: In Arthur L. Robinson's Research News article "New evidence at Wayne State for superconductivity at 240 K" (3 Apr., p. 28), the second sentence of the sixth paragraph should have read, "When the investigators continue to decrease the temperature, at 100 K the sample begins to lose its remaining resistivity and becomes fully superconducting at about 60 K."

Erratum: In Deborah M. Barnes's Research News article "Drug may protect brains of heart attack victims" (6 Feb., p. 632), William A. Pulsinelli (whose name was misspelled) was incorrectly included in the statement, "because rodents are more susceptible to ischemic brain damage than primates, the Cornell researchers stress the importance of testing potential neuroprotective drugs in nonhuman primates before giving them to humans."



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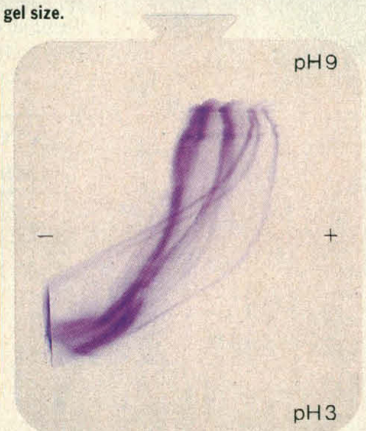

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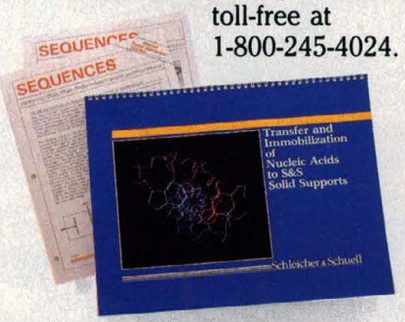

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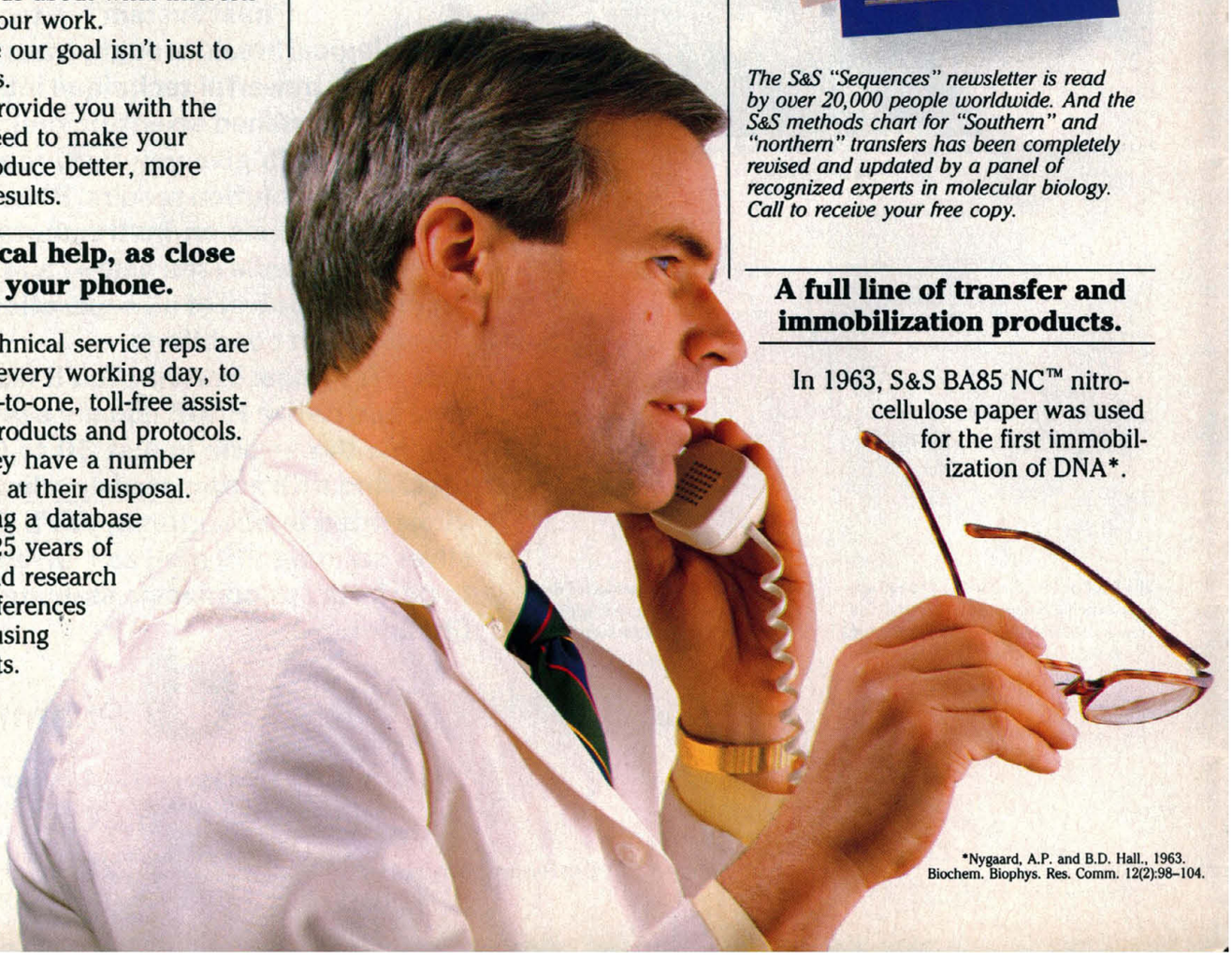

*Nygaard, A.P. and B.D. Hall., 1963. Biochem. Biophys. Res. Comm. 12(2):98–104.

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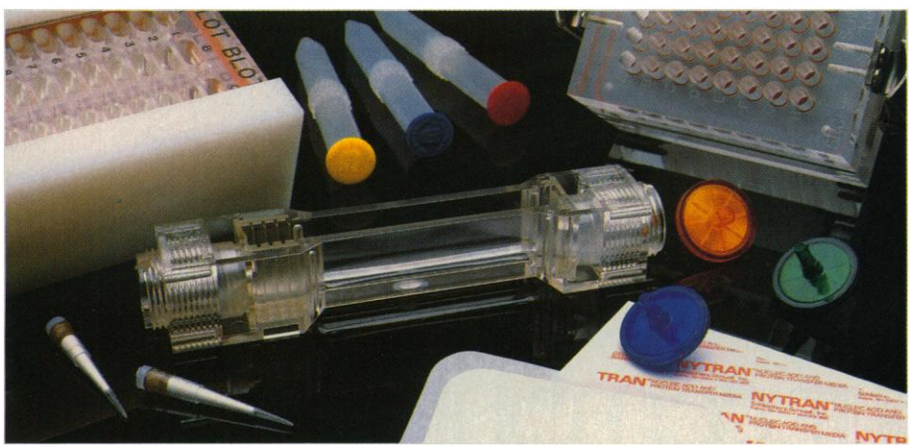

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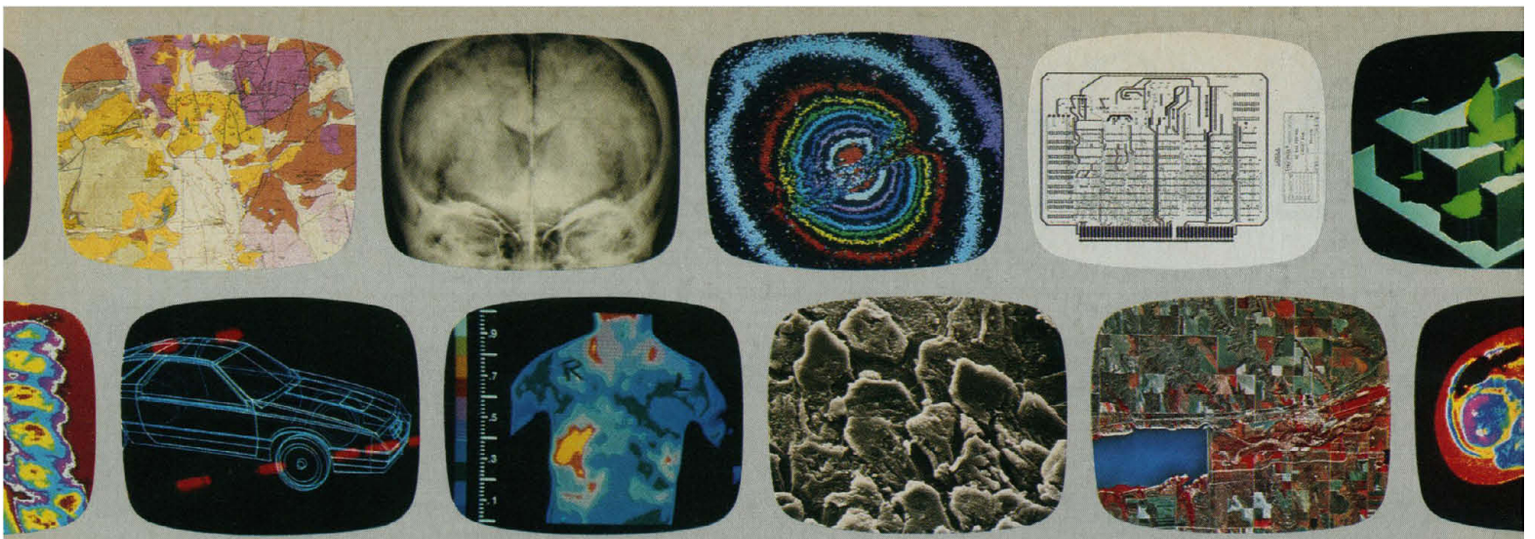

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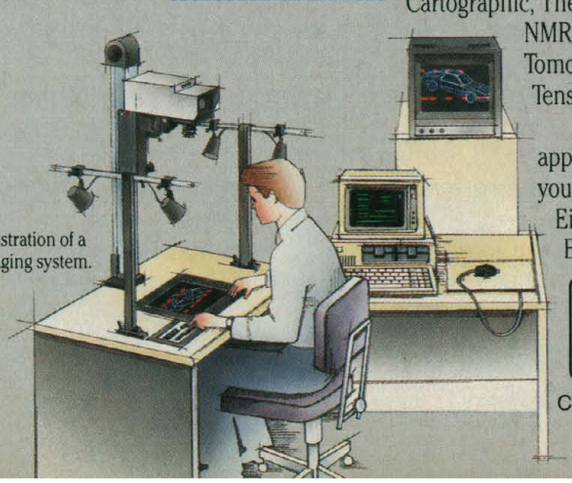

Illustration of a typical imaging system.

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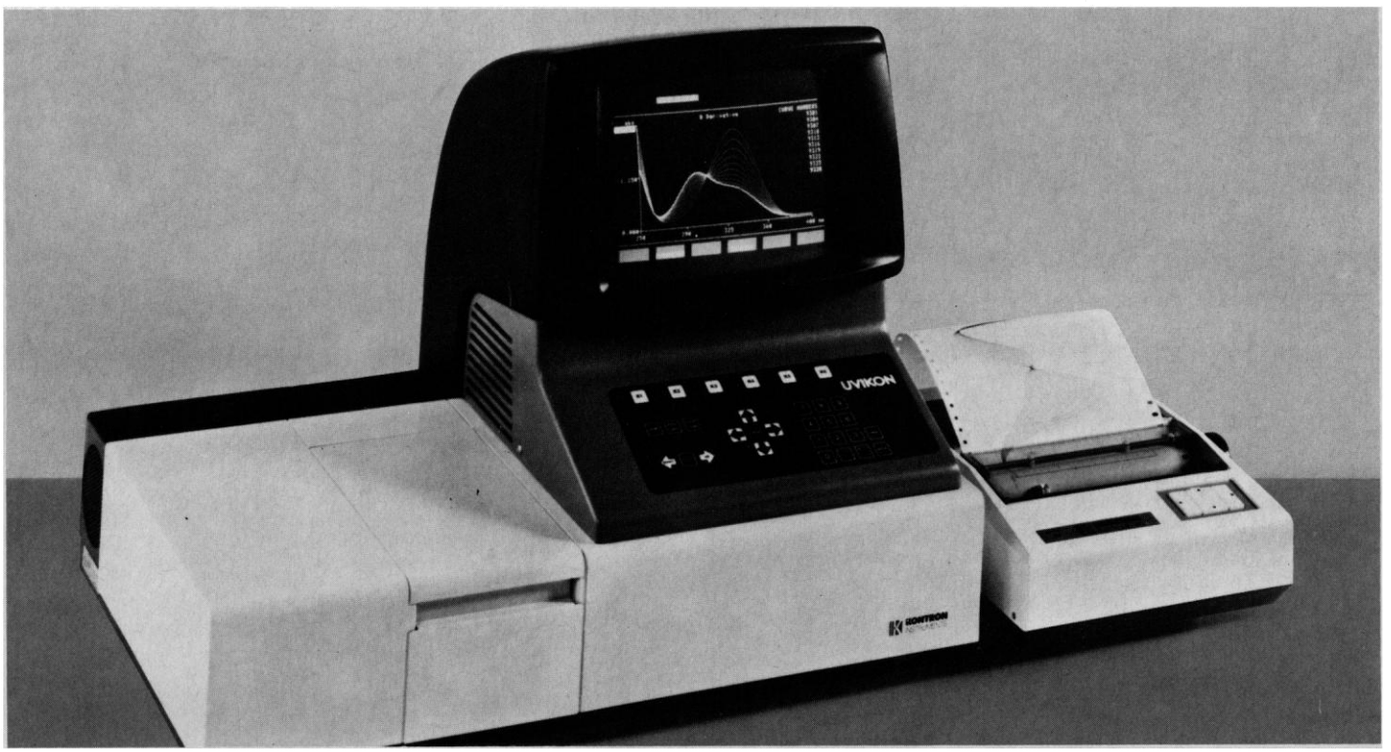

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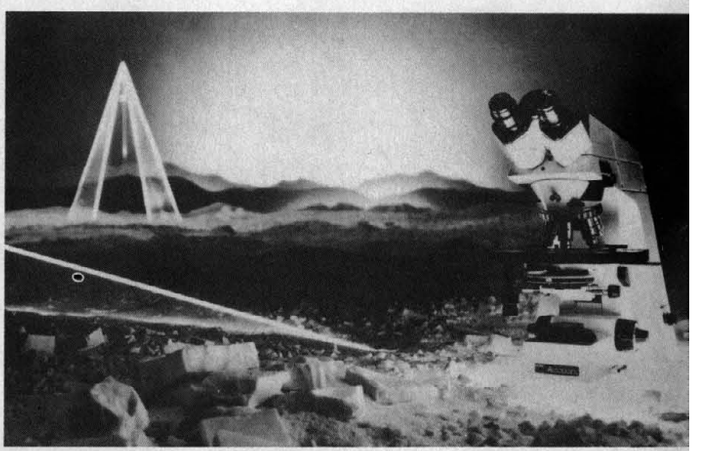

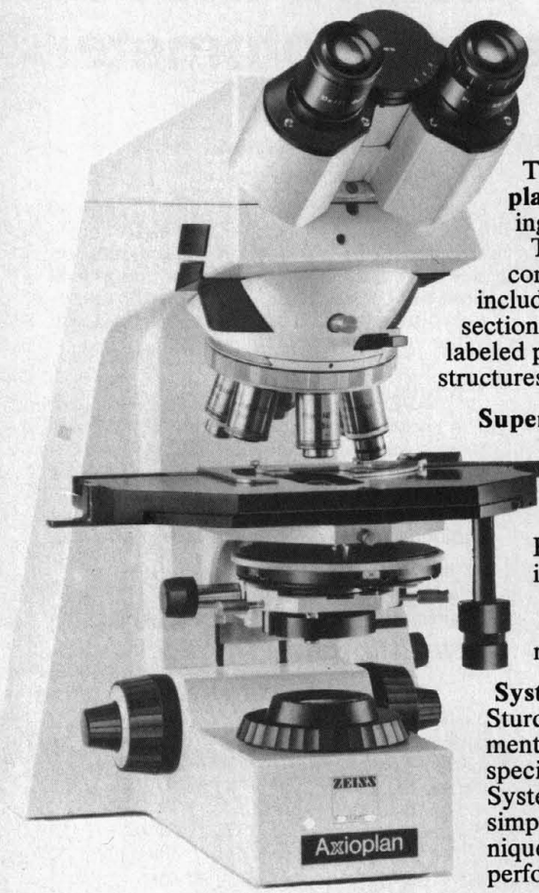

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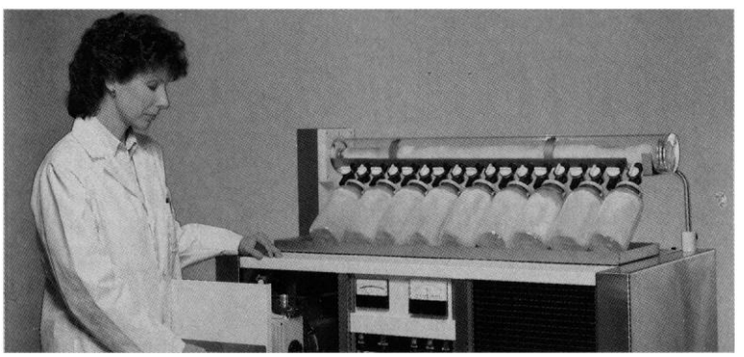

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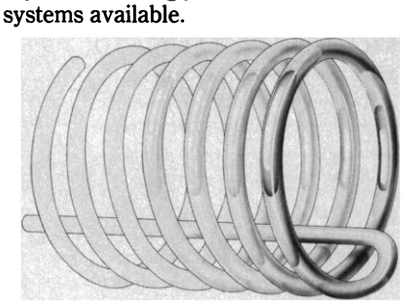

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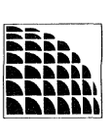

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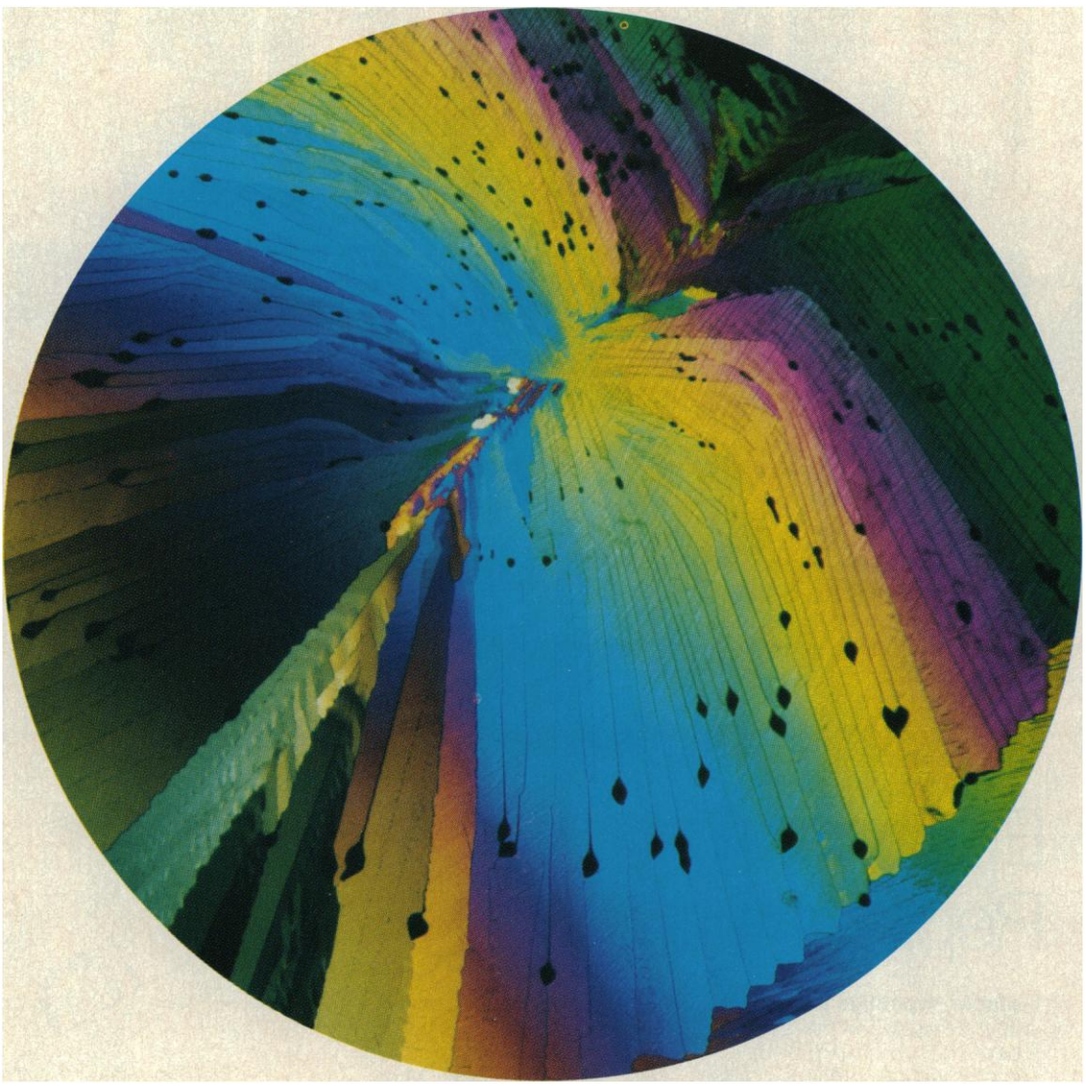

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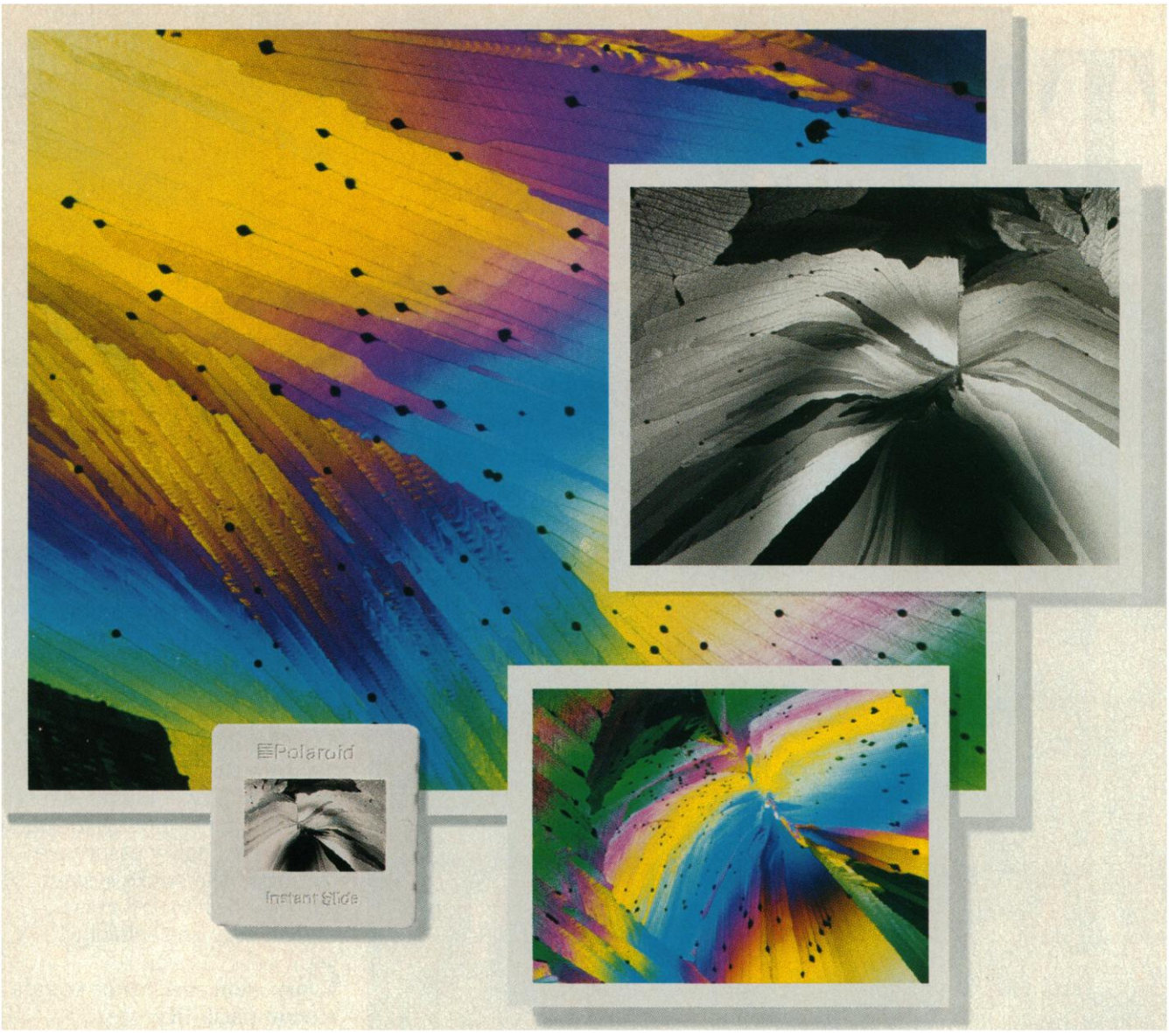

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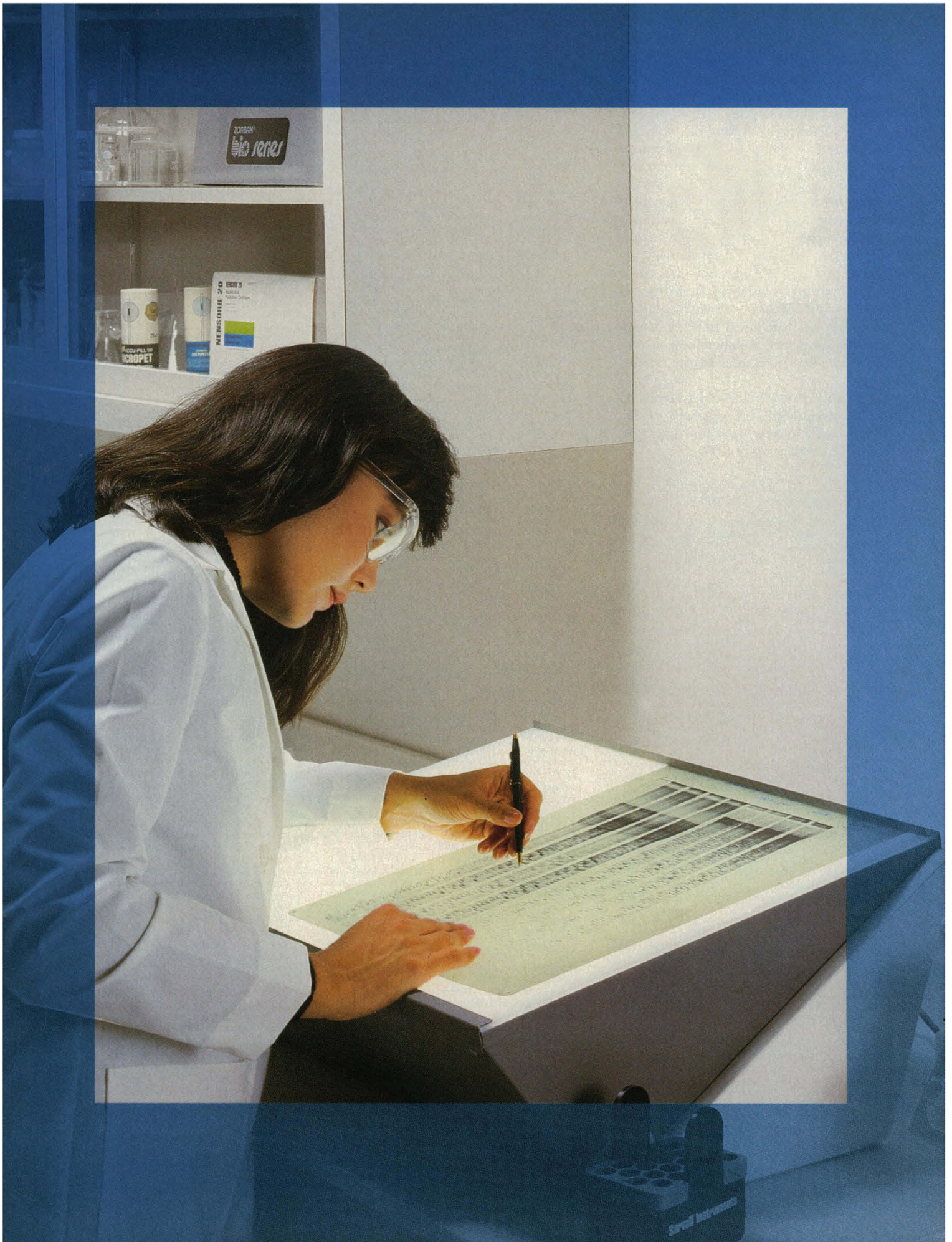
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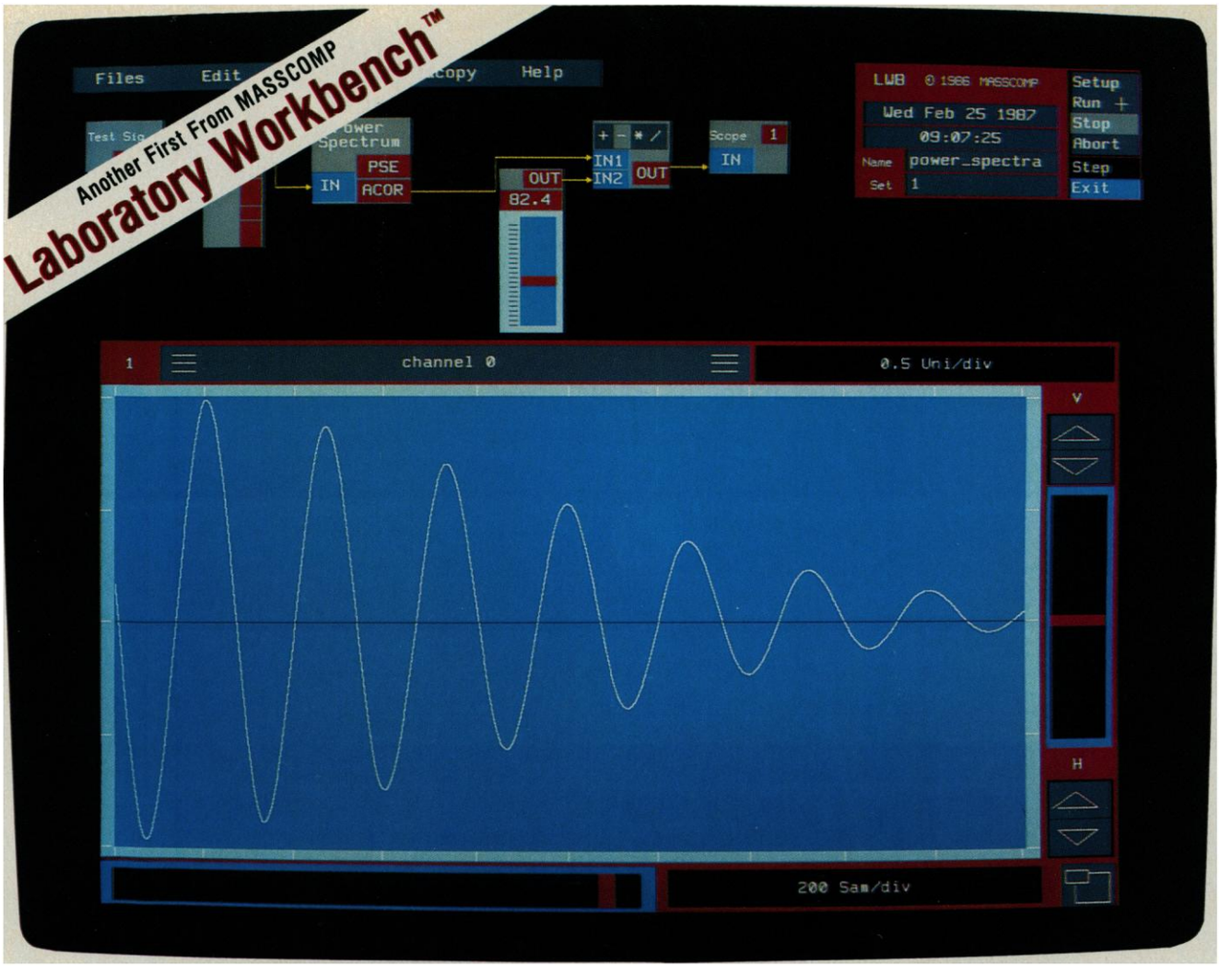

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AN INVITATION TO SUBMIT NOMINATIONS FOR 1988 KING FAISAL INTERNATIONAL PRIZE IN SCIENCE, THE 10TH ANNIVERSARY OF THE AWARD

The General Secretariat of the King Faisal International Prize, located in Riyadh, Saudi Arabia, has the pleasure to invite higher educational institutions and research centers from around the world to nominate qualified candidates for:

The 1988 King Faisal International Prize in Science,

TOPIC: "BIOLOGY"

I Scholars nominated should have made significant contribution with original research to the scientific understanding of the Prize topic.

II The nominees will be carefully evaluated by a Selection Committee consisting of internationally recognized specialists in the field.

III More than one person may share the Prize.

IV The winners' names will be announced in January 1988, and the Prize will be awarded in an official ceremony at the headquarters of the King Faisal Foundation in Riyadh, Saudi Arabia.

V The award consists of:
1. A certificate in the name of the winner, containing an abstract of the work that qualified him/her for the Prize;
2. A gold commemorative medal;
3. And a sum of three hundred and fifty thousand Saudi Riyals (approximately US$93,333)

VI The following nomination procedures must be followed:
1. A nominee must have accomplished outstanding academic work or research on the subject of the Prize topic, benefiting mankind and enriching human progress.
2. The Prize will be awarded for specific original research, but the nominee's complete works will be considered.
3. The works submitted with the nominations must have been published before the nomination deadline.
4. The specific works submitted must not have been previously awarded a prize by any international organization.
5. Nominations must be submitted officially on behalf of institutions of higher education and research centers. Nominations from individuals or political parties will not be accepted.
6. Nominations must give full particulars of the nominee's academic background, experience and publications, as well as copies of his/her educational certificates. Three coloured photos (10x15cm), the full address and the telephone number of the nominees are also requested.
7. Nominations and selected publications (ten copies) are to be sent by registered airmail to the address stated below.
8. The latest date for receipt of complete nomination packets is July 25, 1987.
9. No nomination papers or works will be returned to the senders.
10. All correspondence should be forwarded to:

The General Secretariat of the
King Faisal International Prize
P.O. Box 22476
Riyadh 11495, Saudi Arabia
Telex: 404667 PRIZE SJ


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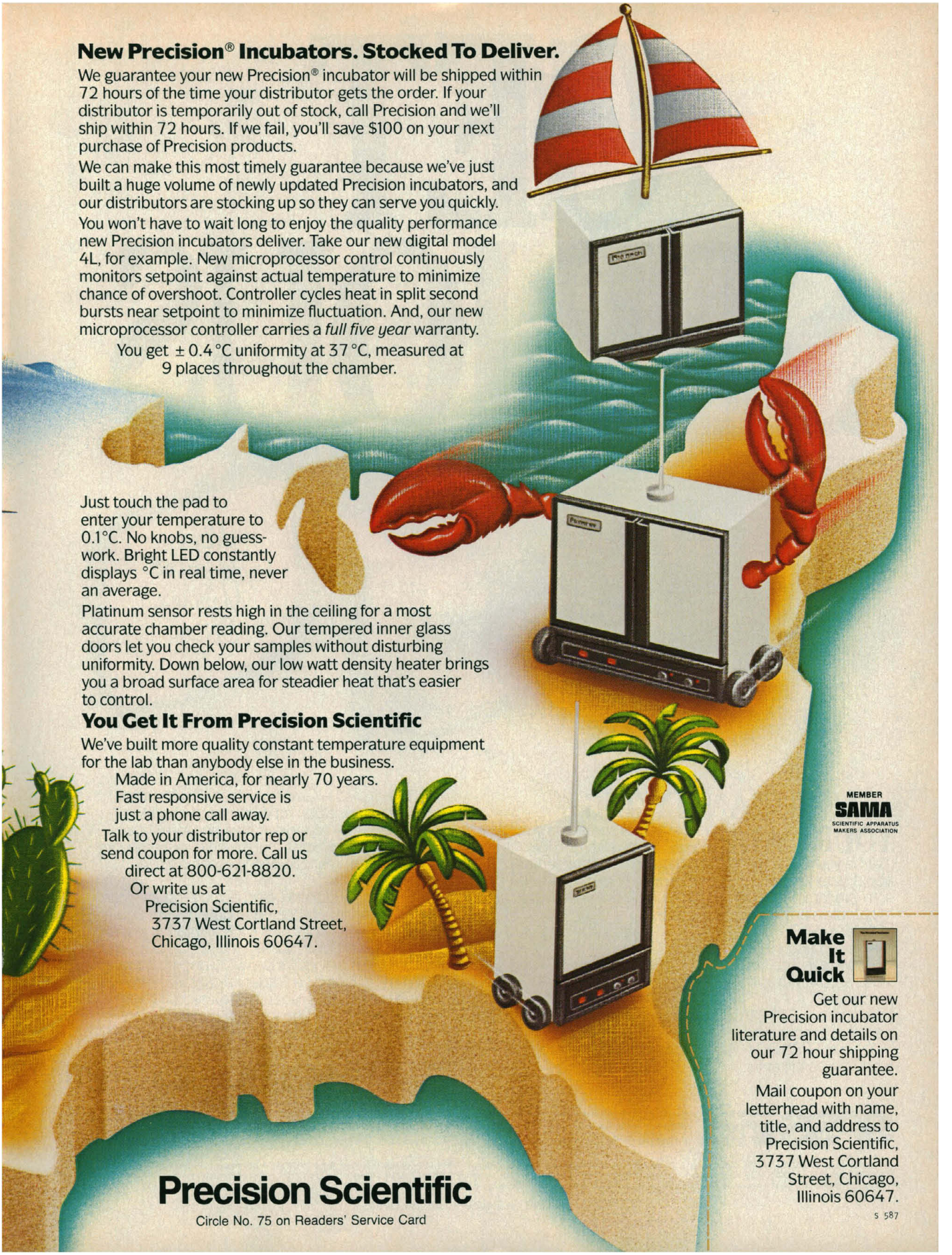

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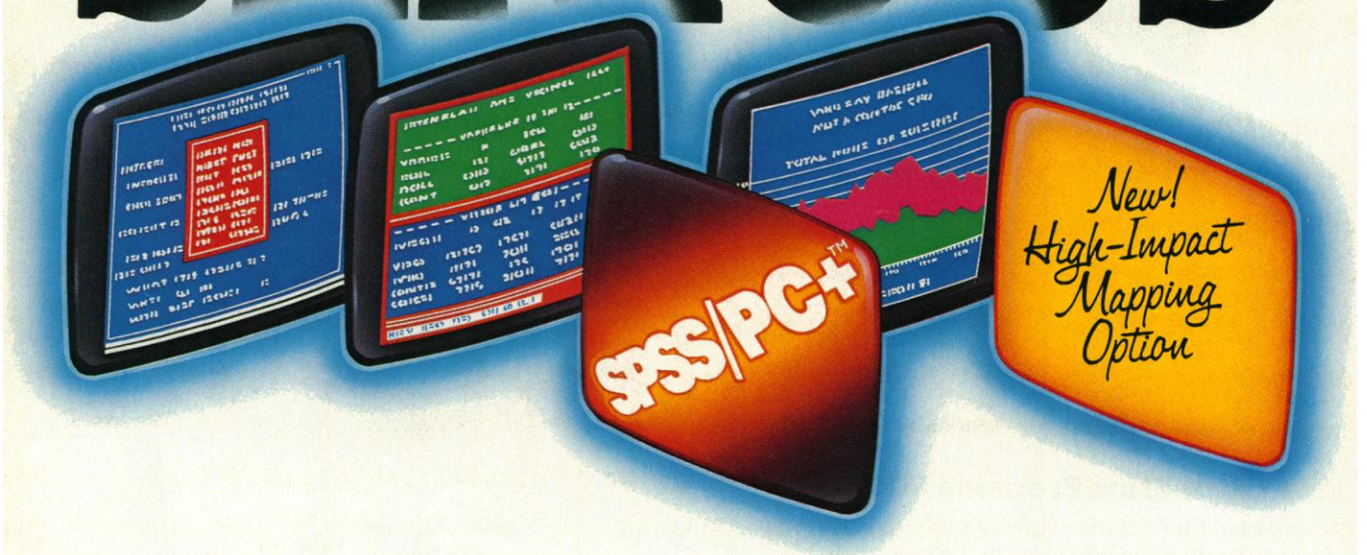

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