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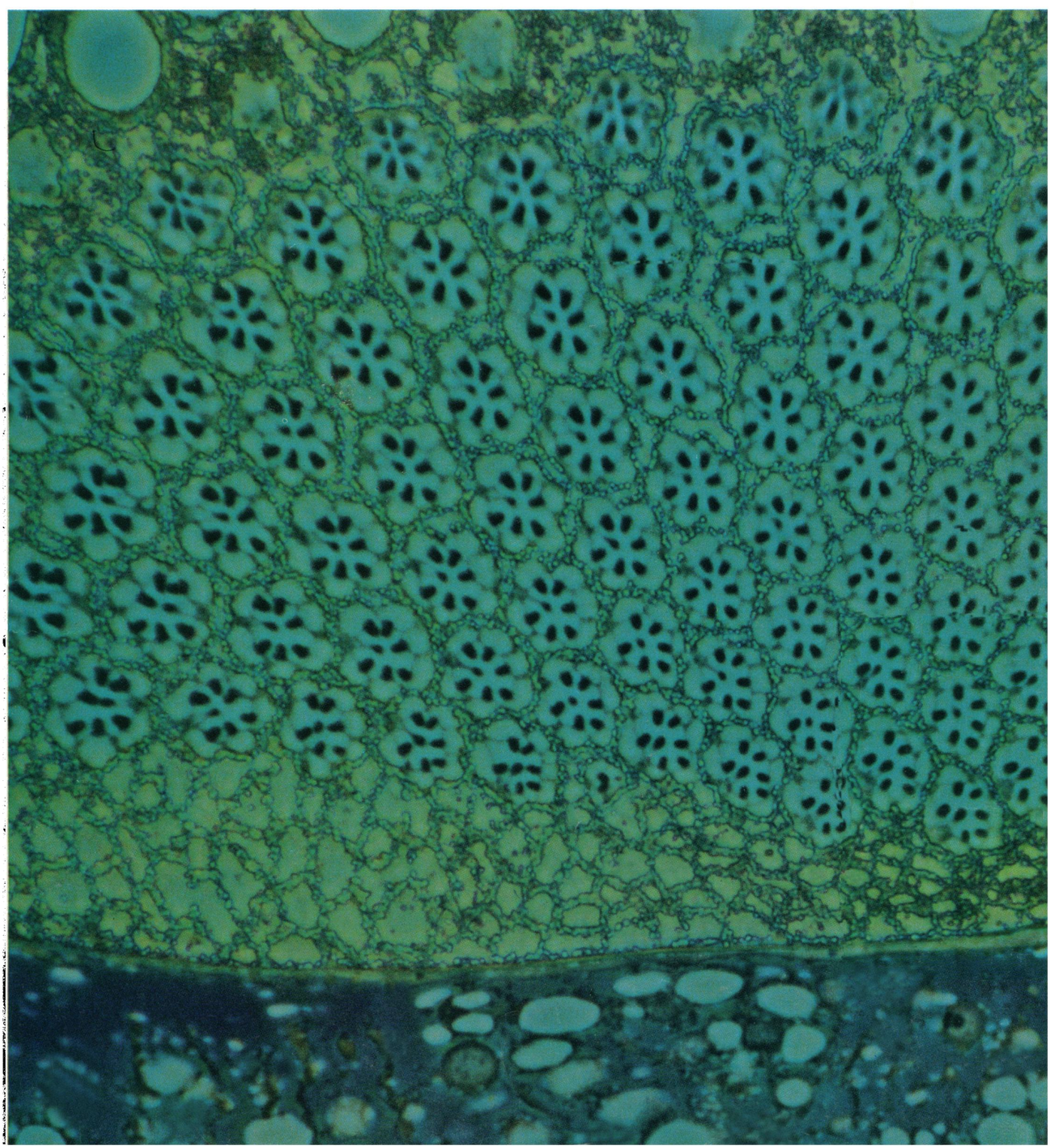

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COVER Radial section through a compound eye of *Drosophila* illustrating its highly ordered and repetitive structure. Approximately 70 repeat units, or ommatidia, are shown. Each ommatidium contains eight photoreceptor neurons, seven of which are visible in any given plane of section. The determination of the various cell types during development depends on cellular interactions. See page 55. [Slide courtesy of Hermann Steller, Howard Hughes Medical Institute, Berkeley, CA 94720]

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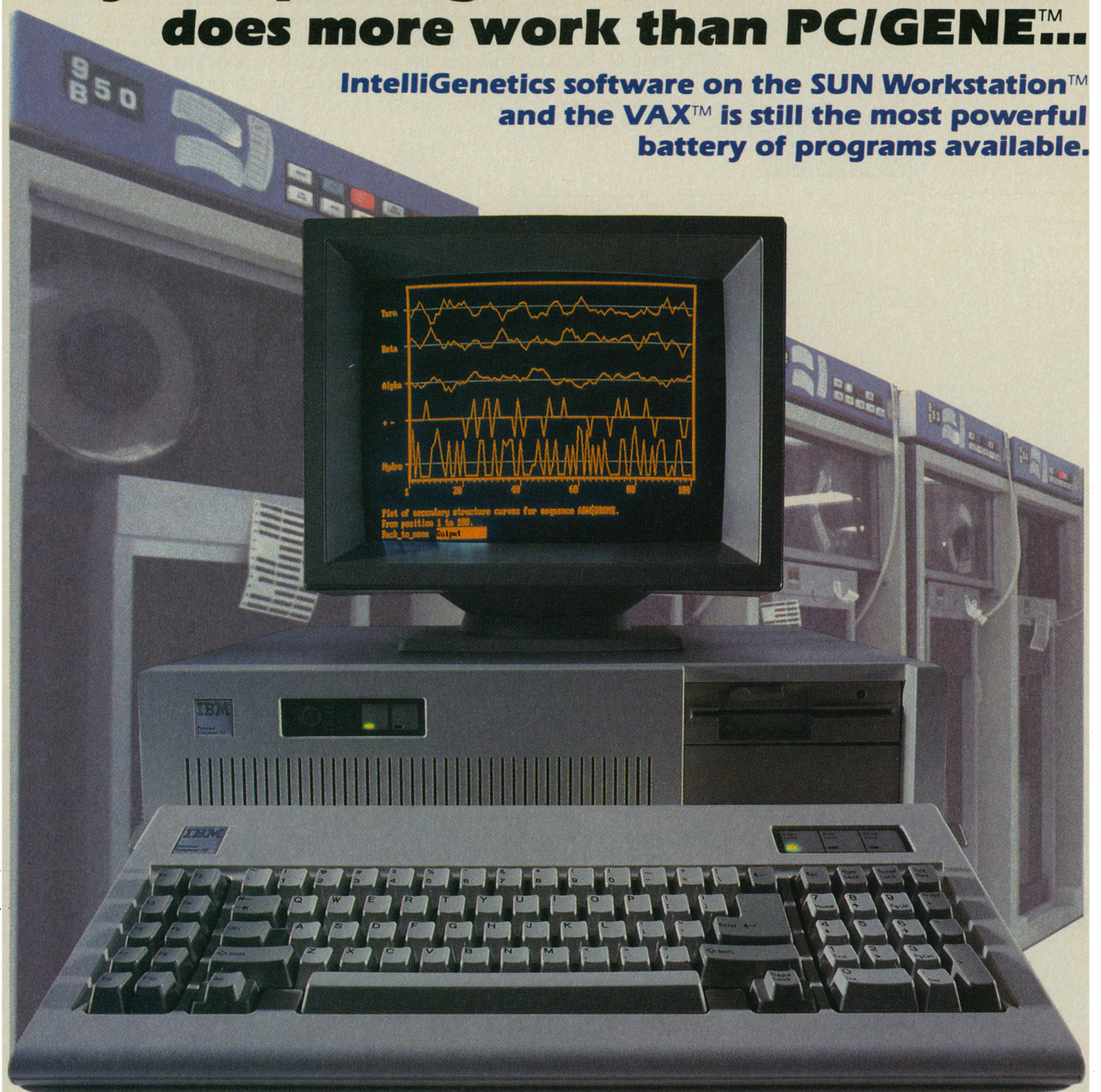

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Foreign engineering students

THERE is a shortage of U.S. citizens interested in becoming full-time graduate students in engineering (page 33). As a result, foreign students have filled more than 50% of the slots for graduate students in engineering departments (chemical, civil, electrical, and mechanical) since the early 1980s. According to a survey by Barber and Morgan, these students come mainly from Taiwan, India, the People's Republic of China, Iran, and the Republic of Korea. Faculty members and heads of engineering departments reported that, in general, the impact of these students on the programs in their institutions is positive; in recent years the foreign students have become essential in the training of undergraduates and carrying out crucial research. Yet, at some time, about 12% of the survey respondents said that they barred foreign students from access to information or laboratories for national security reasons; about 17% reported that they had been prohibited from using foreign students on specific research projects. Problems associated with the foreign students center around their language skills and ability to communicate with others.

Earth's interior

A solid aspherical inner core is at the center of the earth surrounded by a fluid outer core; these are surrounded by the mantle which is surrounded by the crust (page 37). These regions of the earth and boundaries between them are being mapped and studied by seismograms, recordings of ground motions generated by earthquakes and other naturally occurring seismic pulses. Dziewonski and Woodhouse explain how equations and computer models transform seismic data into images of the shape of the earth's interior; growing networks of stations collect and share data on seismic events. The three-dimensional global maps that have been generated contribute to understanding the earth's evolution, dynamic features of its magnetic field, thermal, chemical, and mechanical interactions between the core and mantle, and properties of the various regions that contribute to the individuality of each.

Photoreceptor development

FRUIT flies have compound eyes (cover) consisting of about 800 unit eyes or ommatidia each containing 20 cells (page 55). Eight of the cells are photoreceptors classified according to morphology and sensitivity to certain types of light. One photoreceptor cell, R7, is in a class by itself and is the primary responder to ultraviolet light. R7 cells develop from precursors in response to local environmental cues. The gene *sevenless* that encodes a protein in *Drosophila* responsible for reading or interpreting the information received from the environment has now been isolated and characterized. Its protein product shares structural features with hormone receptors and appears to be a transmembrane protein. Hafen *et al.* speculate that this protein reads positional cues sent by neighboring cells and triggers the R7 developmental pathway. The mechanism by which the *sevenless* gene product works may be similar to the way in which other receptors respond to specific hormones and other diffusible substances. Marx elaborates on the role of the *sevenless* gene product in eye development and on the similarities of this protein to other important proteins that are active during development (page 26).

Lizard bones and "the bends"

LIZARDS that lived in the sea between 100 and 64 million years ago may, like some modern human divers, have suffered decompression syndrome or "the bends" (page 75). Fossil vertebrae from mosasaurs show linear radiolucent patterns of necrosis much like those diagnostic of the human bone disease avascular necrosis, which is sometimes a result of the bends. Rothschild and Martin surveyed fossil vertebrae from three genera of mosasaurs; in two, avascular necrosis was prevalent. The mosasaurs ate fish, squid, and other delicacies from the deep sea, and some probably dove deeply in their search for food. Unlike modern toothed whales with which they may be compared on ecologic grounds, the mosasaurs probably lacked an intravascular oxygen storage system. In its absence, the bends could occur with nitrogen bubbles accumulating in the blood, small vessels occluding, bones necrotizing, and degenerative bone disease and its sequelae resulting.

B cells in autoimmune disease

ANTIBODIES that react with self components arise during the development of rheumatoid arthritis, systemic lupus erythematosus, and other autoimmune diseases (pages 77 and 81). Two commonly occurring autoantibodies are those that react with single-stranded DNA molecules and those called rheumatoid factors that react with the Fc portion of immunoglobulin molecules. Casali *et al.* and Hardy *et al.*, using different experimental systems, report that these typical autoantibodies are secreted by a subset of lymphocytes, called Leu-1^+ B cells, found in spleen and blood. In autoimmune disease and in fetal development, Leu-1^+ cells account for a higher proportion of B lymphocytes than they do during the normal late developmental stages. When experimentally activated with a virus or a bacterium, the Leu-1^+ cells can be transformed into antibody-secreting cells. B cells not carrying the Leu-1^+ marker also make antibody molecules but not the ones that are common to autoimmune diseases. The new strategies that have been designed for purifying and immortalizing the Leu-1^+ cells will facilitate comparisons of the activities of Leu-1^+ cells in normal and diseased individuals; they will also make possible analyses of factors, besides self antigens, that may trigger the development of autoimmune disease.

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1 Transforming growth factor type beta isolated from human platelets (hTGFβ) or from porcine platelets (pTGFβ1) is sequentially (first 50 a.a.) and biologically identical. Both give an ED_{50} of 0.1-0.4 ng on NRK (49F) cells when assayed as per Assoian *et al* JBC *258*, 7155, 1983, and 0.8-1.0 ng/ml on AKR (2B) after Tucker *et al* CAN RES *43*, p1581, 1983.

2 pTGFβ2 is a structurally distinct second form of TGFβ (sequence homology 70% in the first 50 a.a. to hTGFβ/pTGFβ1). When assayed as above, it gives the same ED_{50}s on NRK and AKR cells. However, some cell lines can distinguish between pTGFβ2 versus pTGFβ1/hTGFβ.

3 Human platelet derived growth factor h(PDGF) is assayed on Balb/c-3T3 and NIH-3T3 cells for H^3-thymidine incorporation as per Raines and Ross, Meth. in Enz. *109*, p749.

4 Porcine PDGF is structurally very different from hPDGF (i.e. differs in M.W., subunit composition, N-terminus), it's activity is determined as in 3 above.

5 Both the acidic and basic forms of bovine fibroblast growth factor are isolated from brain and assayed for H^3-thymidine incorporation on NR6-3T3 cells after Gospodarowicz, *et al* JBC, *253*, p3736, 1978.

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World Food

Due to advances in agriculture in many countries, there is now a substantial world surplus of food. Twenty-five countries, including some of the European Economic Community, Canada, Australia, Argentina, China, India, and even Saudi Arabia, are net exporters of grains. Prospects are that for the next decade at least, world capability to produce food will increase faster than population. These developments have had and will have profound effects on American agriculture. Symposiums on global agriculture were part of the recent AAAS meeting in Chicago. In what follows, I will provide some highlights from the sessions.

Improvement in food supplies is the result of many factors. Among them are new and better crop varieties, more irrigation, fertilization, pest control, and the bringing of more land into production. The most important is the new crop varieties. Plant genetics has been the foremost factor in the rise of world farm productivity in recent years. Asian rice yields have increased from 1.2 tons per hectare (t/ha) in 1960 to 3.2 t/ha and are still rising. European wheat yields have about tripled and since 1960 have risen to 4.4 t/ha. Comparable improvements have occurred in a number of other countries, and yields today in many instances are comparable to those in the United States.

China provides the most dramatic example of improvements in agriculture. Since 1978 productivity there has increased 50 to 60 percent. The change is in part due to organizational reforms that encourage private initiative. However, seed-breeding institutions have provided high-yielding varieties that have replaced traditional ones. Improved wheat, rice, and maize seeds are available. In addition, better water control, more irrigation, extension services, and increased use of manufactured fertilizer have been factors. China is now the third largest user of manufactured fertilizer, but night soil and other organic matter still provide half of the added nutrients.

Changes in agriculture in India have also been noteworthy. Since 1968 the country has moved from a grain-importing status to being a grain exporter. Moreover, as in China, the Indians have established excellent capability for genetic improvement of seeds. Substantial developments have occurred elsewhere, for example, in Bangladesh and Indonesia. The slowest rate of progress has been in Africa, but improvements there seem likely. A new sorghum hybrid produced by the International Center for Research in the Semiarid Tropics is drought-resistant. In a bad year, it yields more than local cultivars do in a good year. In a good year, it doubles and triples yields.

The growing food surplus has been exacerbated by national policies of subsidizing farm outputs. World agricultural subsidies, which totaled about $20 billion in 1970, have risen to about $150 billion. In the United States, aid to farmers is expected to reach $27 billion this year. The 12 countries of the European Economic Community spent $23 billion in 1986; Japan spent $15 billion. The subsidies have led to excessive production and low prices for grains sold on the world market. The people who are taxed to provide the subsidies usually do not enjoy the benefits of the low world prices.

In 1960 Japan paid its rice growers twice the world market price. Internal politics have raised the price of Japan's rice to ten times that for Thai rice. Japanese shoppers pay $25 for a melon and $30 per pound for good beef.

U.S. farmers are up against trade barriers or they are competing with low-cost producers in a global marketplace. Exports of food, which totaled $44 billion in 1981, shrank to about $27.5 billion in 1986. Given surpluses, there are many people in the United States who advocate decreasing our agricultural research and extension services. This is, of course, wrongheaded. We are in a global competitive market in which others are improving their capabilities. If we are to compete, we cannot rest on past achievements. We must find ways of being more creative and more effective in rapidly harvesting the many potentials of research and development.—PHILIP H. ABELSON

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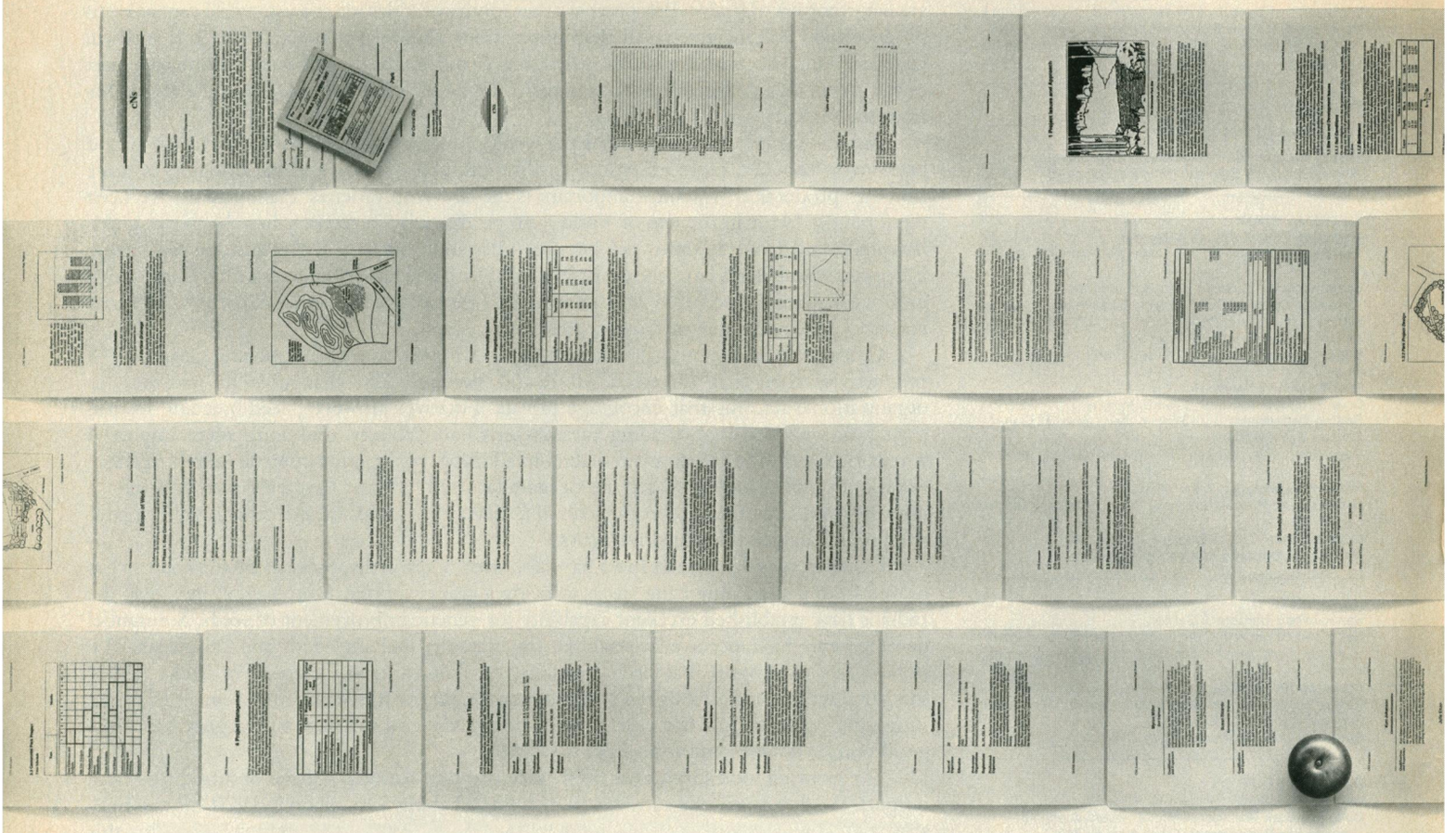

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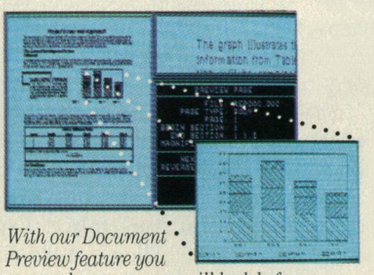

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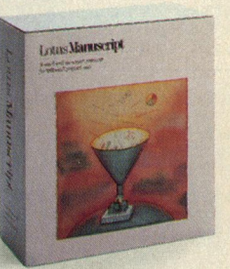

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samples. The only significant difference between our method and that of Barker *et al.* is that they spot the blood directly on the filter, whereas we make a phenol extraction before application of the sample. This can hardly be regarded as new since investigators engaged in DNA-based diagnosis of hepatitis B virus are using similar methods. In our paper we also described a partial sequence of our clone, and the whole repeat has since been further characterized and sequenced by us (*2*) and by others (*3*). The use of repetitive DNA for malaria diagnosis has also been reported by other investigators (*4*).

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1. L. Franzén *et al.*, *Lancet* **1984-I**, 525 (1984).
2. L. Åslund *et al.*, *J. Mol. Biol.* **185**, 509 (1985).
3. P. Oquendo *et al.*, *J. Mol. Biochem. Parasitol.* **18**, 89 (1985).
4. Y. Pollack *et al.*, *Am. J. Trop. Med. Hyg.* **34**, 663 (1985); G. L. McLaughlin *et al.*, *ibid.*, p. 837.

Response: The focus of our work and our report is the development of DNA probe–based methods for the diagnosis of infectious agents, primarily parasites in the developing world. This requires both a specific DNA probe and more important, a method that will allow its use under field conditions directly from clinical samples. Methodologies that require sample extraction or complex experimental procedures such as those suggested by Franzén *et al.* may work very well in the laboratories of the developed world, but our extensive field experience with DNA probes for leishmaniasis, filariasis, and now malaria clearly indicates that simple, direct sample application procedures are necessary if this methodology is to have any future utility for people living in endemic areas. Much of our effort was devoted to developing such direct sample application methods and then testing them directly in the field in Thailand, Brazil, and subsequently Africa. The Franzén *et al.* paper is quoted in our report (reference 4) and we attempted to point out the advantages of our methods over those previously reported. Our focus in this work is not on the molecular biology of repeated DNA sequences but instead on the practical field application of DNA probe–based diagnostics for malaria.

DYANN F. WIRTH
ROBERT H. BARKER, JR.
Department of Tropical Public Health, Harvard School of Public Health, Boston, MA 02115

Erratum: In the Table of Contents for the issue of 16 January (p. 260), the authors of the article "Geologic evolution of northern Tibet: Results of an expedition to Ulugh Muztagh" on page 299 should have been listed as P. Molnar, B. C. Burchfiel, Z. Zhao, K. Liang, S. Wang, and M. Huang.

Erratum: In Mark Crawford's article "Genentech sues FDA on growth hormone" (News & Comment, 20 Mar., p. 1454), antibody response that occurs in some patients using Protropin was incorrectly portrayed as the result of the product's 192nd amino acid—a methionyl. While the methionyl may be involved in the antibody responses of a limited number of Protropin users, there is evidence that antibody formation is a result of a number of factors. In particular, the precise details of the manufacturing process appear to be the major factor in determining the antigenicity of growth hormone preparations.

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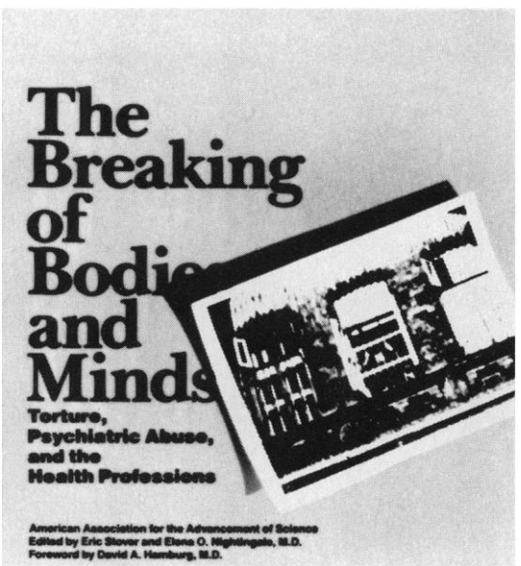

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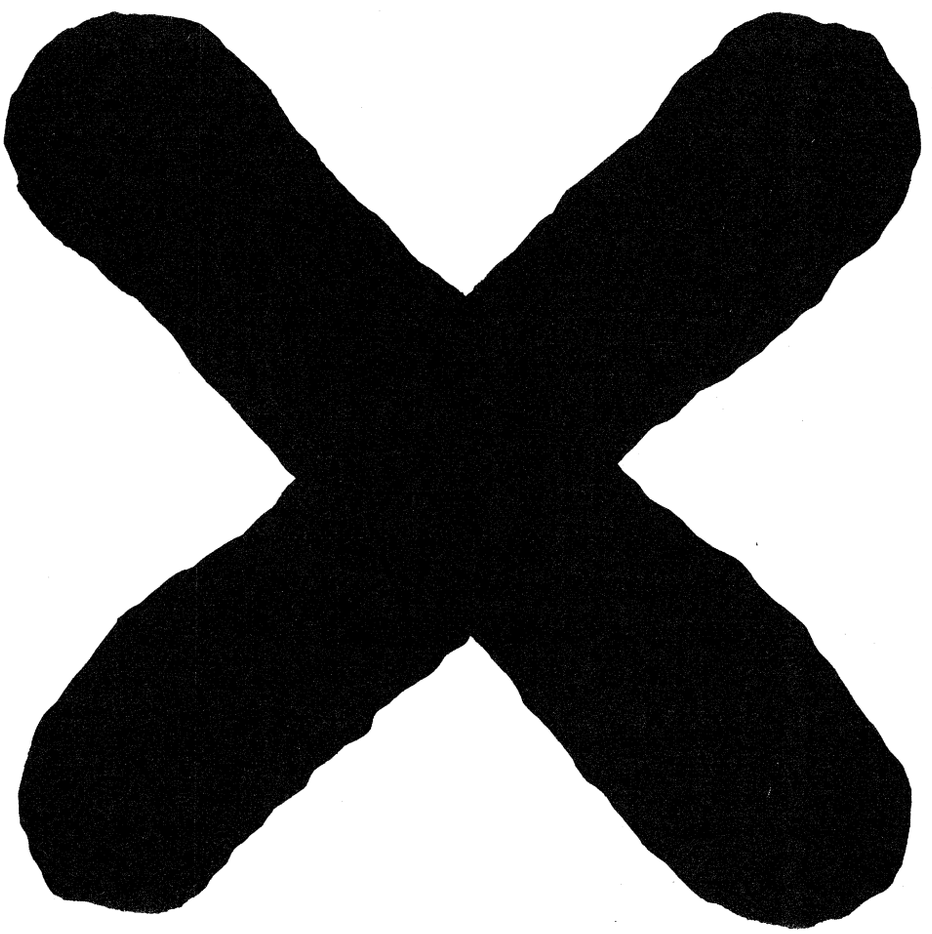

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