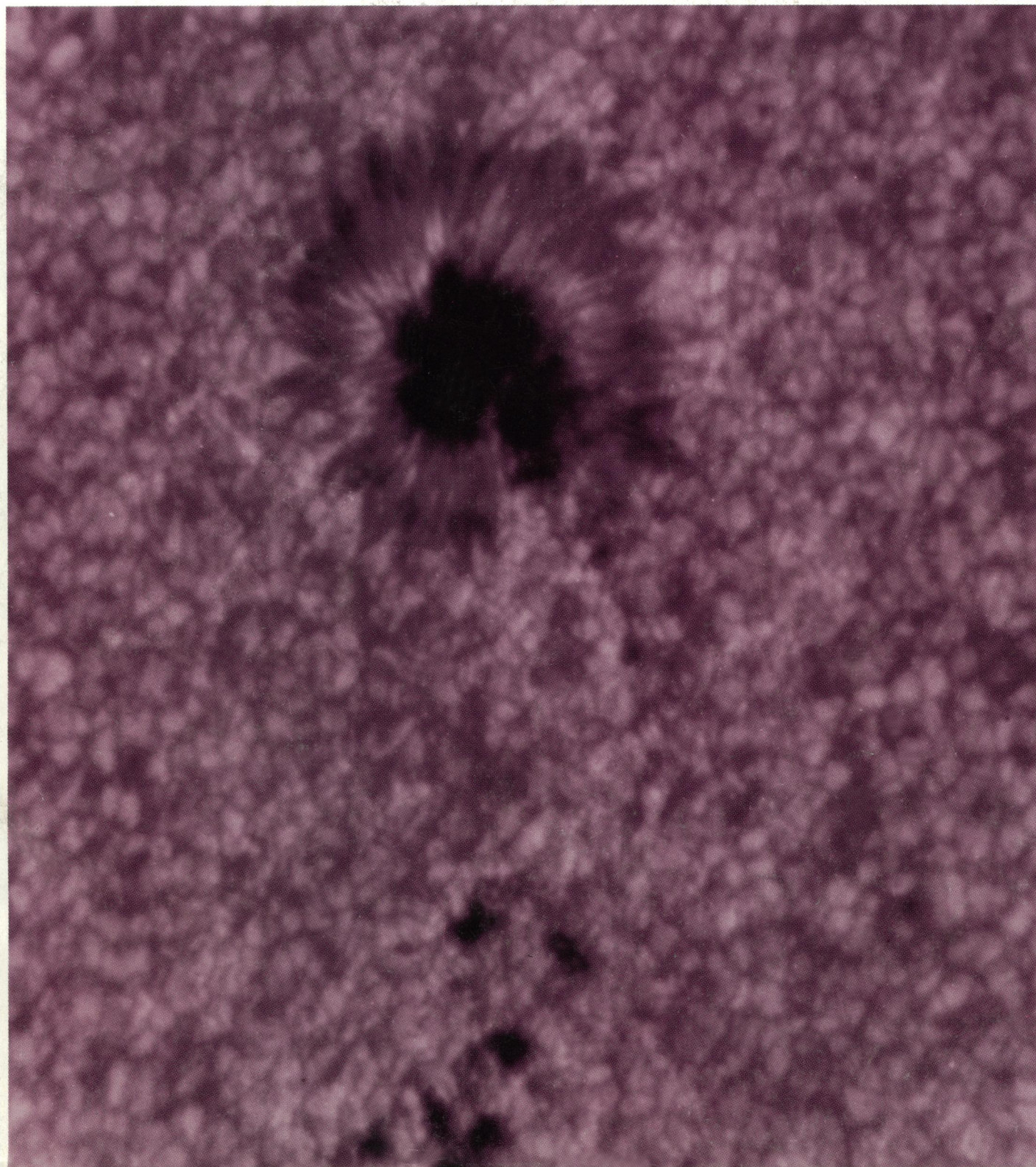


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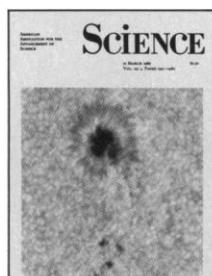
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COVER A white-light image of an active region on the sun taken by the Solar Optical Universal Polarimeter instrument during the Spacelab-2 mission on board the space shuttle Challenger. The granular structures are due to convection in the solar atmosphere. The dark sunspot is a region of strong magnetic fields and is approximately 14,000 kilometers in diameter. See page 1264. [Lockheed Palo Alto Research Laboratory, Palo Alto, CA 94304]

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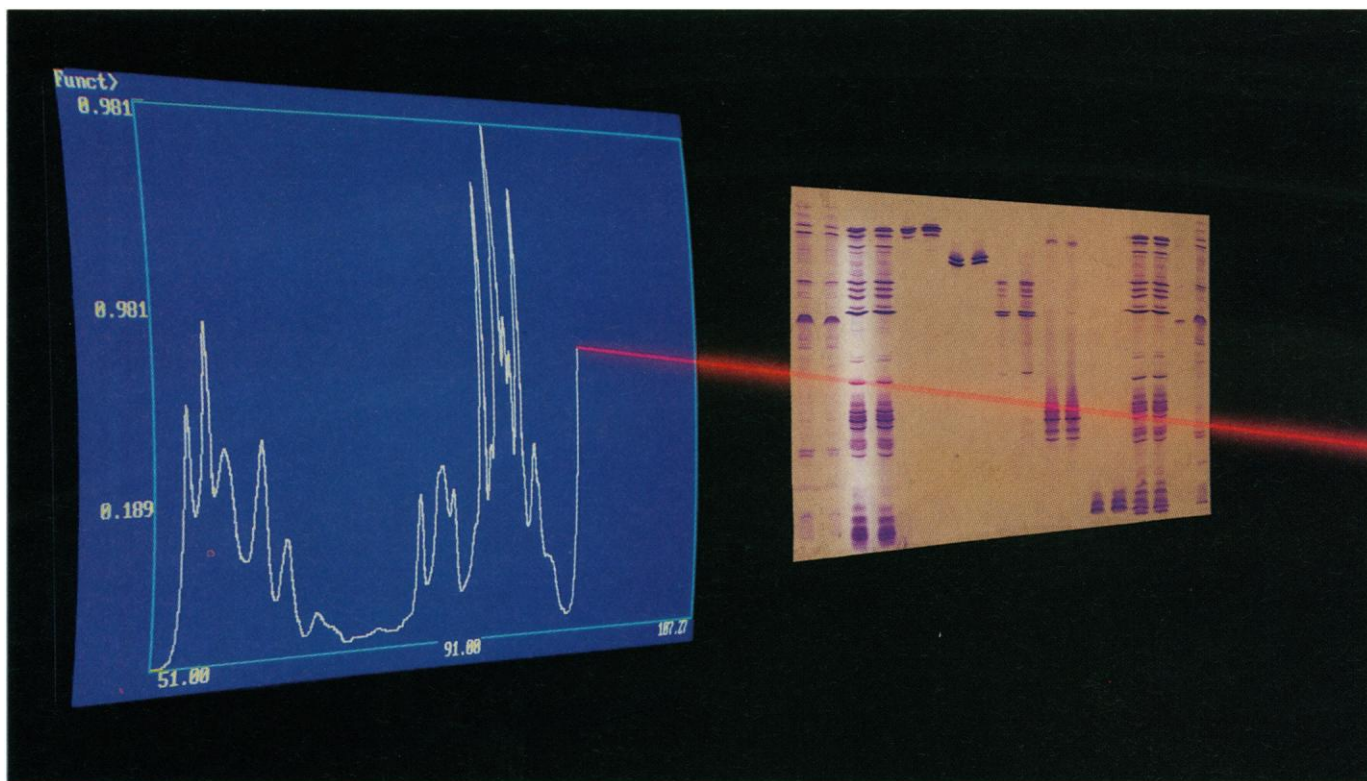
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This Week in SCIENCE

Ozone hole

EACH spring in the Southern Hemisphere, a gaping hole has been appearing in the ozone layer above Antarctica (pages 1253 and 1258). Laboratory experiments by Molina *et al.* and Tolbert *et al.* show what chemical reactions might account for the catalytic destruction of ozone—two molecules of ozone yield three of oxygen—on the surfaces of ice particles in the stratosphere. Stratospheric clouds are thought to consist mostly of ice and nitric acid. Relevant chemical species were shown to stick, diffuse, and react at accelerated rates when exposed to ice particles at temperatures approximating those of stratospheric clouds (about 200 K): gas-phase hydrochloric acid and chlorine nitrate generated gas-phase chlorine and other chlorine-containing species that can quickly photolyze to free radicals. During the reactions, certain nitrogen species were suppressed, and thus all conditions were fulfilled for creating an environment in which catalytic destruction of ozone by halogenated free radicals can take place.

Spacelab-2 studies

THE flight of the space shuttle that began late in July 1985 was dedicated to experiments and observations in space physics and astronomy; some of the findings are now reported (pages 1260, 1264, and 1267). Mendillo *et al.* describe properties of “ionospheric holes” that were generated when shuttle engines were fired and neutral exhaust gases injected into the ionosphere; the interactions of gases with ionospheric molecules depleted plasma and produced the holes. One hole served as a temporary window through which low-frequency radio waves from celestial sources (that are otherwise blocked) were detected from an observatory on the earth. Shine *et al.* describe various phenomena associated with sunspots (cover) that were detected by high-resolution white light polarimetry and analyzed with interactive video equipment and image processing techniques. Fine structures of the solar

chromosphere (the surface layer above the region visible to the eye) and the transition zone between it and the sun’s hot corona were studied by ultraviolet spectroscopy; Dere *et al.* discuss dynamic properties of various structures in relation to the unusual temperature profile (varying over many orders of magnitude) that characterizes the solar atmosphere.

Halting leukemia growth

FOR a rat to be able to reject leukemia cells it must produce sufficient quantities of differentiation factor (DF) (page 1278). This factor channels the cell’s metabolic activity away from unchecked proliferation in the undifferentiated state and toward terminal differentiation and eventual cell death; in the absence of DF, the cells remain leukemic and can quickly kill the host. Jimenez and Yunis show that 7-day-old rats that typically die by day 16 from chloroleukemia (a form of myelogenous leukemia that is similar to the human disease) can be protected if they are given an injection of DF; 21-day-old rats are not normally killed by the leukemia cells, and they were found to produce on their own much more DF than did the younger rats. The injected DF caused the leukemia cells to differentiate into macrophages, and this occurred even if the tumor was enclosed in a chamber inside the host. These results suggest that injections of DF might have a role in the therapy of patients with myelogenous leukemia.

Protein anchor

A protein can be anchored in a cell membrane in one of several ways (page 1280). One strategy common to the decay accelerating factor (DAF) and several other proteins is attachment through a hydrophobic glycosylated phosphatidylinositol (PI) complex. PI forms a complex with ethanolamine and carbohydrates; the carboxyl group at the protein’s carboxyl terminus links covalently to ethanol-

amine. Caras *et al.* fused a small portion (the 37 terminal amino acids) of DAF to a truncated, secreted (not membrane-bound) form of the protein glycoprotein D (gD-1) from herpes simplex virus type 1. The fusion protein was expressed in and on cells; the terminal segment of DAF apparently carried the signals for covalent attachment of gD-1 to the PI anchor complex. The signals for protein-to-anchor linkage are not defined, but all proteins that attach with PI anchors have hydrophobic domains in the carboxyl terminus; these may act as transient membrane anchors that later are clipped and replaced by PI anchors. Proteins that use PI anchors are totally exposed on the cell’s surface; thus, PI anchoring may be useful for making new biologic reagents.

Chloroquine-resistant malaria parasites

SOME strains of the malaria parasite *Plasmodium falciparum* are resistant to the drug chloroquine whereas other strains are susceptible to its effects; kinetic studies of accumulation and release of the drug indicate why this is so (page 1283). Both resistant and susceptible parasites accumulated chloroquine at the same initial rate but, in resistant strains, the rate of accumulation fell off rapidly after 4 minutes: resistant strains released 50% of accumulated chloroquine in 2 to 3 minutes, but susceptible strains took longer than 85 minutes to release the same amount of drug. The accelerated release of chloroquine by resistant strains could be slowed by several calcium channel blockers, an antibiotic, and an inhibitor of microtubule function. Krogstad *et al.* point out that because some of these same decelerating substances slow drug release from multidrug-resistant cancer cells as well, drug clearance in these two systems may be mediated by similar cellular mechanisms. Furthermore, the rapid efflux phenotype may be a common feature of certain resistant *Plasmodium* strains in all regions of the world—West Africa, South America, and Southeast Asia—where they have appeared.

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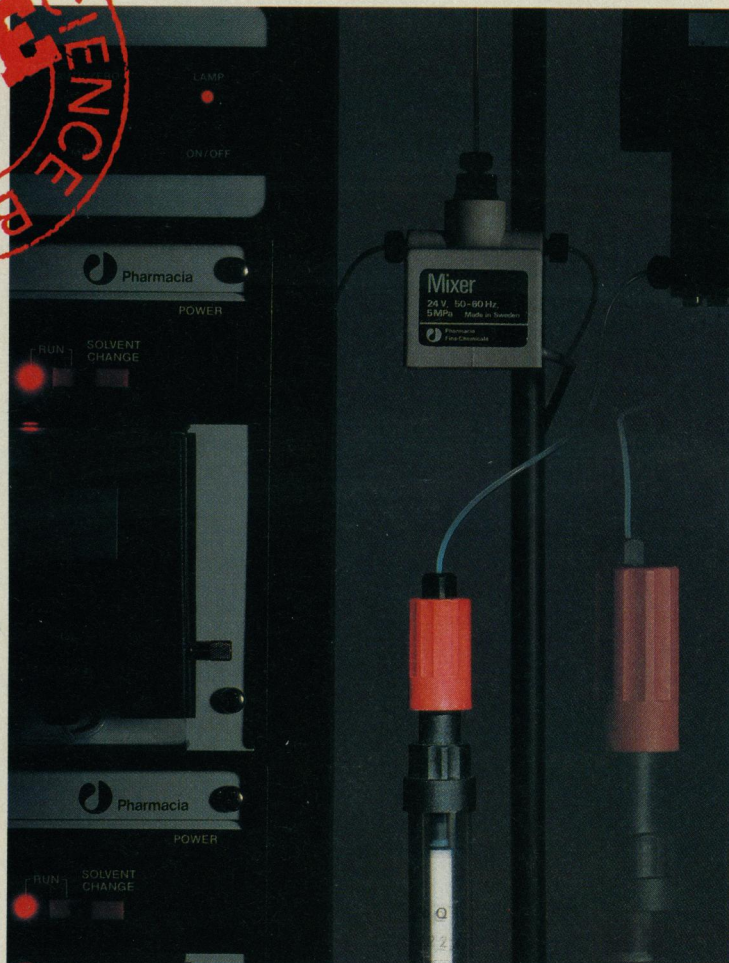
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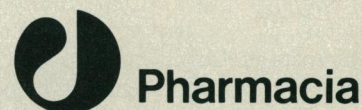
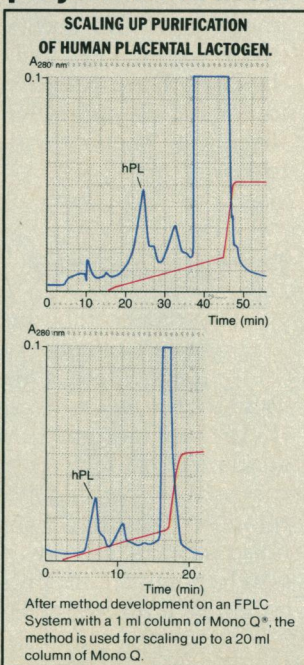
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Federal and Trade Deficits

If the budget deficit and especially the foreign trade deficit are substantially curtailed soon, great damage will probably be averted. However, continuation of present trends for an indefinite period could make the recent Wall Street crash only a prelude to other, more serious sequelae.

Some economists have written that the foreign trade and budget deficits are closely related. There is a partial, but not a one-to-one, relation. Lowering the budget deficit will not eliminate costs of oil imports. Other economists have stated that lowering the value of the dollar will cure the trade deficit. Although some improvement in competitiveness will arise from a weak dollar, that is no cure-all.

The "Advance report on U.S. merchandise trade: September 1987," prepared by the U.S. Department of Commerce and issued 12 November provides useful information on the matter. A superficial examination of the report showing that the September deficit was less than that in August gave rise to a 1-day rally on Wall Street. But numbers for 1 month are not necessarily a faithful indication of what is occurring. The total numbers for the third quarter and for the first 9 months of 1987 show a poorer performance than the corresponding 1986 figures, that is \$46.234 billion versus \$44.828 billion for the third quarter and \$128.165 billion versus \$123.452 billion for the first 9 months.

The weak dollar has had a beneficial effect on our trade deficit with the European Economic Community. In the first 9 months of 1987, the imbalance was \$17.643 billion versus \$20.623 billion the year before. There was no improvement in trade with Japan (\$44.323 billion versus \$43.028 billion).

The large and more intractable problems are trade relations with newly industrializing countries and increasing use of imported oil. This year our imports of oil and its products will cost about \$44 billion versus about \$38 billion in 1986. The growth of our trade imbalance with East Asian countries—Taiwan, Korea, Hong Kong, and Singapore—is symptomatic of additional problems we will encounter with industrializing countries. During the first 9 months of 1987 our trade deficit with the four countries grew to \$28.842 billion from \$22.553 billion in 1986. Their currencies are not tied to the yen or Deutsche mark but rather are roughly aligned with the dollar. Thus weakening the dollar further will not cure our deficit with the four countries. A rapidly rising portion of U.S. imports from these countries is high-tech or other products that in the past have been produced only in advanced industrialized countries. Their exports to us are about three times their imports from us, as is the case in our trade with Japan. Other developing countries with which the United States has substantial trade deficits include Brazil, Mexico, and the People's Republic of China. During the first 9 months of this year, our trade deficit with China grew to \$2.896 billion from \$1.409 billion in the corresponding months of 1986.

In the future our worst problem is likely to be demand for imported oil. Domestic production is down and will continue to decline. Completions of oil wells in the past 12 months have been at half the rate of 2 years ago. At the same time, consumption of products has increased. This is notably true of transportation liquids, uses of which are setting all-time records. Federal actions to increase the speed limit and decrease the mandated mileage for new cars have been moves in the wrong direction.

In the time between February 1985 and the present, a very large drop in the comparative value of the dollar slowed, but did not stop, the increase in the trade deficit. However, it made tangible assets in the United States look cheap, and foreigners are openly and surreptitiously buying up choice real estate, production plants, and other items. In terms of yen or Deutsche marks, members of OPEC are receiving about one-third the currency per barrel of oil that they obtained in 1985. At some point, they might demand payment in a strong currency.

Congress is aware that we must do something about the two deficits. But the thousand-page trade bill, if passed, would probably be vetoed and, if enacted, would make little difference. Washington will provide leadership, but only if the people demand it. The dawdling behavior of Congress and the Administration with respect to budget-deficit reduction suggests that an additional and more unpleasant shock than occurred on 19 October will be required before really significant actions are taken.—PHILIP H. ABELSON

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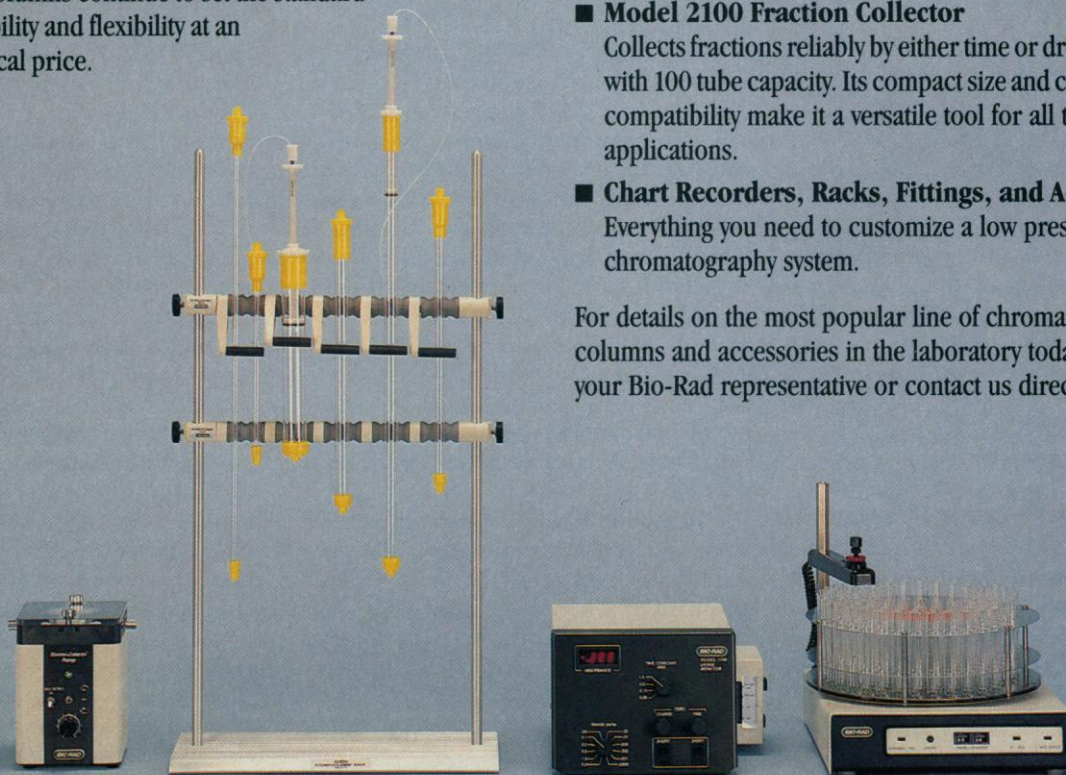
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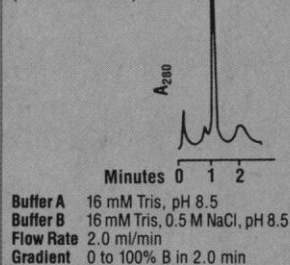
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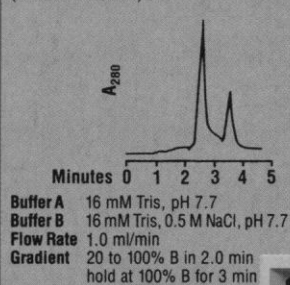
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Eluted peak volume	0.10 ml	not reported
Kinetics	rapid (nonporous)	diffusion limited (porous)
Matrix type	polymer	polymer
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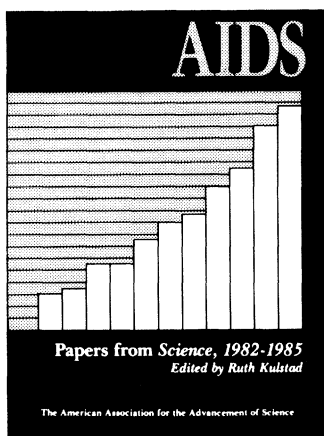
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ries are given or suggested.

This listing can be recognized as exhaustive and complete; it clearly refers to 1972 technology, covering all its possible states. Had the drafters meant to cite the five categories merely as examples, they would—or should—have added “but not limited to” after the word “include”.

The Soviet version of the treaty does not translate “include” by the most direct term, but uses instead the unambiguous *otnosyat'sya*, which means “refers to.” In the absence of a qualifier, such as “among others,” there is no question that the Soviet version covers only 1972 technologies.

S. FRED SINGER
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Monitoring of Atmospheric Ozone

Richard Kerr (Research News, 10 July, p. 131) states that the Dobson spectrometer was not designed for trend monitoring and that there are problems with its maintenance and calibration. We agree (1) and believe that cross-referencing data from the Solar Backscatter Ultraviolet instrument with Dobson data must be inconclusive because

both systems are subject to drifts of similar magnitude.

Dobson instruments are calibrated against a particular Dobson spectrometer chosen as a reference. The procedure is vulnerable because the reference instrument is also subject to drift and because changes occur during transportation. The precision of Dobson measurements is not readily calculable from instrument characteristics; rather it is established empirically and with difficulty. Checks on performance are intricate, time consuming, and demand dedicated, trained personnel. In practice, the checks are often not adequate and major malfunctions can go undetected, sometimes for years. The Dobson data include a high proportion of empirical zenith sky readings that are unsuitable for long-term trend studies.

The Automated Brewer spectrometer (2), unmentioned in Kerr's article, was designed in the early 1980s specifically for monitoring and has numerous fundamental and operational advantages over the Dobson instrument. The sun-tracking feature enables the Brewer to record a large number of direct sun observations and thus to avoid the zenith sky problem. Experimental evaluations of the measurement uncertainty, which are from two to three times smaller than those of the Dobson, confirm the values

calculated from the instrument design. Brewer ozone measurements are not affected by sulfur dioxide and do not show dependence on the solar elevation. Instrument checks and self-characterizing procedures are programmed into routine operation of the Brewer, and the results are analyzed automatically. Consequently, malfunctions can be detected and rectified promptly.

The Brewer reference triad, to which the network Brewers are normalized, comprises three reference Brewer spectrometers operating continuously at Toronto. Each of these is independently and absolutely calibrated and can be replaced at any time without significant impact on the reference system. The transfer of calibration to the network spectrometers is usually effected by means of another Brewer that acts as a traveling standard.

In order to obtain better ozone data and to save a significant amount of manpower, Canada has put Brewer spectrometers into operation at six monitoring stations; Dobson instruments in the Canadian system are scheduled for decommission after 3-year periods of parallel measurement. Brewer spectrometers are now located in 11 countries. We believe the Dobson system should be replaced by the Brewer system throughout the global network and in the NASA net-



How to close the critical gap between measurement hardware

work for Stratospheric Change. Otherwise ozone trend monitoring will continue to be based on a set of instruments whose long-term stability is in doubt.

W. F. J. EVANS

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1. W. F. J. Evans *et al.* *Stratospheric Ozone Research in Canada: 1987* (AES internal report ARPX-87-2, Atmospheric Environment Service, Downsview, Ontario, November 1987).
2. J. B. Kerr, C. T. McElroy, D. I. Wardle, R. A. Olafson, W. F. J. Evans, in *Proceedings of the Quadrennial Ozone Symposium* (Reidel, Hingham, MA, 1984), pp. 396-401.

Mitochondrial DNA in Sperm

Roger Lewin's parenthetical explanation of why sperm do not as a rule contribute mitochondria to the zygote (Research News, 2 Oct., p. 24) is, I'm afraid, incorrect.

Rather like a machine capable of generating more energy than it consumes, a sperm without a mitochondrion would be a most remarkable sperm indeed. The maternal inheritance of mitochondrial DNA in most eukaryotes is caused by exclusion of the sperm's mitochondria from the zygote at fertilization.

A. RICHARD PALMER

Department of Zoology,

University of Alberta,

Edmonton, Canada T6G 2E9

"Homology" Controversy

In relation to the controversy over the use of the term "homology" to express identity of sequences in proteins or nucleic acids, I found myself in agreement with the more classical biologists who protest that this word already has a precise meaning, and it is not being used in this sense by modern molecular biologists (Research News, 25 Sept., p. 1570). One wonders indeed what is wrong with "percent identity," since this is the obvious term to use. Is it perhaps too obvious or ordinary and an example of scientists' increasing reluctance to use simple words to convey their meaning and to coin noninformative new words or to arbitrarily

redefine words already in use? Clearly science needs a precise, technical language that must be learned; but have we gone too far? The same problem applies to legal language and to that vast mass of deadening verbiage that emanates daily from one or another bureaucratic office. A recent *New York Times* article (1) began, "The Tower of Babel so annoyed the Almighty, the Bible tells us, that the Lord forced its builders to converse in a babble of mutually unintelligible languages. A glance at any of the thousands of scientific journals published these days is enough to tell the story; the titles alone are enough to sow confusion among all but a few initiates." We have indeed come a long way since Isaac Newton could write very clearly, "In the beginning of the Year 1666. . . . I procured me a Triangular glass—Prisme to try therewith the celebrated Phaenomena of Colors" (2).

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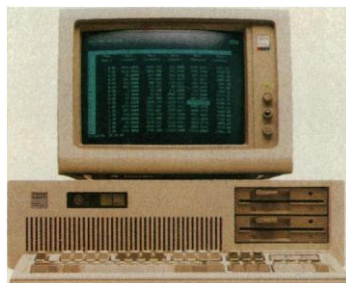
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1. M. W. Browne, *New York Times*, 6 January 1987, p. C20.
2. G. E. Christianson, *In the Presence of the Creator. Isaac Newton and His Times* (Free Press, New York, 1984), p. 92.

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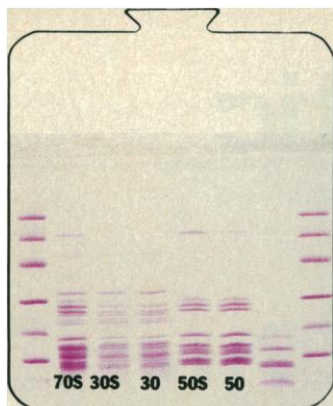
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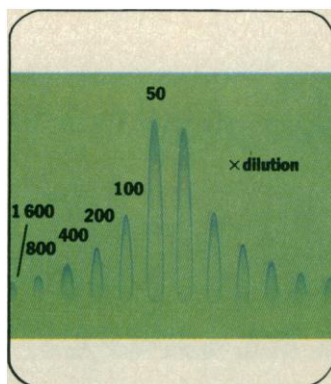
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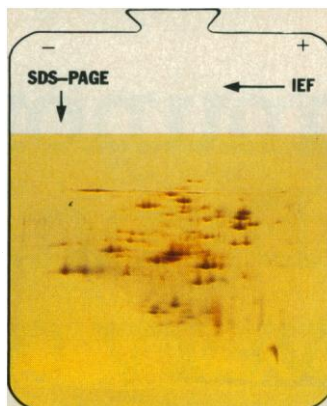




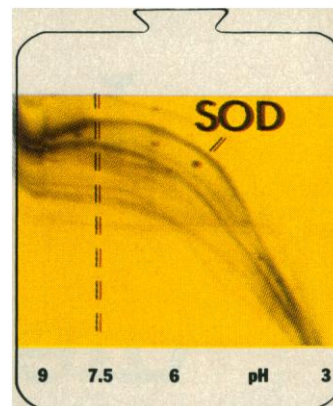
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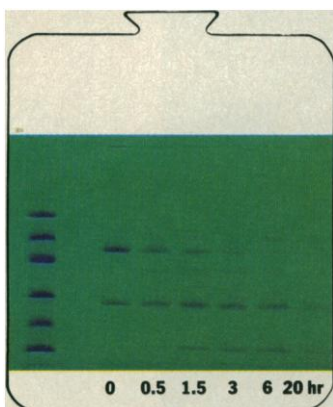
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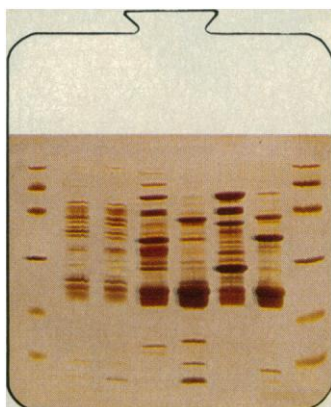
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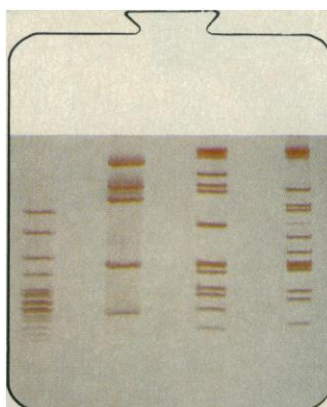
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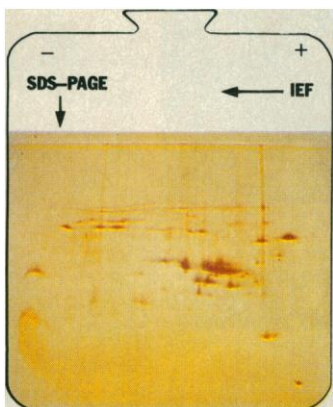
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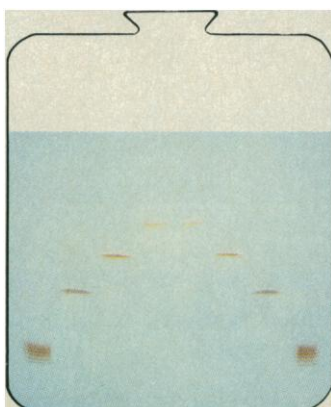
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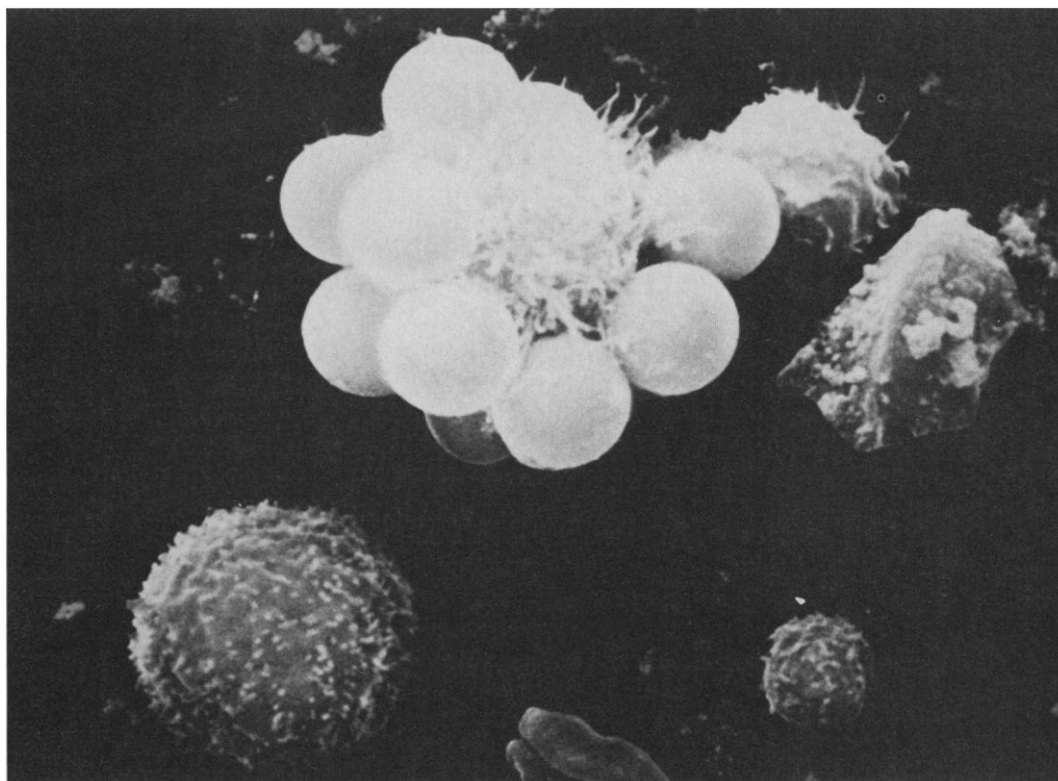
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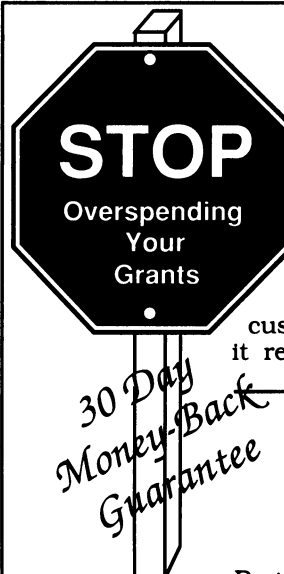
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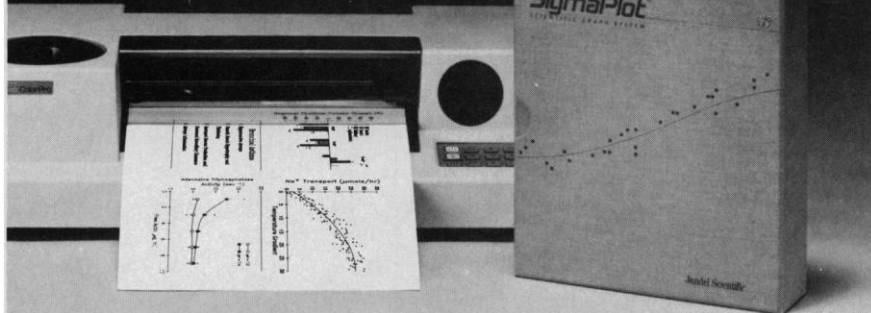


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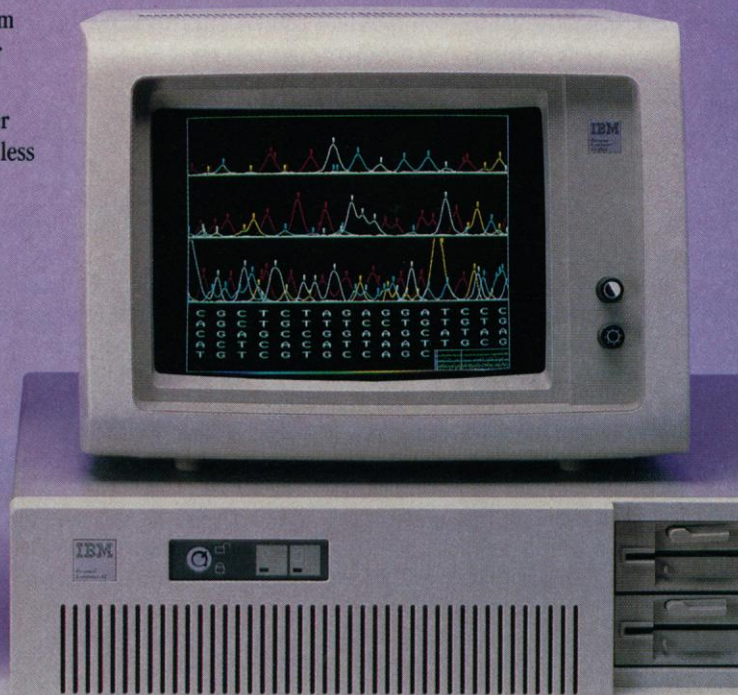
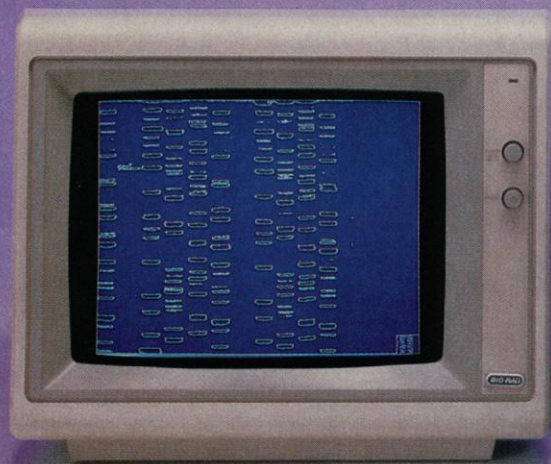
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1. Elder, J.K., Green, D.K., and Southern, E.M. (1986). *Nuc. Acids Res.* 14:417-424.

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