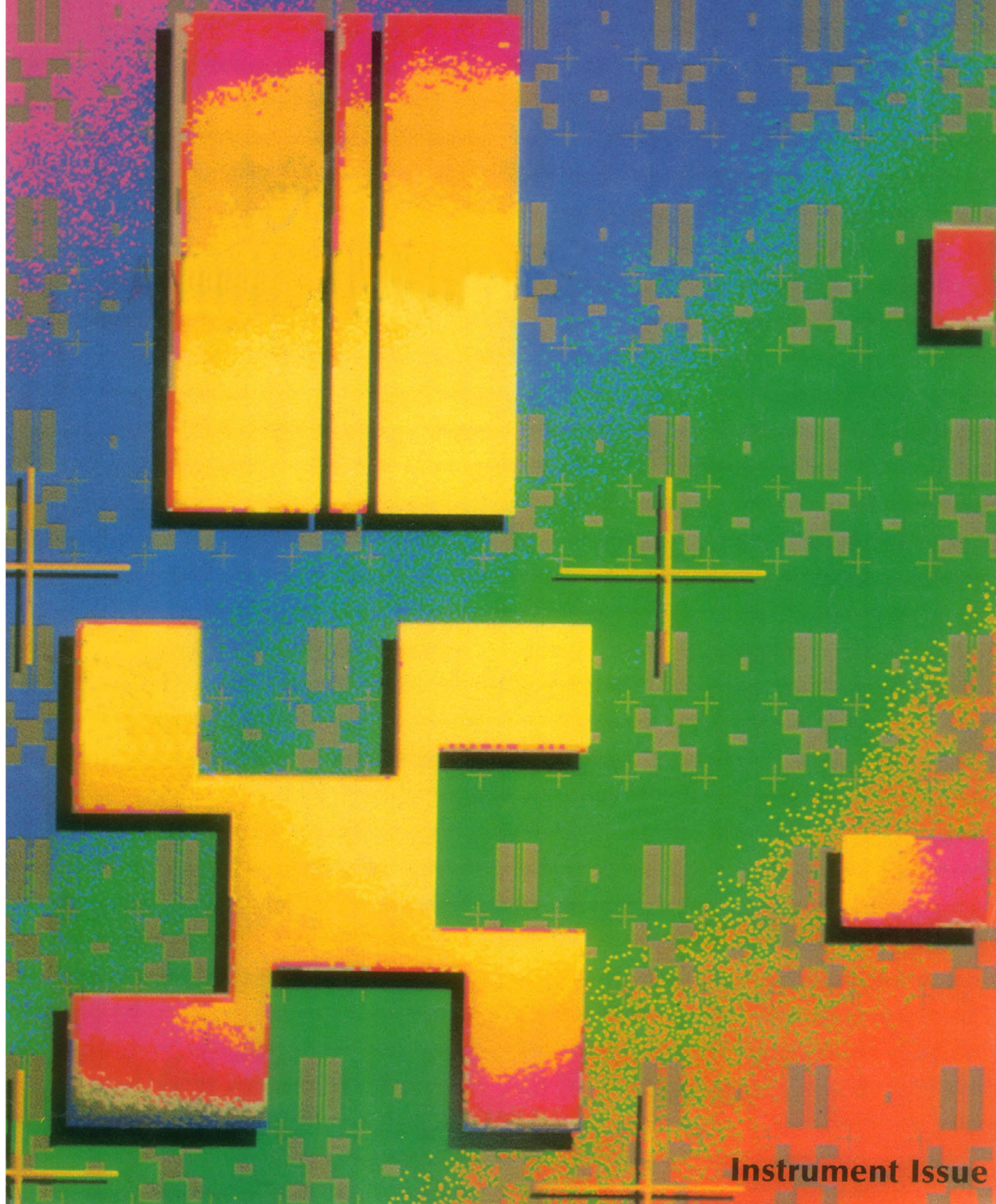


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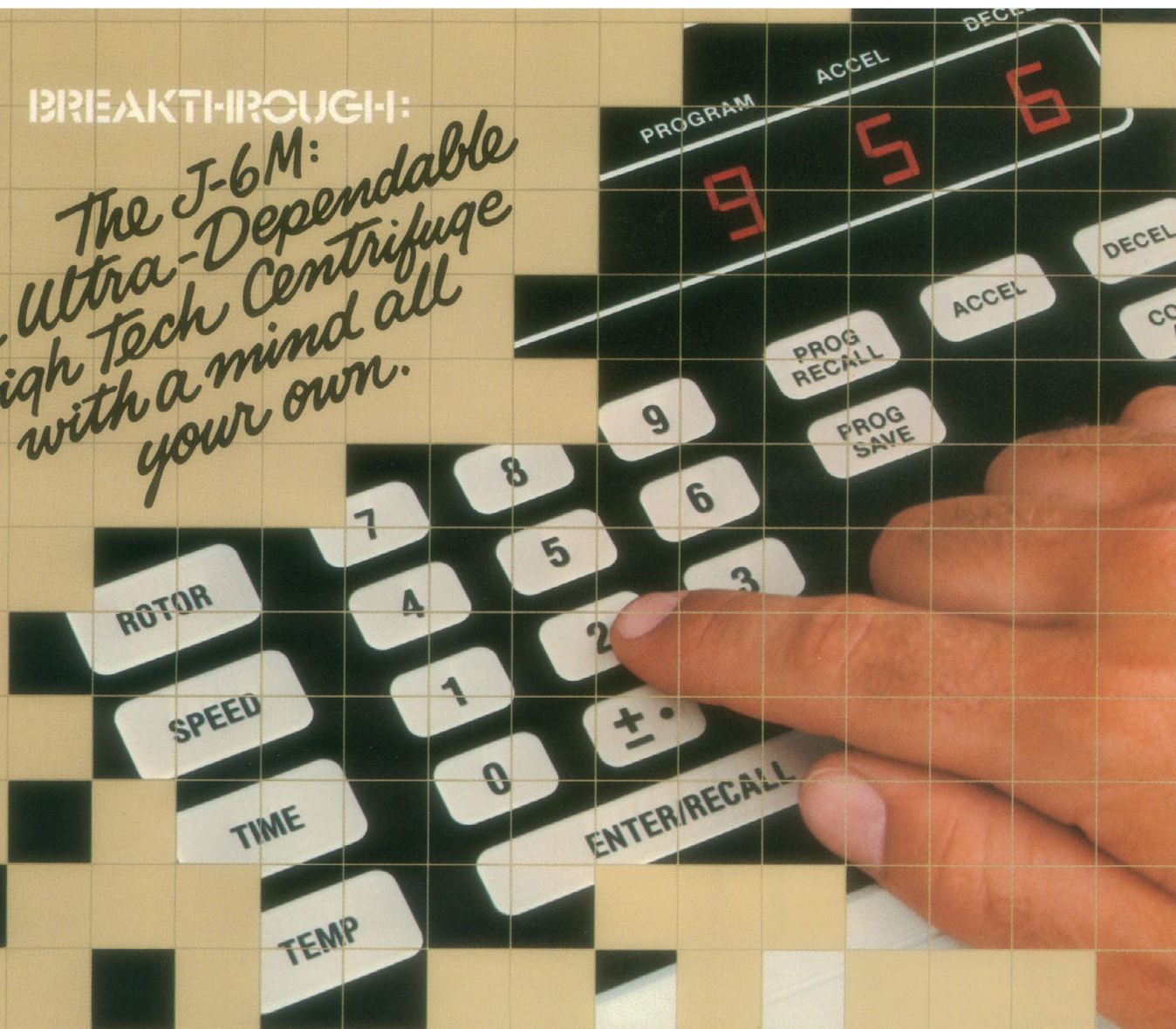


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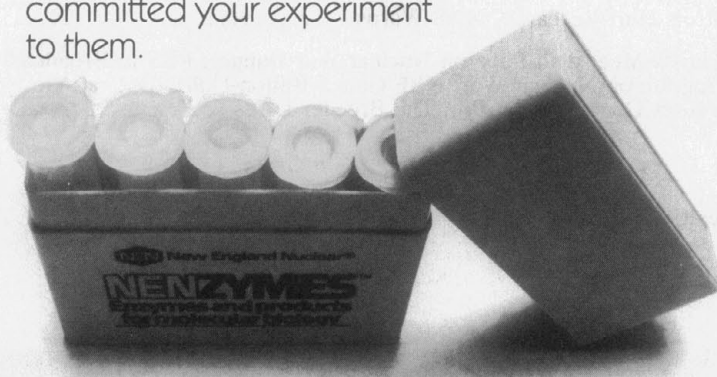
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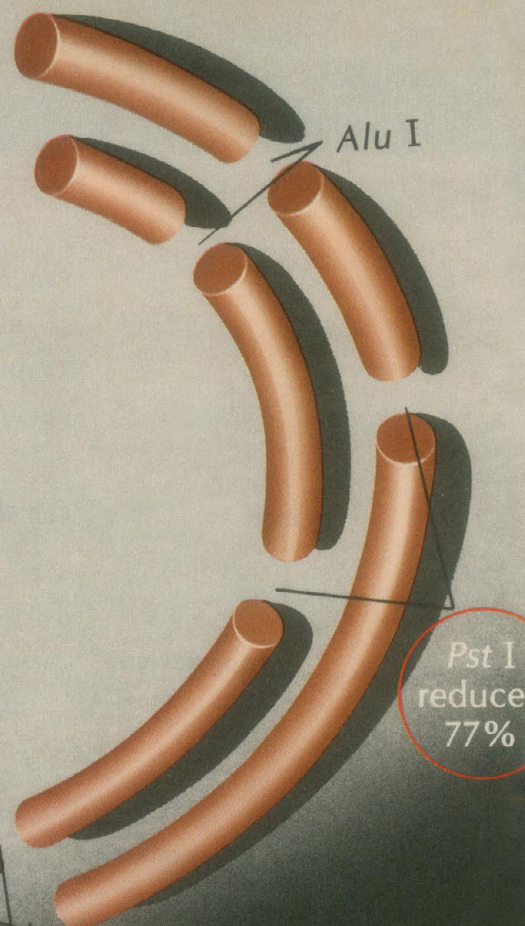
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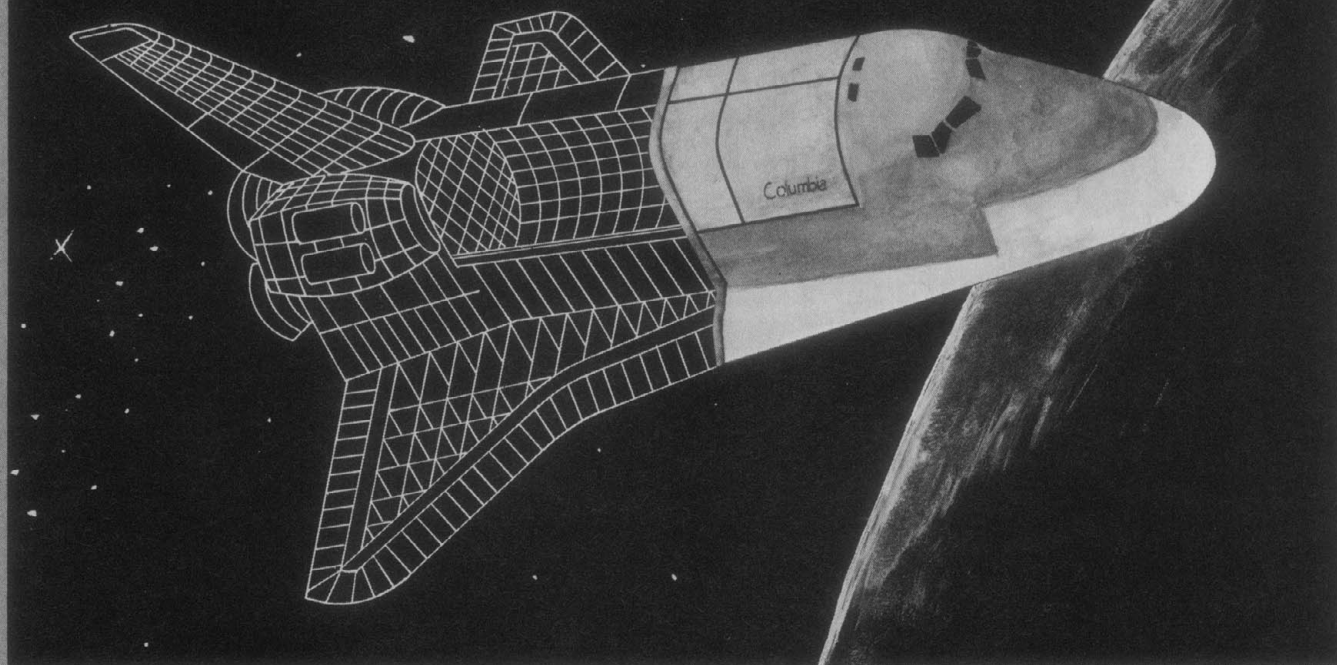
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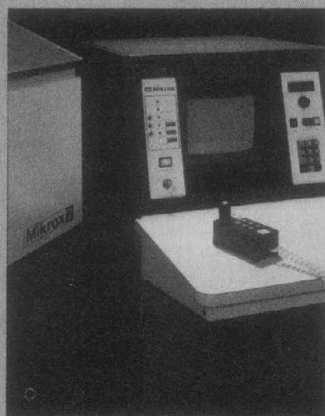


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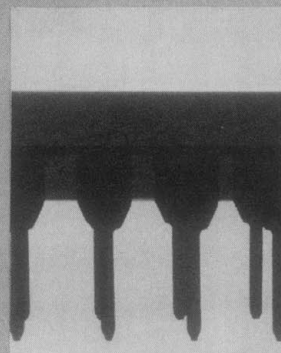


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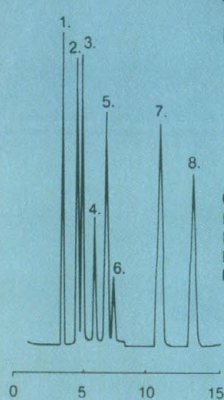
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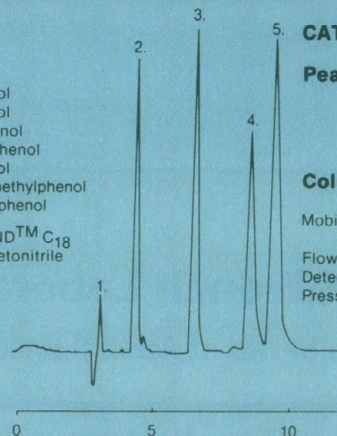
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3. 3-nitrophenol  
4. 2-chlorophenol  
5. 2, 4-dinitrophenol  
6. 2-nitrophenol  
7. 4-chloro, 3-methylphenol  
8. 2, 4-dichlorophenol

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Mobile Phase: Water/Acetonitrile  
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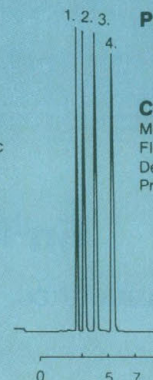
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4. butylparaben

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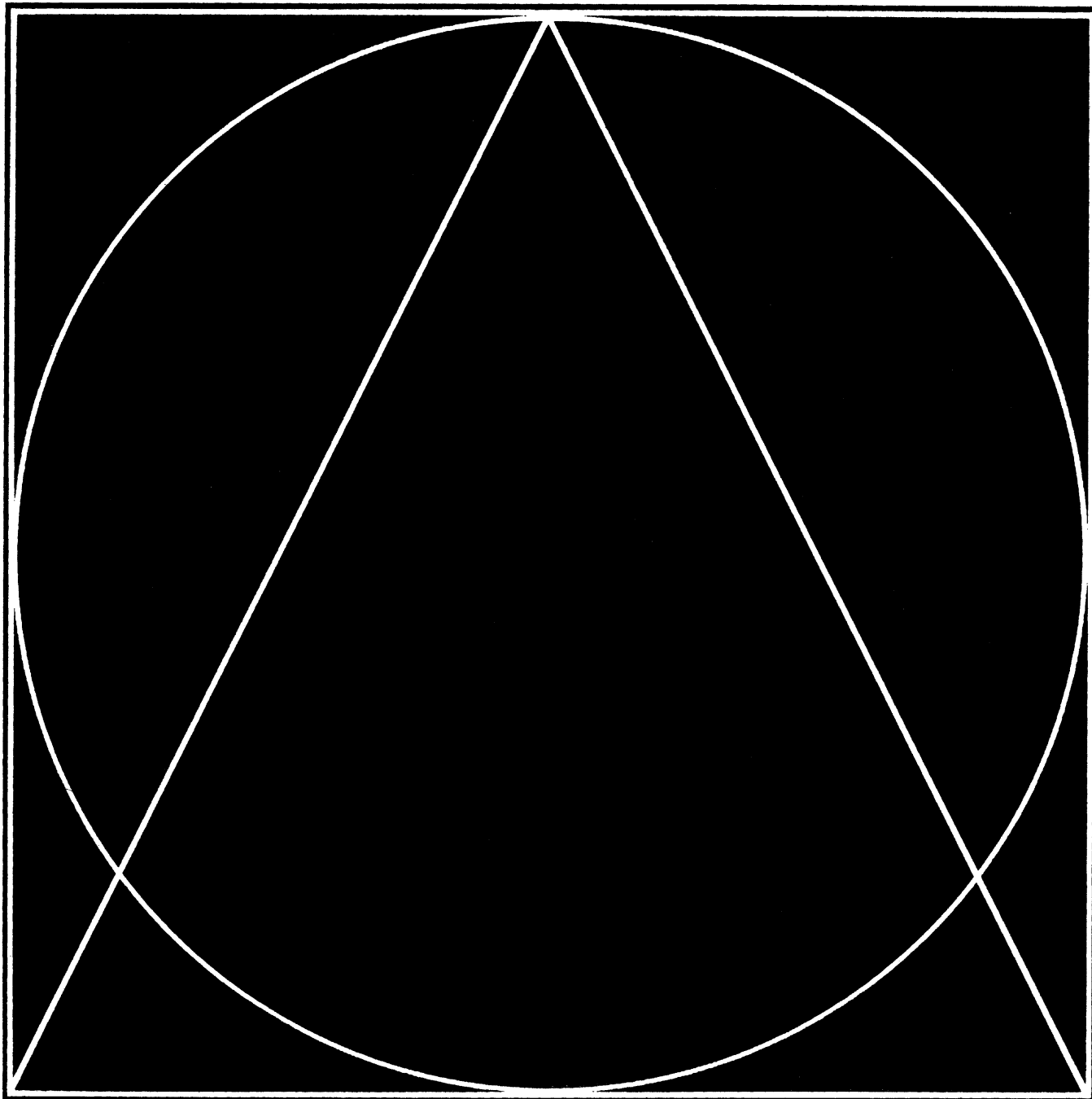
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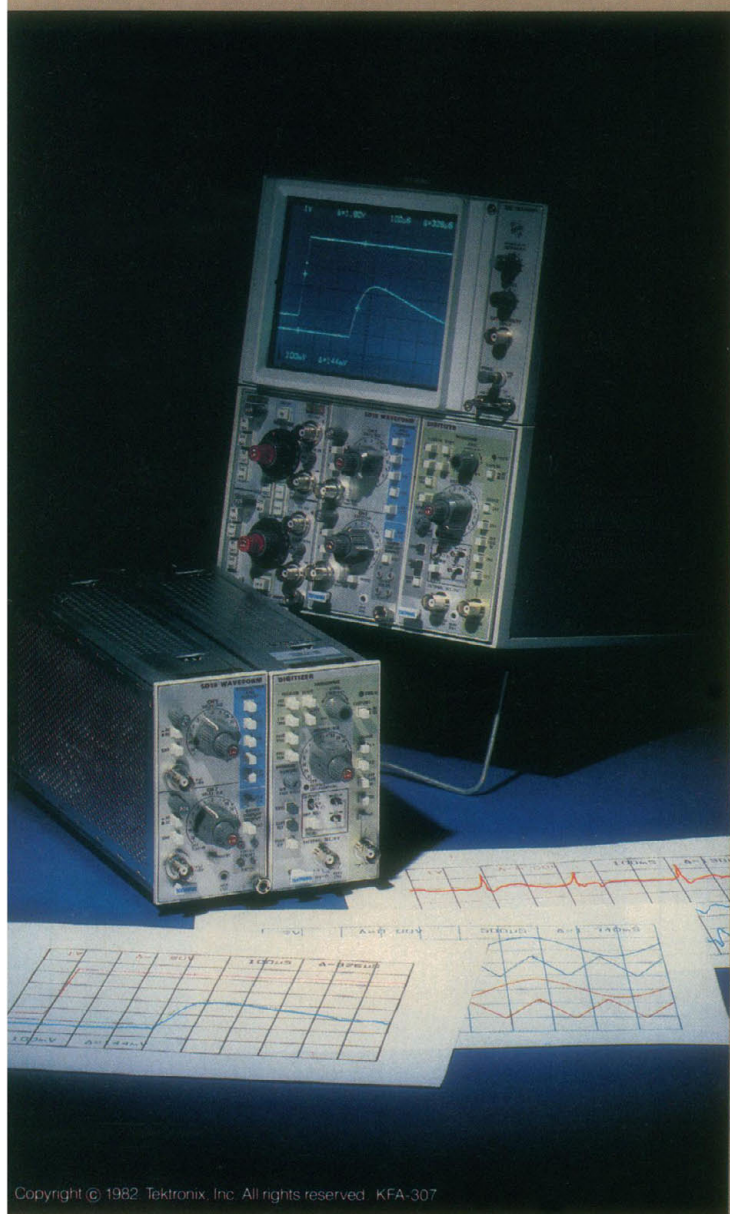
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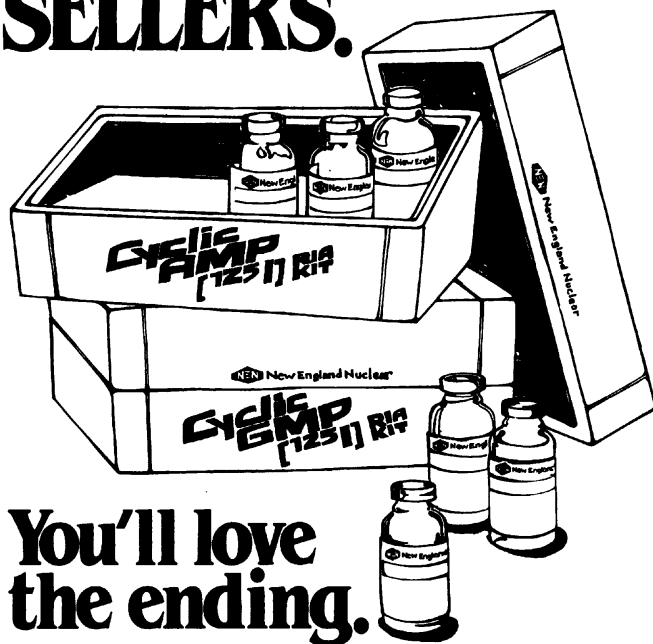
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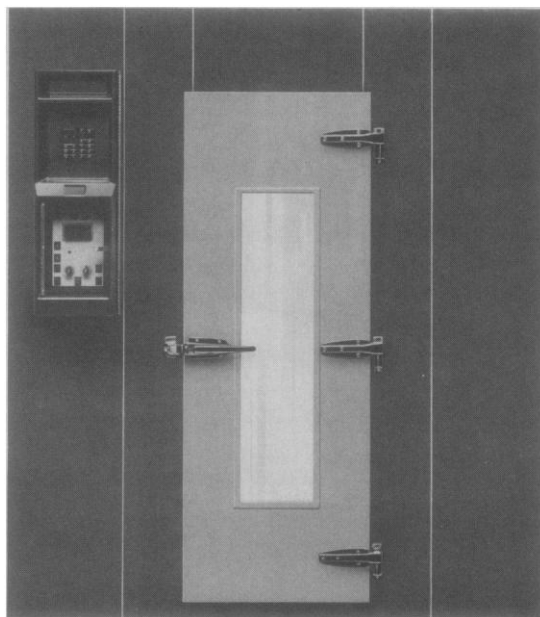
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# ***SCIENCE/SCOPE***

Delivery of the first production Joint Tactical Information Distribution System (JTIDS) terminal has been called a milestone achievement by the commander of the U.S. Air Force's Electronic Systems Division. Lt. Gen. James W. Stansberry congratulated Hughes for its efforts in delivering the first production JTIDS Class 1 terminal 31 days ahead of schedule. He said the delivery and acceptance "demonstrably establishes jam-resistant, secure digital data links as a viable medium for tactical command, control, and communications (C<sup>3</sup>) systems."

Infrared scanning has paid off both monetarily and educationally for a financially hard-pressed Washington school district. Faced with a tight budget and increased need to conserve energy, the district used the Probeye® infrared viewer to survey its 19 buildings for energy leaks in insulation, roofing, windows, and doors. Although some of the buildings were as much as 30 years old, the results of the survey brought solutions that will save between 5% and 15% in fuel costs next year. The Hughes-developed Probeye viewer also proved to be an effective educational tool as students participated in the energy-scanning evaluation as part of semester-long energy conservation assignments.

Landsat 4, the new second-generation Earth-watching satellite, is studying crops and other resources in greater detail than ever before possible. The spacecraft carries two primary instruments. One is a multispectral scanner like the ones on previous Landsat missions. The other is a thematic mapper, whose remote-sensing capabilities are a considerable improvement over the scanner's. The new mapper gathers different kinds of data and has a spatial resolution of 30 meters versus 80 meters of earlier scanners. Hughes and its Santa Barbara Research Center subsidiary built both instruments for NASA.

The largest domestic communications satellite network is being operated by Western Union now that Westar V is relaying messages from its equatorial slot approximately on a line with San Francisco. The Hughes-built satellite is providing video, facsimile, data, and voice communications throughout the United States, including Alaska, Hawaii, Puerto Rico, and the Virgin Islands. Westar V has an expected lifetime of 10 years. Each of its 24 transponders is capable of carrying 2,400 one-way voice channels or one color television transmission.

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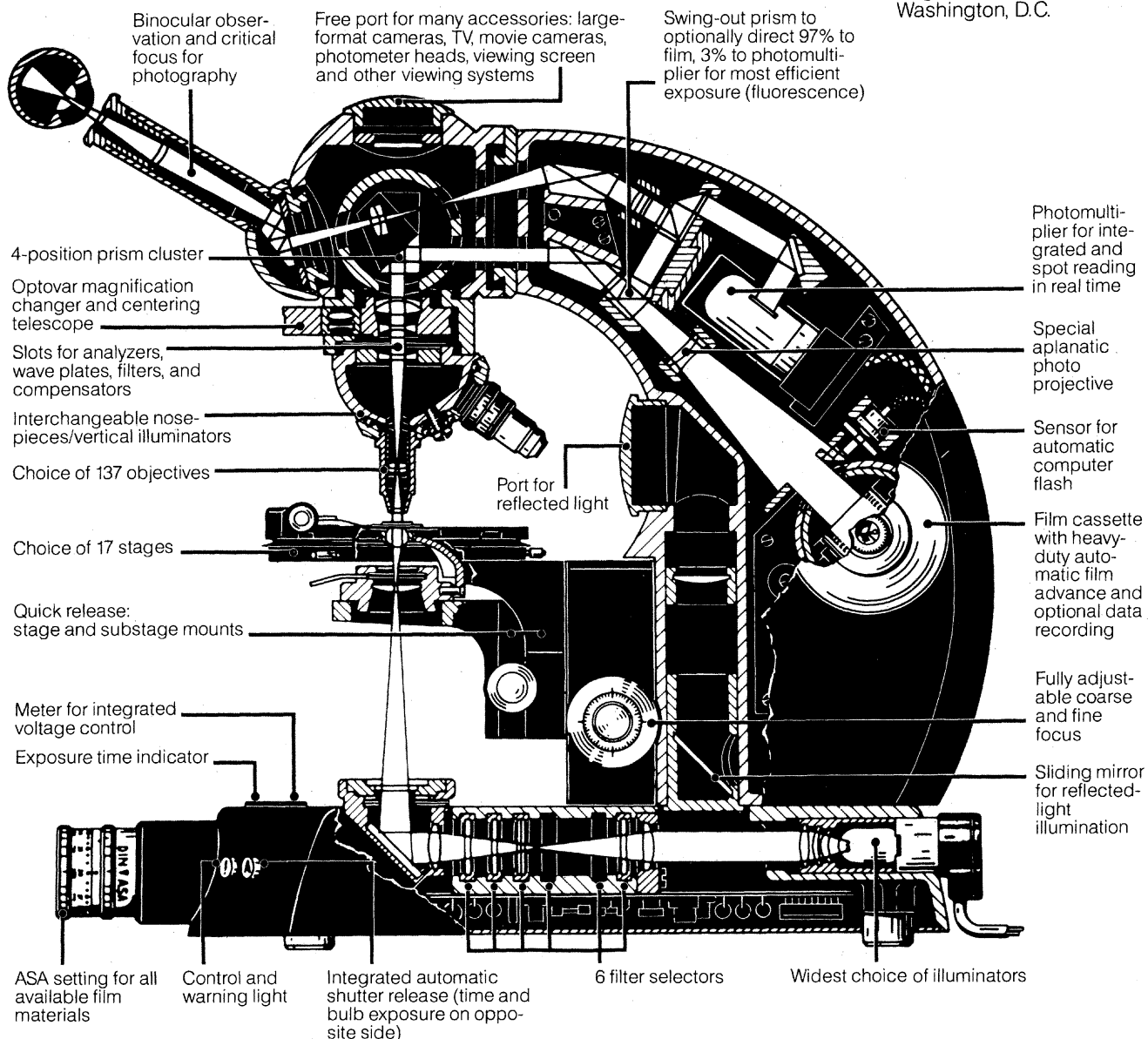
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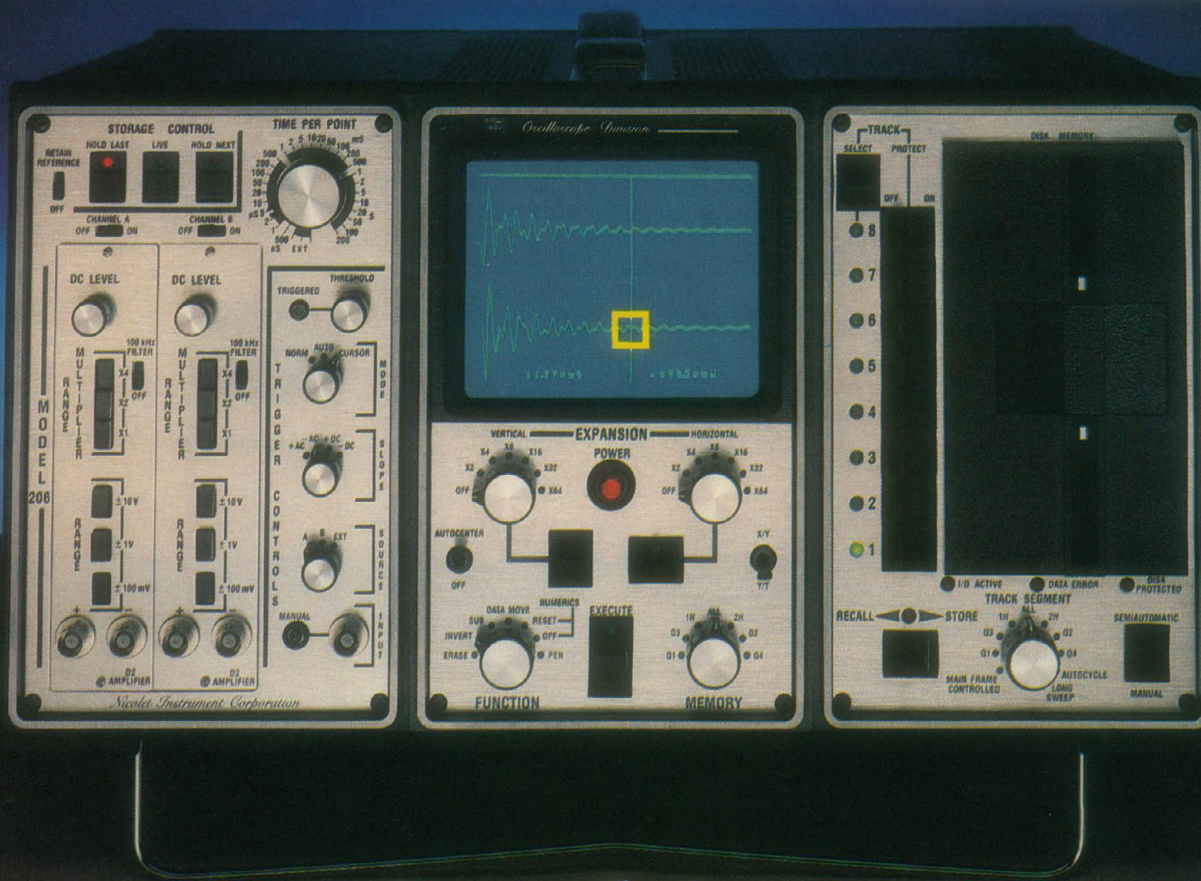
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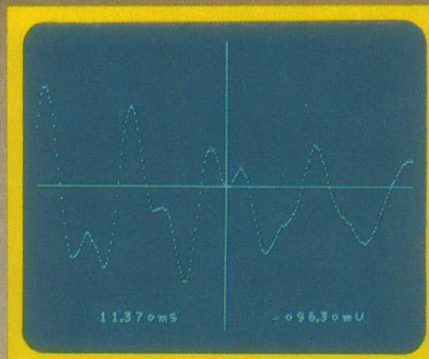




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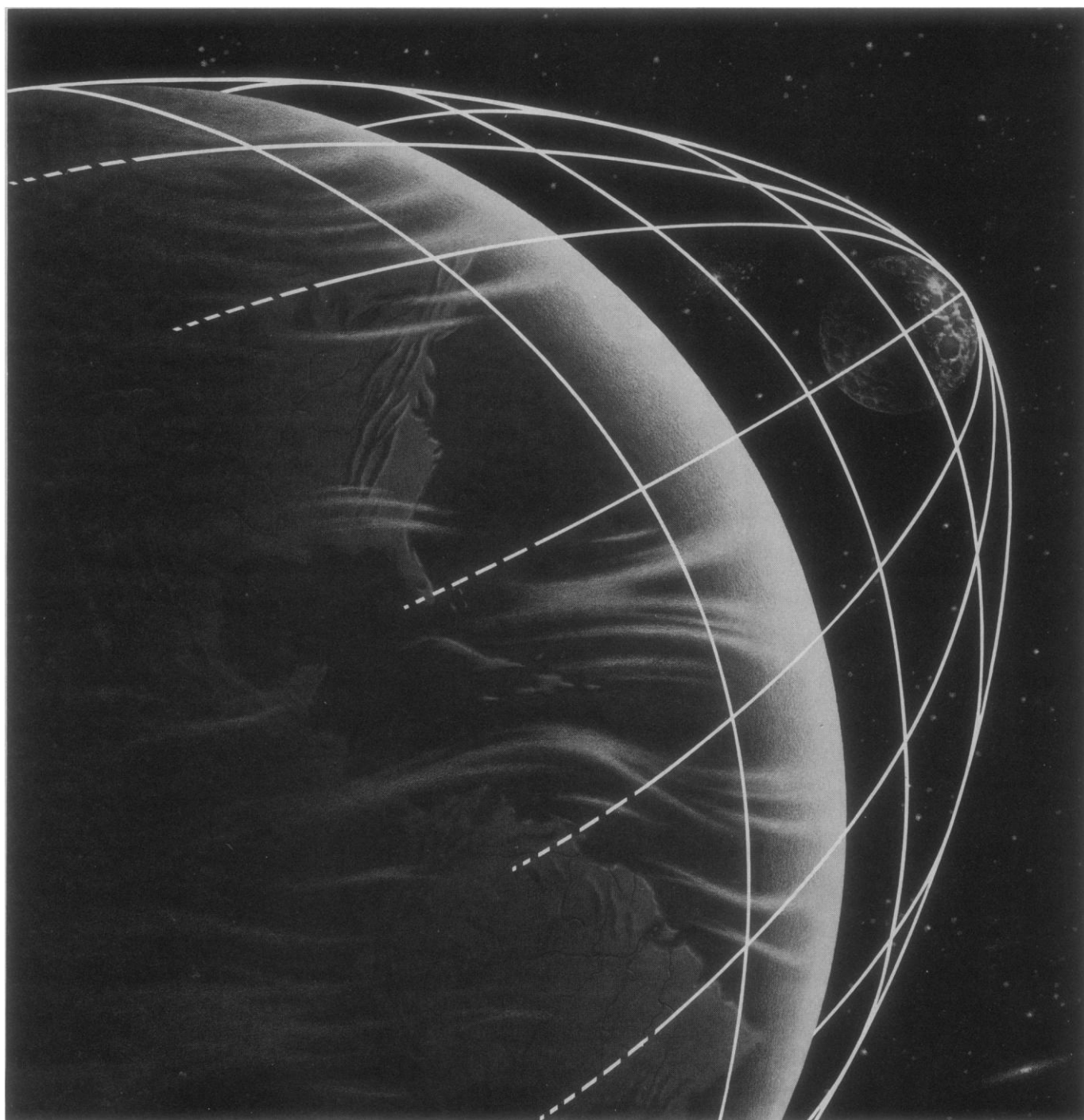
Amoco scientists use a borehole gravimeter that can detect gravitational pull as small as three-millionths of an ounce. Porous rock, capable of holding oil and natural gas, exerts less pull than non-porous rock.

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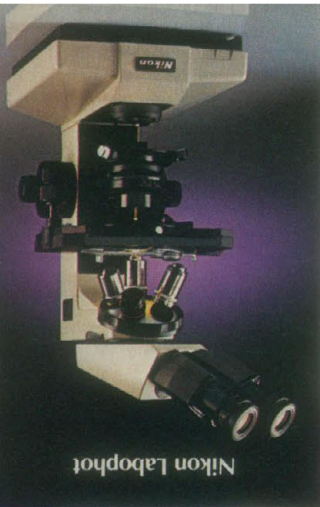
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## Scientific Instrumentation

Instrumentation has opened many frontiers for investigation or has sped exploration of existing fields. Improvement of analytical equipment has been especially notable. Further progress is portrayed in this issue of *Science*. Developments in mass spectrometry are particularly impressive. Mass spectroscopists have volatilized hitherto involatile substances, including some with molecular weights as high as 12,500. They can determine masses of large molecules and of their fragments and thus obtain much information about molecular weights and structure. This capability can be coupled with various forms of chromatography and gel electrophoresis. Together, these tools will be used to facilitate discoveries in many areas of biology and medicine.

In mass spectrometry beams of ions are bent, usually in magnetic fields. For a given charge, the lighter ions are deflected more readily than the heavier ones. Thus, the constituents of the beam arrive at different places on a target. Ion beams may be formed by volatilizing the substance being analyzed, bombarding the vapor with electrons to make ions, and accelerating the ions. By 1940 mass spectrometry was being used in physics (for isotopes), earth science (radiometric dating), analytical chemistry, and biochemistry.

With time, all the components of mass spectrometers have been improved, including magnet design and control and detecting equipment. Computers have been added. More efficient types of ion sources have been created. In some forms of mass spectrometry molecular weights can be determined with a precision of 5 parts per million. Substances present in the  $10^{-15}$  mole range have been detected. The combination of gas chromatography with mass spectrometry proved very effective in identifying and quantitating components of complex mixtures such as petroleum.


Until recently, though, many important types of molecules could not be studied by mass spectrometry. These were involatile substances or materials that would be destroyed by heating them to the temperature necessary to volatilize them. Examples are carbohydrates and polypeptides.

In attempts to volatilize these substances, techniques such as field desorption and laser desorption have been used. Major success has come from bombardment of the sample by energetic charged or uncharged atoms. Results of studies with fast atom bombardment are described by Rinehart in this issue. Argon or xenon is ionized and accelerated to 3 to 10 kilovolts. The ions are neutralized and the beam is directed to target substances in a nonvolatile solvent, such as glycerol. The large molecules, often accompanied by glycerol molecules, are given sufficient energy to escape from the surface. Some of the large molecules are intact and ionized, and their masses can be measured. Some of them break into fragments, which can also be detected and measured. The fragmentation appears to occur in reproducible ways. Breaks usually occur where a heteroatom is attached to a carbon chain. Rinehart reports that when a compound containing a sugar was subjected to fast atom bombardment, peaks of molecules with and without the sugar were found. The mass difference between the peaks was 163, which corresponds to  $C_6H_{11}O_5$ . When polypeptides are studied, the molecular ions provide the molecular weight. Ions at low masses are characteristic of individual amino acids. Ions at intermediate masses provide information about the sequence of the amino acids. Fragmentation was observed to occur often at the CO-N bonds with charge retention on the amino terminal fragment. When a high-resolution spectrometer is employed the atomic proportions of a fragment can be determined since the mass defects of hydrogen, carbon, nitrogen, and oxygen differ.

Mass spectroscopists are already talking of further possible advances that will make their instruments even more useful in tackling scientific questions. But were their ability to be limited to exploiting the recently revealed potentialities, their contributions would still be enormous.

—PHILIP H. ABELSON





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Although it is too late to submit suggestions for symposia for this Annual Meeting, contributed papers can be sent in up to 21 January 1983. Instructions for abstracts are given below and a sample is shown.

The contributed paper sessions are of the POSTER type. In such sessions each contributor will have a bulletin board on which to place text and graphic material (of an oversized nature) for an extended period of time so that the work can be discussed with all interested parties.

Please note that all contributions must be submitted and signed by a AAAS member or fellow, although this person need not be one of the authors.

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Type abstracts, using a clean (new) ribbon, on ordinary white bond paper (8.5 by 11 inches; 21.5 by 28 cm) according to the format shown on the right (the example is reduced to about one-half of the linear dimension; your abstract will be printed *directly from your copy* at about two-thirds of its linear dimensions). Indicate at the top of the page the letter of the AAAS Section which comes closest to your subject matter (a full list will be found at the bottom of the contents page of any issue of *Science*), as well as two or three words which give the subspecialty involved.

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