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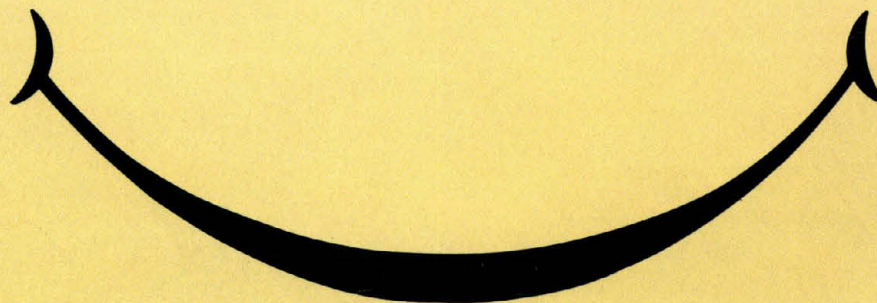
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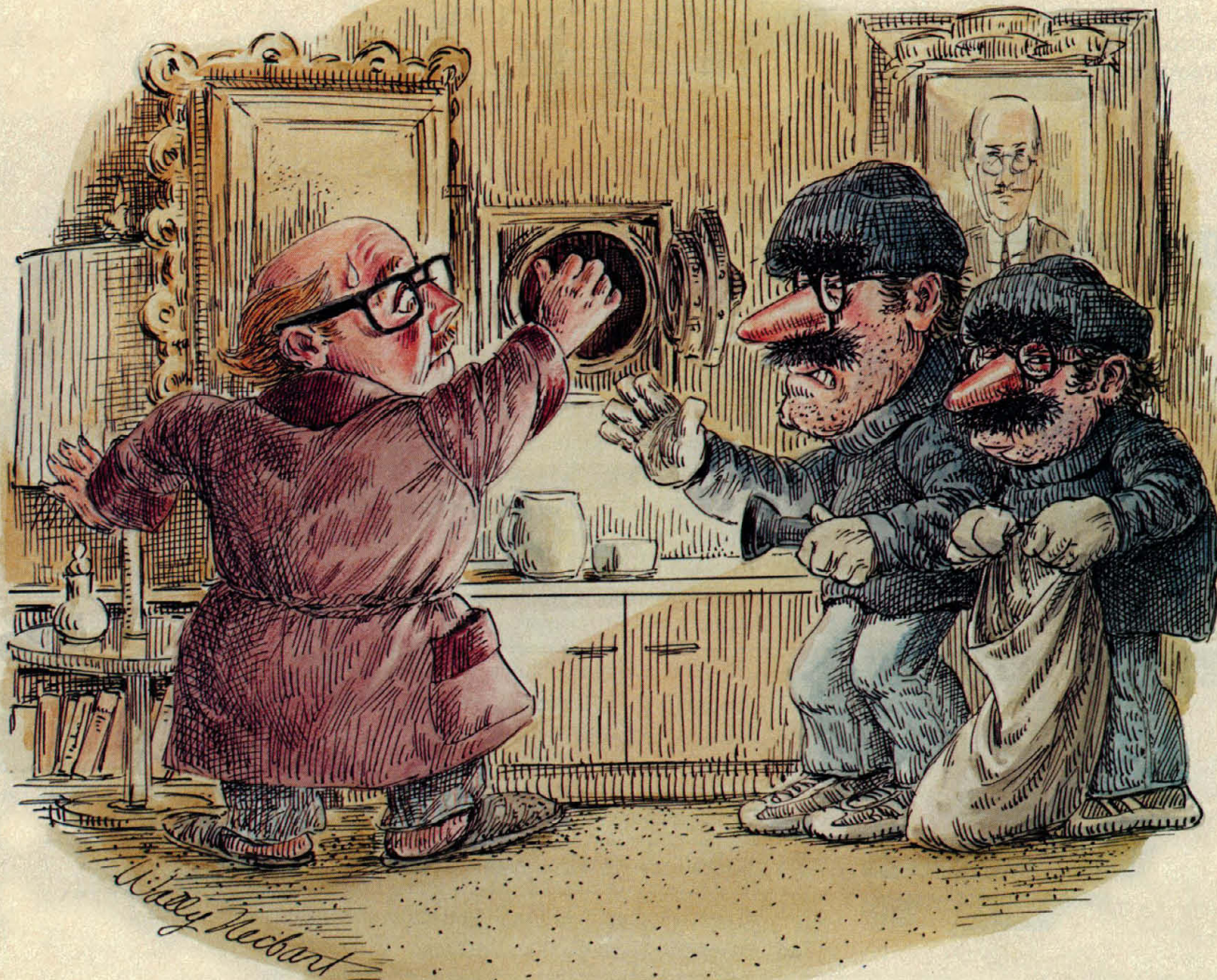
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COVER A section through the head of a cricket frog shows the eighth cranial nerve piercing the skull between the inner ear and brain case. The amphibian papilla, an auditory organ, lies in the chamber above the nerve. Below, the larynx opens into the mouth. The auditory and vocal systems coevolve to match call frequency with tuning of the ear. See page 1786. [Histology and photograph by Blinda McClelland and Walter Wilczynski, Department of Psychology, University of Texas, Austin 78712]

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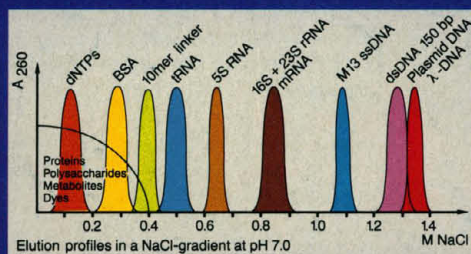
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This Week in SCIENCE

Hawaiian-Emperor corals

CORALS did not begin building reefs along the Hawaiian-Emperor chain until the early Oligocene, even though conditions conducive to coral growth—warm, tropical, shallow seas—probably existed there (page 1737). This chain includes islands, drowned atolls, and seamounts that formed as the Pacific Plate moved over a hot spot in the ocean: the oldest (most northerly) volcanic edifice formed more than 60 million years ago; today Hawaii is over the hot spot. In the fossil record from northern seamounts, there are no signs of reef-building corals; the earliest evidence of such corals in the chain is in those seamounts that formed 34 million years ago. Grigg suggests that when in the Oligocene ocean circulation changed in both strength and direction, current patterns were altered, and these, in turn, facilitated transport and dispersal of coral larvae eastward from islands in the Indo-West Pacific (IWP) where such corals were abundant and diverse. The Hawaiian archipelago is still relatively isolated and even today supports only 10% as many reef-building species as live in the IWP. All species established during the Pleistocene and 30% of those established during the Pliocene are still present on Hawaiian islands.

Stars: the inside story

NUCLEAR reactions deep inside stars cause stars to shine, but the opacity of star material prevents direct observation of the stellar core (page 1743). With time, however, deep material is mixed to the surface where it radiates light characteristic of its chemical composition. From this it is possible to determine what makes up the star surface. As stars evolve, they convert hydrogen to helium, helium to carbon and oxygen, and these to heavier elements. Wallerstein discusses the compositions of stellar atmospheres as they relate to various stages in stellar evolution, the variations in their stabilities, and some causes of forms that mixing can take within stars. Just as

stars evolve, so must theories of the star-formation process.

Deuterium on Mars

THE ratio of deuterium to hydrogen (D/H) on Mars has been measured; it is about six times the ratio of these isotopes on the earth (page 1767). If it is assumed that the martian ratio was once more earth-like, then hydrogen must have escaped more rapidly from the red planet in the past than it does now to account for the observed D/H. Calculations by Owen *et al.* show that the escape rate of hydrogen in the planet's distant past (for about a billion years after the planet formed) should have been 200 times the present rate in order to account for both the current D/H and also the requirement that large amounts of running water were present on the planet long enough to erode its surface. At the time that the planet had a wet surface, it also likely had a dense and warm atmosphere, conditions favoring the more rapid escape of hydrogen.

Hair cells and hearing

BIRDS that have suffered acoustic traumas from steady exposure to loud sounds can regain their hearing; new evidence suggests that replacement of hair cells is associated with recovery (pages 1772 and 1774). Hair cells transduce acoustic stimuli into electric activity and were once considered unregenerable, but studies in young chickens (Corwin and Cotanche) and adult quails (Ryals and Rubel) document both destruction of hair cells in the cochleae of traumatized ears and appearance of new hair cells at lesion sites. Cell regeneration and the restoration of hearing to normal levels followed the same time course in chickens, with both being complete 10 days after trauma. The source of new hair cells may be supporting cells or some other stem cells at the lesion site. In mammals as in birds, hair cell production was thought to be complete after the postnatal period. If mammalian hair cells

can also be induced to regenerate, there may be some hope that hearing losses caused by certain diseases, loud sounds, antibiotic treatments, and aging might be reversed.

Leaping lovers

WHEN male cricket frogs advertise for mates, the dominant frequency of the advertisement call is one to which the ears of the females of their species are most attuned (cover) (page 1786). In many animals, the match of songs sung and songs received correlates with body size, and this congruence is simply one of the several incidental effects (along with brain size, metabolic rate, and territory size) of the individual's body size. However, in the case of the cricket frogs, Ryan and Wilczynski show that the match of signals and receivers is unrelated to body size and has apparently evolved independently. This appears to help cricket frogs that live in close proximity maintain distinctions even at the subspecies level: song preferences minimize cross-breeding.

Rabbit-mouse hybridomas

TECHNOLOGIC problems have been removed from the preparation of rabbit-mouse hybridomas, cell lines capable of secreting a single species of rabbit antibody with specificity for a given antigen (page 1788). Conditions for preparing and stabilizing the lines of hybrid cells, made from rabbit antibody-producing cells and mouse myeloma cells, and for isolating the monoclonal antibodies that they secrete are described by Raybould and Takahashi. This type of hybridoma has been long-sought, because rabbits are not known to make myelomas and mice cannot make antibodies to certain important antigens. Rabbit monoclonal antibodies will be useful both as research and diagnostic reagents: they are very stable and procedures for preparing their reactive fragments are already well established.

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World Gas Conference

The International Gas Union held its triennial meeting in Washington, D.C., 5 to 9 June. Talks by high-level participants among those present from 46 member countries provided a view of the increasing role of natural gas in the world's energy economy. Of special interest were presentations by speakers from Western Europe and the Soviet Union. West Germany, France, and Italy are major importers of hydrocarbons, and the Soviet Union has the world's largest total fossil energy reserves.

From the tenor of the talks, it was clear that the people of Western Europe are intent on maximizing the security of energy supplies. Thus six nations, including France and West Germany, have entered into a 27-year contract to obtain part of their natural gas from the Norwegian-controlled giant Troll field located in the North Sea. This source will supplement gas currently being obtained from the Soviet Union, the Netherlands, Algeria, and Libya. Western Europe as a consumer is in the agreeable position of being in the midst of a huge and enduring gas glut. The use of this fuel is expanding, replacing fuel oil and some coal in boilers and being employed increasingly in home heating. The change is not rapid, but it progresses and additional countries, including Spain and Greece, will be served.

The most significant talk at the conference was delivered by V. S. Chernomyrdin, Minister of the Gas Industry in the Soviet Union. He told of Soviet plans for production and use of his country's enormous proven reserves of hydrocarbons. Proven reserves change with price, technology, and exploration, but the probabilities are that the Soviet Union will retain a huge margin over the United States. The Soviets have a large unexplored continental shelf, and their technology is evolving and improving.

About 60 percent of that country's gas is located in northern Siberia, above the Arctic Circle, much of it near the mouth of the River Ob. Conditions there are extreme. For 3 months of the year, winds blow with hurricane force. The mean annual temperature is -10°C . The permafrost is deep and heterogeneous, including pockets of brine. Nevertheless, the construction of production platforms, pipelines, and pumping stations is proceeding. Large segments of the production platforms, weighing 1000 metric tons or more, are fabricated in factories 1500 kilometers south of the gas fields. During the summer thaw, they are floated on pontoons northward on the River Ob. In the winter, they are conveyed on special trucks to the fields. From each platform about 20 wells are drilled employing controlled directional drilling. In addition to methane, the wells will produce substantial amounts of gas liquids. To bring the gas west from fields on the Yamal Peninsula, it is planned by 1996 to lay six pipelines, 1420 millimeters in diameter, operating at pressures of 75 atmospheres. The pipelines will pass through the Gulf of Baidarak, which for most of the year is covered with drift ice.

This year the Soviet Union will produce about 26 trillion cubic feet (tcf) of natural gas (about 50 percent more than the U.S. production. In succeeding years, production will increase steadily, exceeding 35.3 tcf in the 1990s, with growth to continue beyond the year 2000. In 1987 the share of gas in energy use in the Soviet Union amounted to 36 percent with a projected share of 40 percent in 1990. Environmental considerations and the Chernobyl incident have spurred use in the generation of electric power. From 1984 to 1987, consumption for that purpose increased about 37 percent. Future substantial markets lie in home heating and in the application of gas condensate for petrochemicals. The Russians are moving toward the use of compressed natural gas in motor vehicles. Already 250 automobile gas-filling compressor stations are functioning. In 1990 the number of trucks operating on compressed natural gas will exceed 500,000. Prospects are that transportation applications will increase further in scale and number. Chernomyrdin stated, "The development of compressed and liquefied gas stations will allow us to decrease the consumption of petrol and diesel fuel."

The energy content of world reserves of natural gas is now nearly equal to that of petroleum, and prospects are that gas energy content will continue to grow much faster than that of oil. With increasing exploitation of gas reserves and broadened applications, gas is likely to serve for some time as an impediment to drastic increases in the price of petroleum.—PHILIP H. ABELSON

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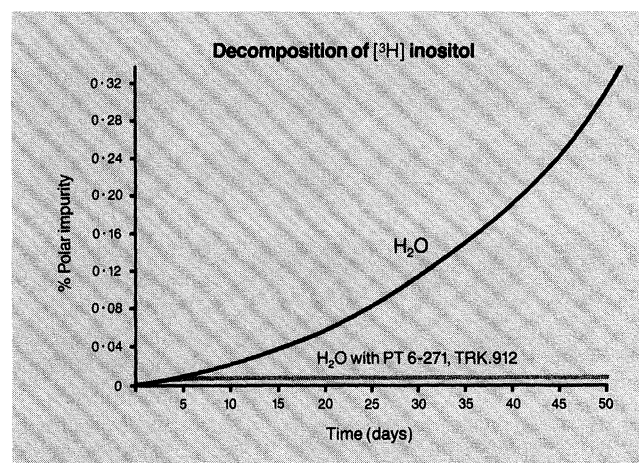
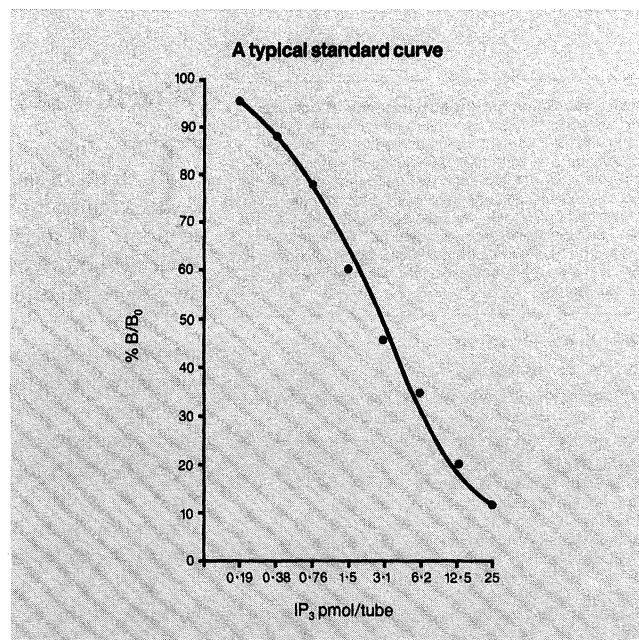
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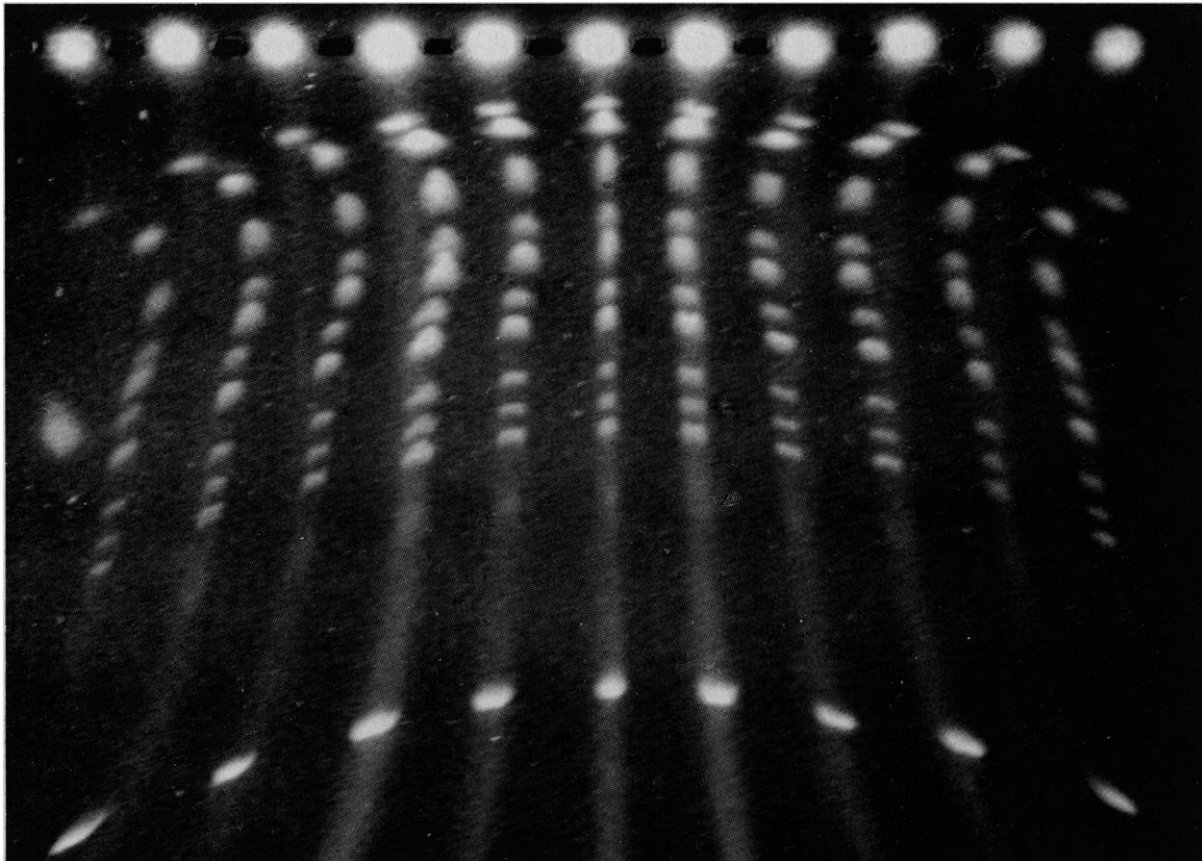
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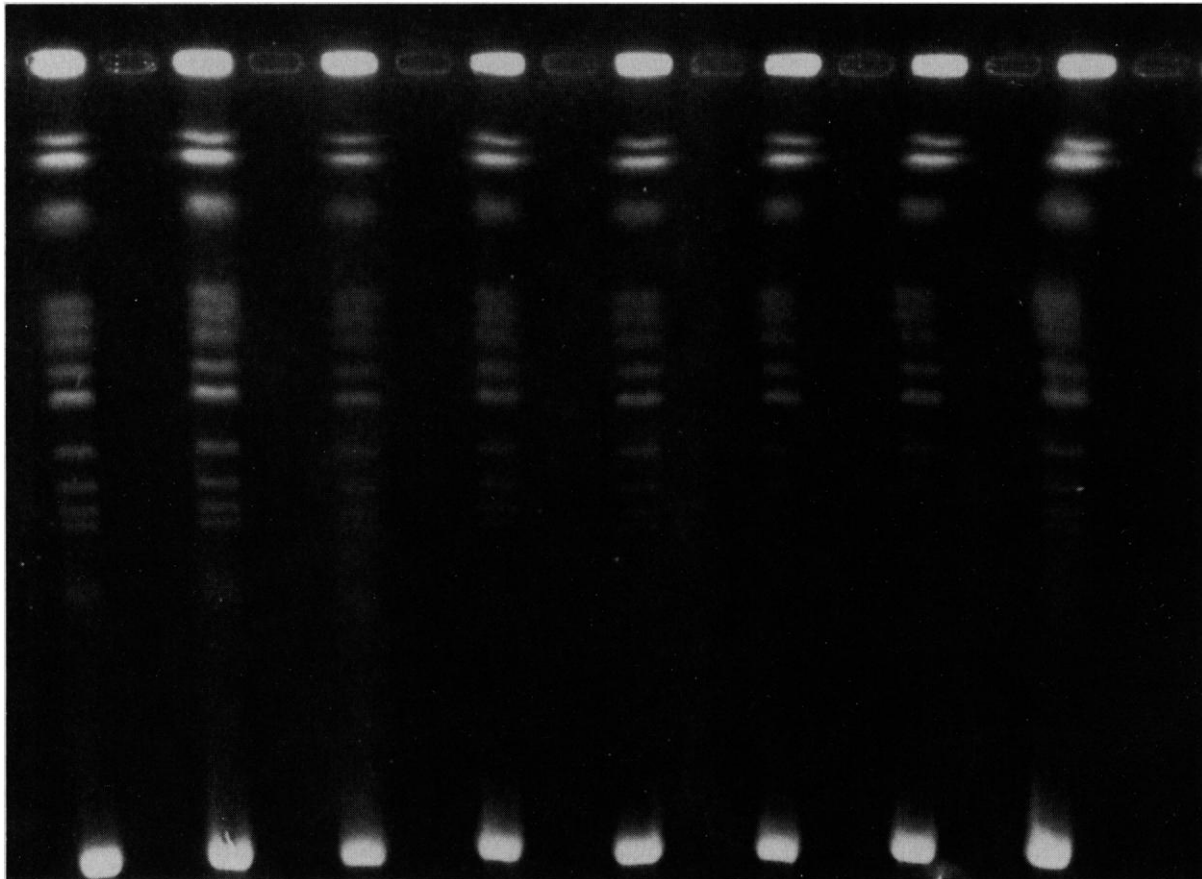
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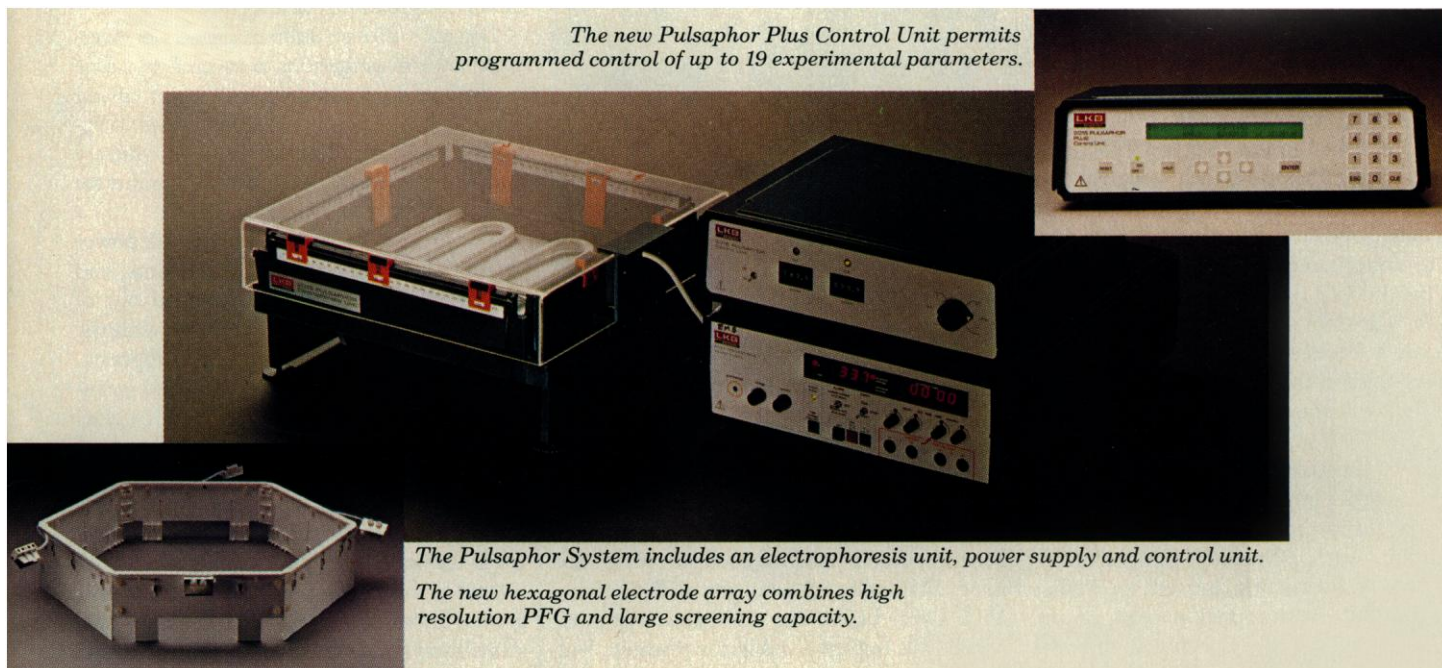
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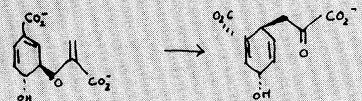
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