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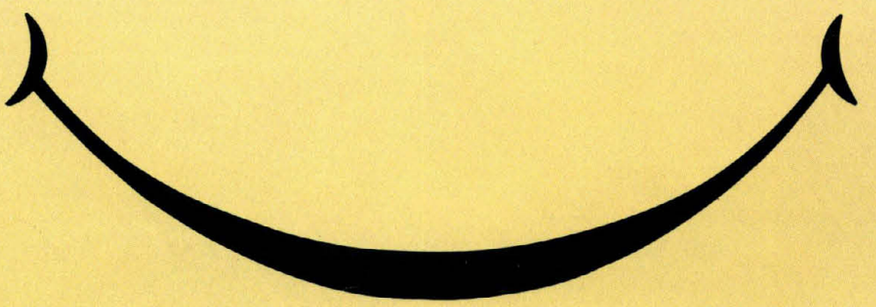

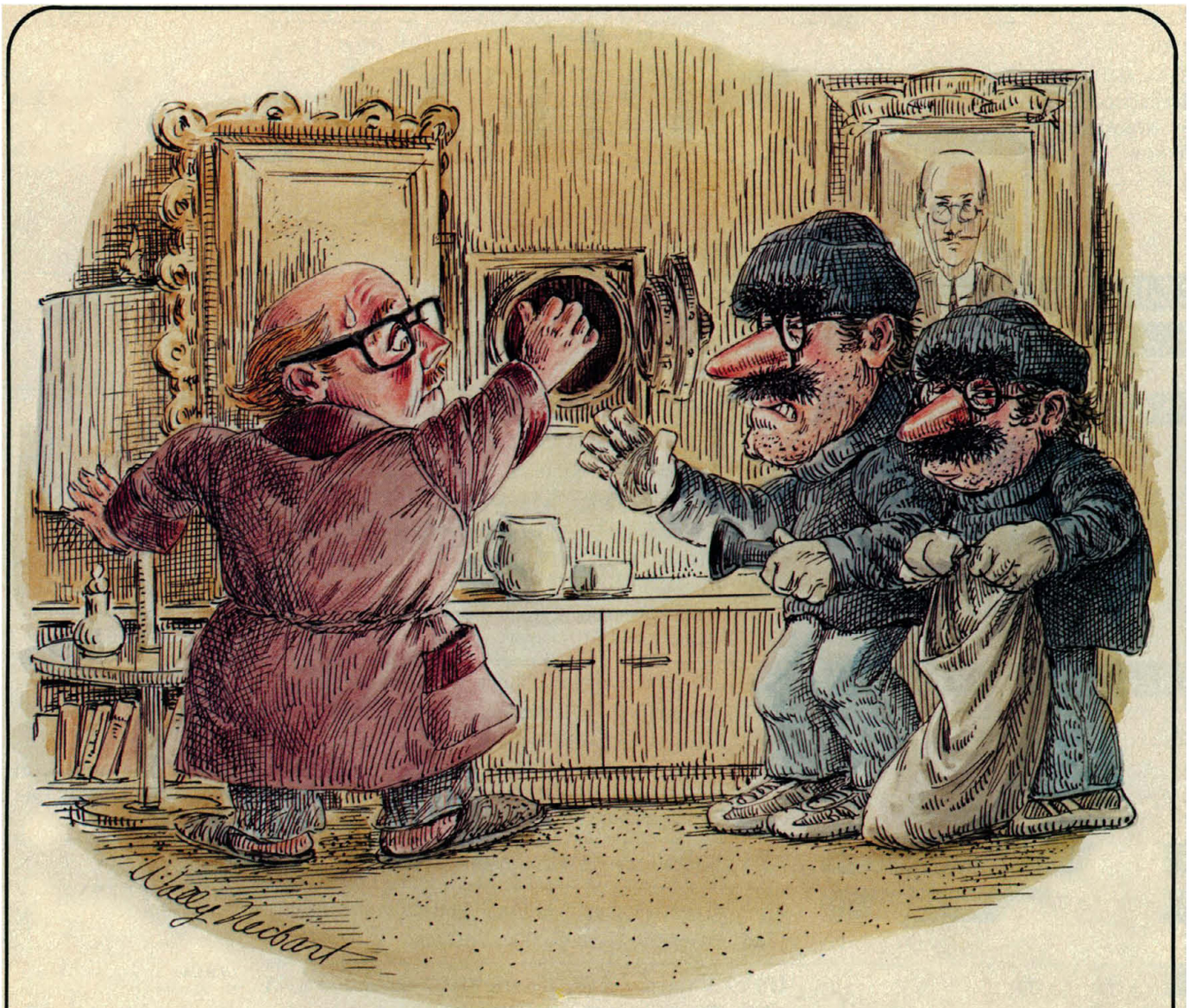

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SCIENCE

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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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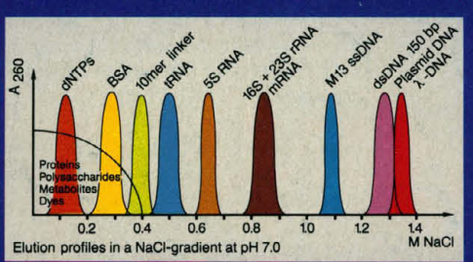

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Hawaiian-Emperor corals

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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SCIENCE

24 JUNE 1988
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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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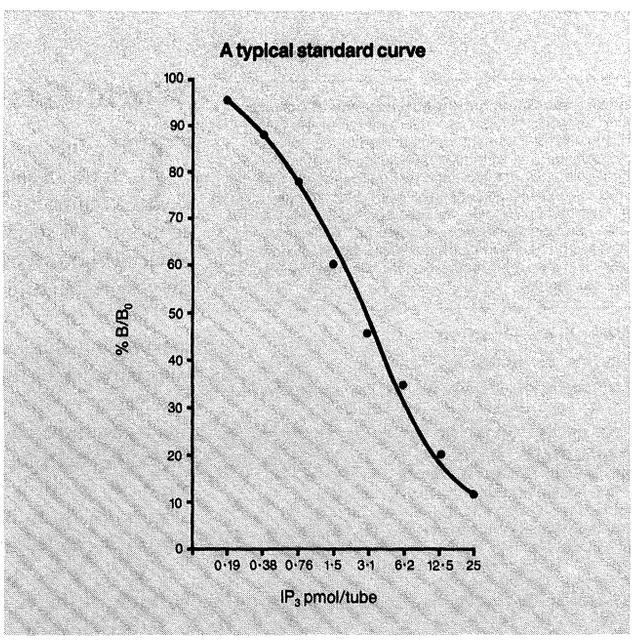

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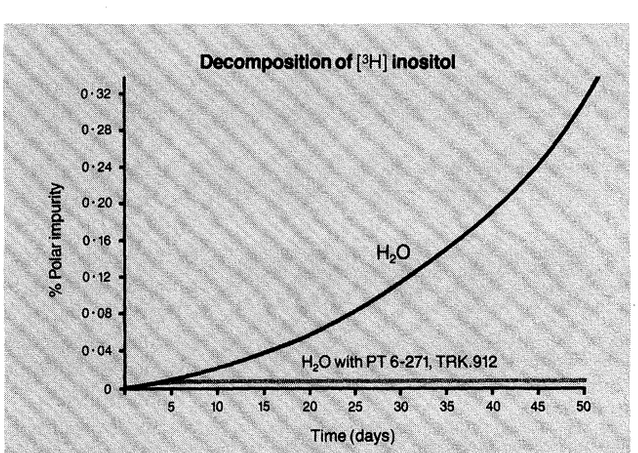

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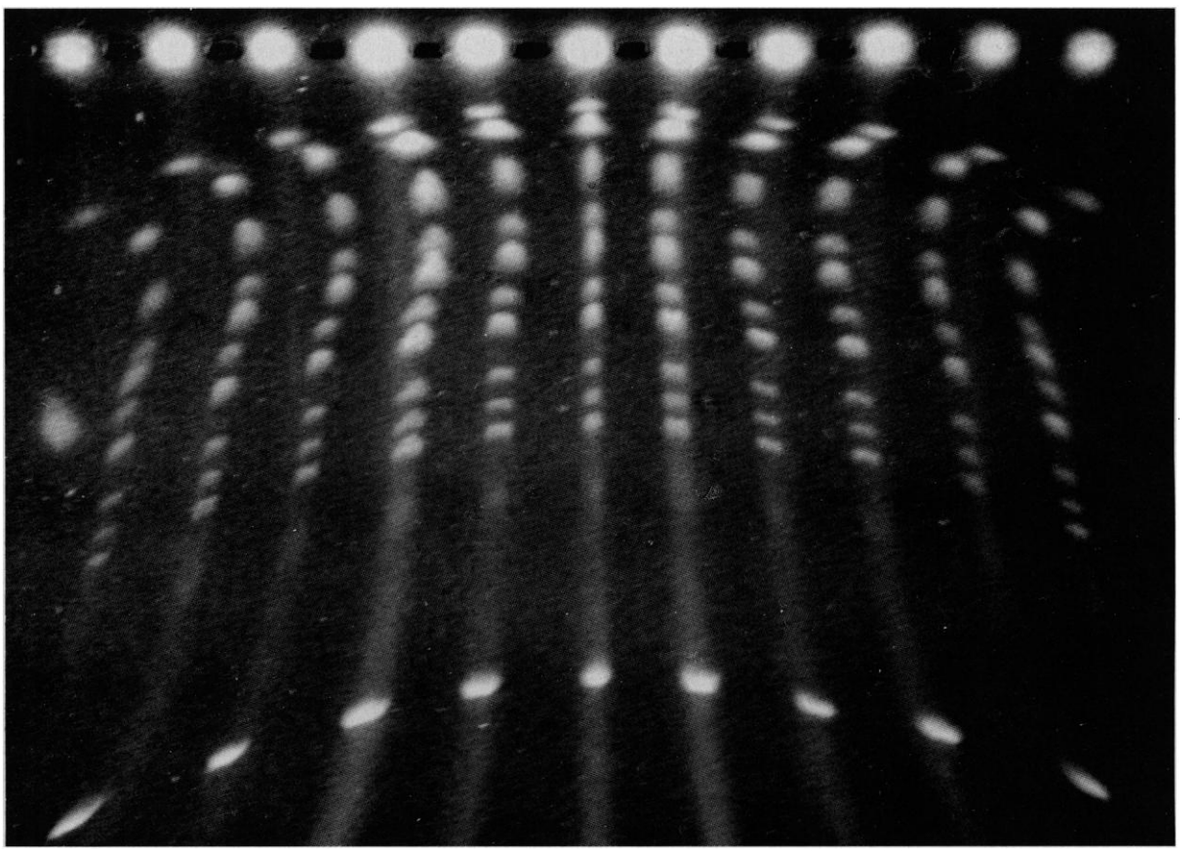
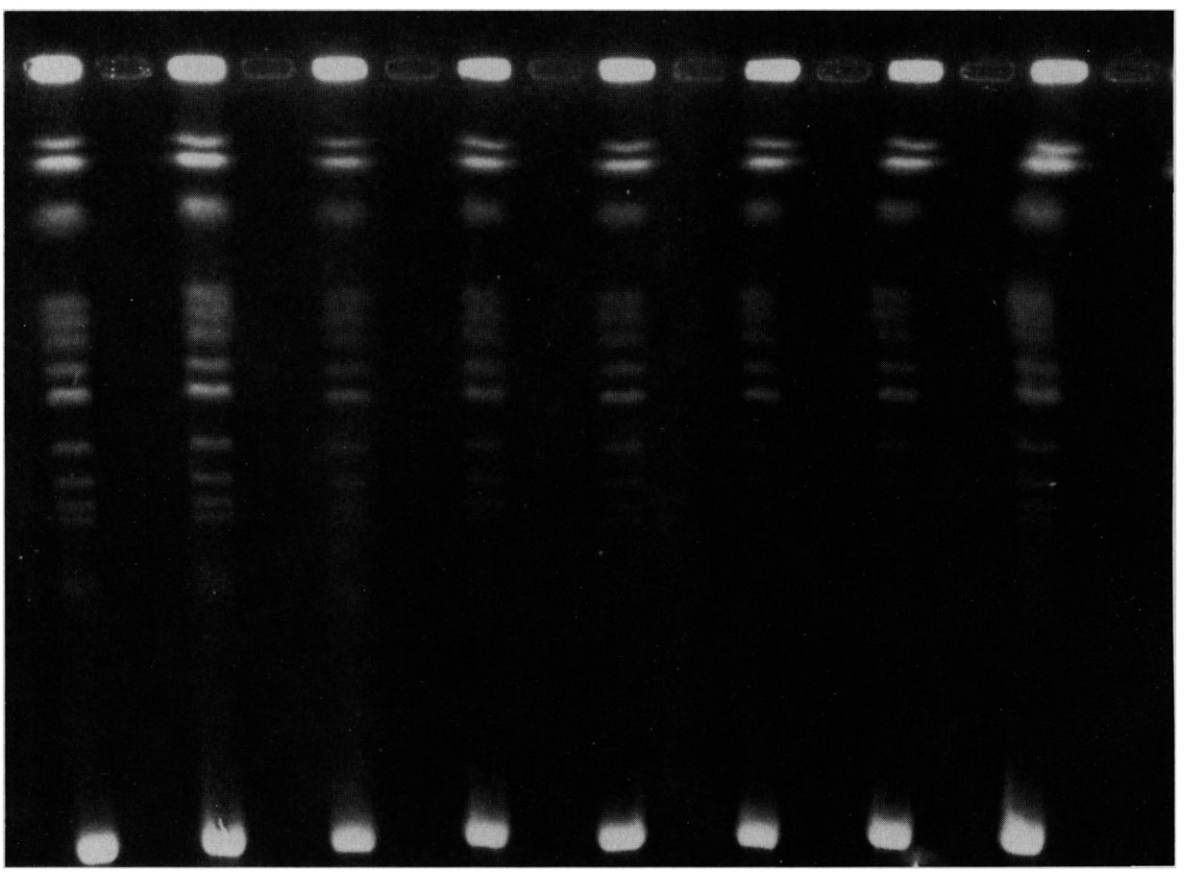


A good idea—the conventional point electrode result shown above is DNA from S. cerevisiae strain CF 21 run on a 1% agarose, 1×TBE buffer gel.



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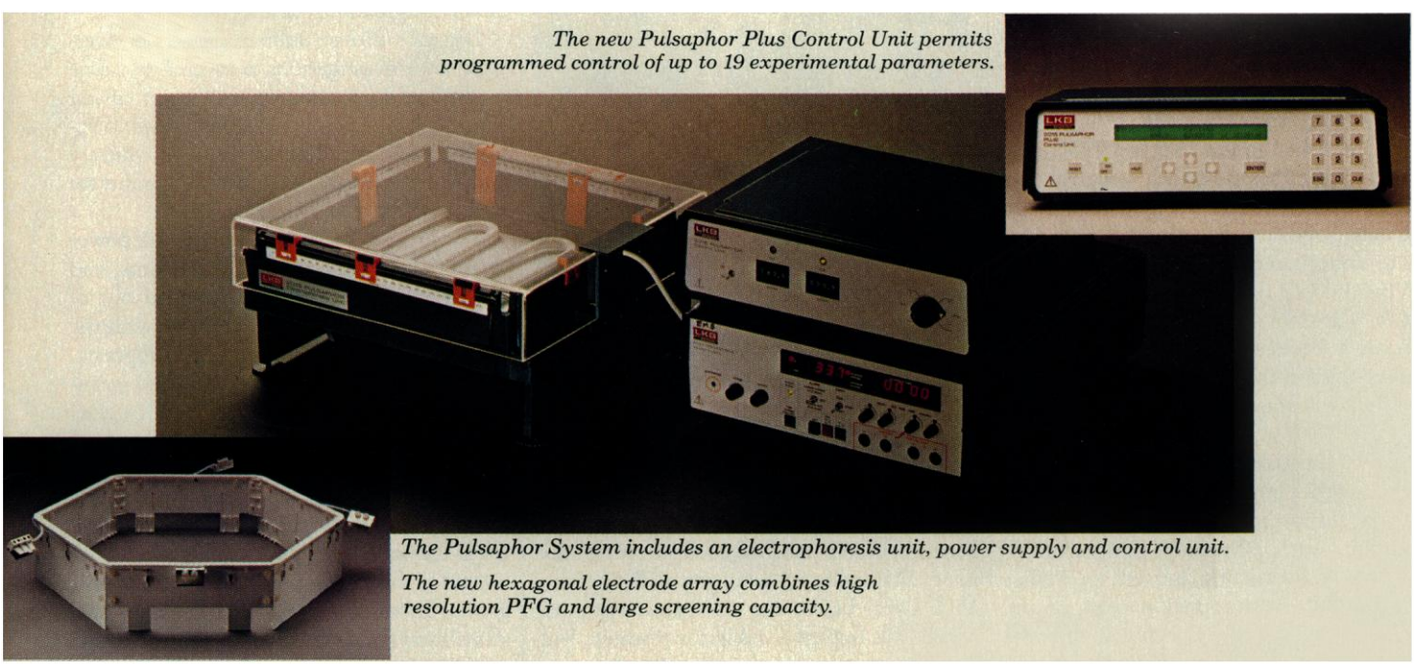

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Before being reviewed in depth, most papers are rated for their interest and overall suitability by a member of the Board of Reviewing Editors. Papers submitted in disciplines for which there is no appropriate member of the Board of Reviewing Editors may be screened by editorial staff members in consultation with outside experts. Papers that are not highly rated are returned to the authors within about 2 weeks; the title page and abstract from one copy are retained for our files. The others are reviewed in depth by two or more outside referees. Authors are notified of acceptance, rejection, or need for revision, usually within 6 to 10 weeks. Papers cannot be resubmitted, either after initial screening or after in-depth review.

Conditions of Acceptance

When a paper is accepted for publication in *Science*, it is understood by the editors that (i) any materials and methods necessary to verify the conclusions of the experiments reported will be made available to other investigators under appropriate conditions; (ii) sequence and crystallographic data will be offered for deposit to the appropriate data bank; and (iii) the paper will remain a privileged document and will not be released to the press or the public before publication. If there is a need in exceptional cases to publicize data in advance of publication, the AAAS Office of Communications (202-326-6440) must be consulted.

Selection of Manuscripts

In selecting papers for publication, the editors give preference to those of general significance that are well written, well organized, and intelligible to scientists in different disciplines. An attempt is made to balance the subject matter in all sections of *Science*. Membership in the AAAS is not a factor in selection.

Accepted papers are edited to improve the accuracy and effectiveness of communication and to bring them within the specified length limits. When the author's meaning is not clear, the editor may consult the author by telephone; when editing is extensive, the manuscript may be returned for approval and retyping before the type is set.

Categories of signed papers include: general articles, research articles, reports, letters, technical comments, book and software reviews, perspectives, and policy forums.

General Articles. General articles (up to 5000 words) are expected to (i) review new developments in one field that will be of interest to readers in other fields; (ii) describe a current research problem or a technique of interdisciplinary significance; or (iii) discuss some aspect of the history, logic, policy, or administration of science. Readers should be able to learn from a general article what has been firmly established and what are unresolved questions; speculation should be kept to a minimum.

Many of the general articles are solicited by the editor, but unsolicited articles are welcome. Both solicited and unsolicited articles undergo review.

General articles should include a note giving the authors' names, titles, and addresses; a summary (50 to 100 words); an introduction that outlines for the general reader the main point of the article; and brief subheadings to indicate the main ideas. The reference list should not be exhaustive; a maximum of 50 references is suggested. Figures and tables should occupy no more than one printed page.

Research Articles. A research article (up to 4000 words) is expected to contain new data representing a major breakthrough in its field. The article should include an author note, abstract, introduction, and sections with brief sideheads. A maximum of 40 references is suggested. Figures and tables together should occupy no more than one printed page.

Reports. Reports (up to 2000 words) are expected to contain important research results. They should include an abstract (no more than 100 words) and an introductory paragraph. A maximum of 30 references is suggested. Figures and tables together with their legends should occupy no more than one printed page.

Letters. Letters are selected for their pertinence to material published in *Science* or because they discuss problems of general interest to scientists. Letters pertaining to material published in *Science* may correct errors; provide support or agreement; or offer different points of view, clarifications, or additional information. Personal remarks about another author are inappropriate. Letters may be reviewed by outside consultants. Letters selected for publication are intended to reflect the range of opinions received. The author of the paper in question is usually given an opportunity to reply.

All letters are acknowledged by postcard; authors are notified if their letters are to be published. Preference is given to letters that do not exceed 250 words. Letters accepted for publication are frequently edited and shortened in consultation with the author.

Technical Comments. Technical comments (up to 500 words) may criticize articles or reports published in *Science* within the previous 6 months or may offer useful additional information. Minor issues should

be resolved by private correspondence. The authors of the original paper are asked for an opinion of the comment and are given an opportunity to reply in the same issue if the comment is published. The comments, and sometimes the reply, are subject to the usual review procedures. Priority disputes undergo extensive review and are published only when action is recommended.

Book and Software Reviews. The selection of books and software packages to be reviewed and of reviewers is made by the editors. Instructions and length specifications accompany items to be reviewed when they are sent to reviewers.

Manuscript Preparation

Typing. Use double-spacing throughout the text, tables, figure legends, and references and notes and leave margins of at least 2.5 centimeters. Put your name on each page and number the pages starting with the title page.

Titles. Titles should be short, specific, and amenable to indexing. For general articles the maximum length is 80 characters and spaces; for research articles and reports the maximum is 100 characters.

Summaries or abstracts. These should include a sentence or two explaining to the general reader why the research was undertaken and why the results should be viewed as important. The abstract should convey the main point of the paper and outline the results or conclusions.

Text. A brief introduction should indicate the broad significance of the paper. The whole text should be intelligible to readers in different disciplines. Technical terms should be defined. All tables and figures should be cited in the text in numerical order.

Symbols and abbreviations. Define all symbols, abbreviations, and acronyms.

Units of measure. Use metric units. If measurements were made in English units, give metric equivalents.

References and notes. Number references and notes in the order in which they are cited, first through the text and then through the table and figure legends. List a reference only one time. References that are *always* cited together may be grouped under a single number. Use conventional abbreviations for well-known journals; provide complete titles for other journals. For references with up to five authors provide all the names; for more than five, provide the name of the first author only. See issues of the journal for examples.

Unpublished observations. Reference to unpublished data should be given a number in the text and placed, in correct sequence, in the references and notes.

Acknowledgments. Gather all acknowledgments into a brief statement at the end of the references and notes.

Informed consent. Investigations on human subjects must include a statement indicating that informed consent was obtained after the nature and possible consequences of the studies had been fully explained.

Animal welfare. Authors using experimental animals must state that their care was in accordance with institutional guidelines. For animals subjected to invasive procedures, the anesthetic, analgesic, and tranquilizing agents used, as well as the amounts and frequency of administration, must be stated.

Figures. For each figure submit three high-quality glossy prints or original drawings of sufficient size to permit relettering but not larger than 22 by 28 centimeters (8½ by 11 inches). On the back of every figure write the first author's name and the figure number and indicate the correct orientation. *Manuscripts with oversized figures will be returned to the author without review.* Photocopies of figures are not acceptable; transparencies, slides, or negatives cannot be used because they cannot be sent to reviewers.

On acceptance of a paper, authors requesting the use of color will be asked to supply slides or negatives of the color artwork and to pay $600 for the first color figure or figure part and $300 for each additional figure or figure part as a contribution toward printing costs.

Illustrations reprinted from other publications must be credited. It is the author's responsibility to obtain permission to reprint such illustrations in *Science*.

Tables. Tables should supplement, not duplicate, the text. They should be numbered consecutively with respect to their citation in the text. Each table should be typed, with its legend (double-spaced), on a separate sheet. Give each column a heading with units of measure indicated in parentheses. Do not change the unit of measure within a column.

Equations and formulas. Use quadruple-spacing around equations and formulas that are to be set off from the text. Define all symbols.

Uncertainties and reproducibility. Evidence that the results are reproducible and the conditions under which this reproducibility (replication) was obtained should be explicitly stated. The effect of limitations in experimental conditions on generalizability of results should be discussed. Uncertainties should be stated in terms of variation expected in independent repetitions of the experiments; they should include an allowance for possible systematic error arising from inadequacies in the assumed model and other known sources of possible bias. Probabilities from statistical tests of significance should be subordinated to the reporting of results and associated uncertainties.

Printing and Publication

Proofs and reprints. One set of galley proofs is sent to the authors. An order blank for reprints accompanies the proofs.

Scheduling. Papers are scheduled for publication after *Science* has received corrected galley proofs from the authors. Papers with tables or figures that present problems in layout, or with color figures or cover pictures, or that exceed the length limits may be subject to delay.

Cover Photographs

Particularly good photographs that pertain to a paper being submitted will be considered for use on the cover. Submit prints (not slides, negatives, or transparencies) with the manuscript.

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You are invited to submit abstracts for contributed paper sessions at the 155th National Meeting of the American Association for the Advancement of Science. Appropriate topics span the physical, life, and behavioral and social sciences. If your abstract is accepted, you will have the opportunity to present your work to fellow meeting registrants, to gain visibility in your field, and to contribute to the overall advancement of scientific inquiry.

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Each contributor will be assigned to a poster session and will be provided with a $4' \times 6'$ bulletin board on which to display large, easy-to-read text and graphics for approximately 1½ hours so that the work can be discussed with interested parties. In addition, the contributor's abstract will be published and distributed to all meeting registrants.

Instructions:

The privilege of submitting a contributed paper is open **only** to AAAS members and fellows. Although the member/fellow need not be one of the authors, his or her endorsement is required.

Type the abstract on plain white paper. The main body of the abstract must fit within a 5″ square and should be indented, spaced, capitalized, and underlined as in the example at right. Use a typewriter or letter-quality printer. Do not double-space text. Use reproducible black ink for all hand-lettering. Do not draw a box around the abstract or cut and paste it onto another piece of paper.

Above the 5″ square, indicate which broad discipline encompasses your subject, and provide up to three index words that specifically describe the area within that discipline. Below and to the left of the square, type the full name, address, and telephone number of the person to be contacted regarding scheduling, etc. Below and to the right, include the name, affiliation, and signature of the AAAS member or fellow endorsing the abstract.

Send the original plus one copy of the abstract no later than 1 November to **Contributed Papers, AAAS Meetings Office, 1333 H Street, NW, Washington, DC 20005.**

Fees: Presenters must be registered for the AAAS Annual Meeting. Members may register for the full 5-day conference ($75 in advance or $100 on-site) or for just the day of their presentation ($50 on-site); there are also substantial discounts for students. Advance registration information will be sent to all applicants in September.

DEADLINE: 1 November 1988

Example:

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Indent Five Spaces and Type Title in Upper and Lower Case Letters and Underline. AUTHOR'S NAME IN UPPER CASE (Institution Name in Upper and Lower Case), SECOND AUTHOR (Institution).*

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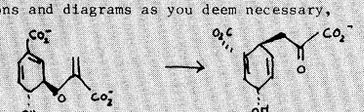

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