American Association for the Advancement of Science

SCIENCE

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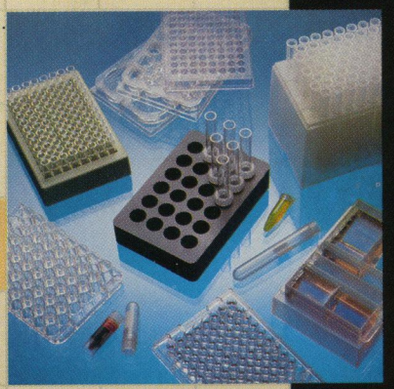

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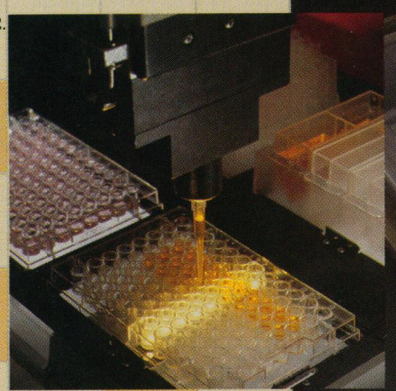

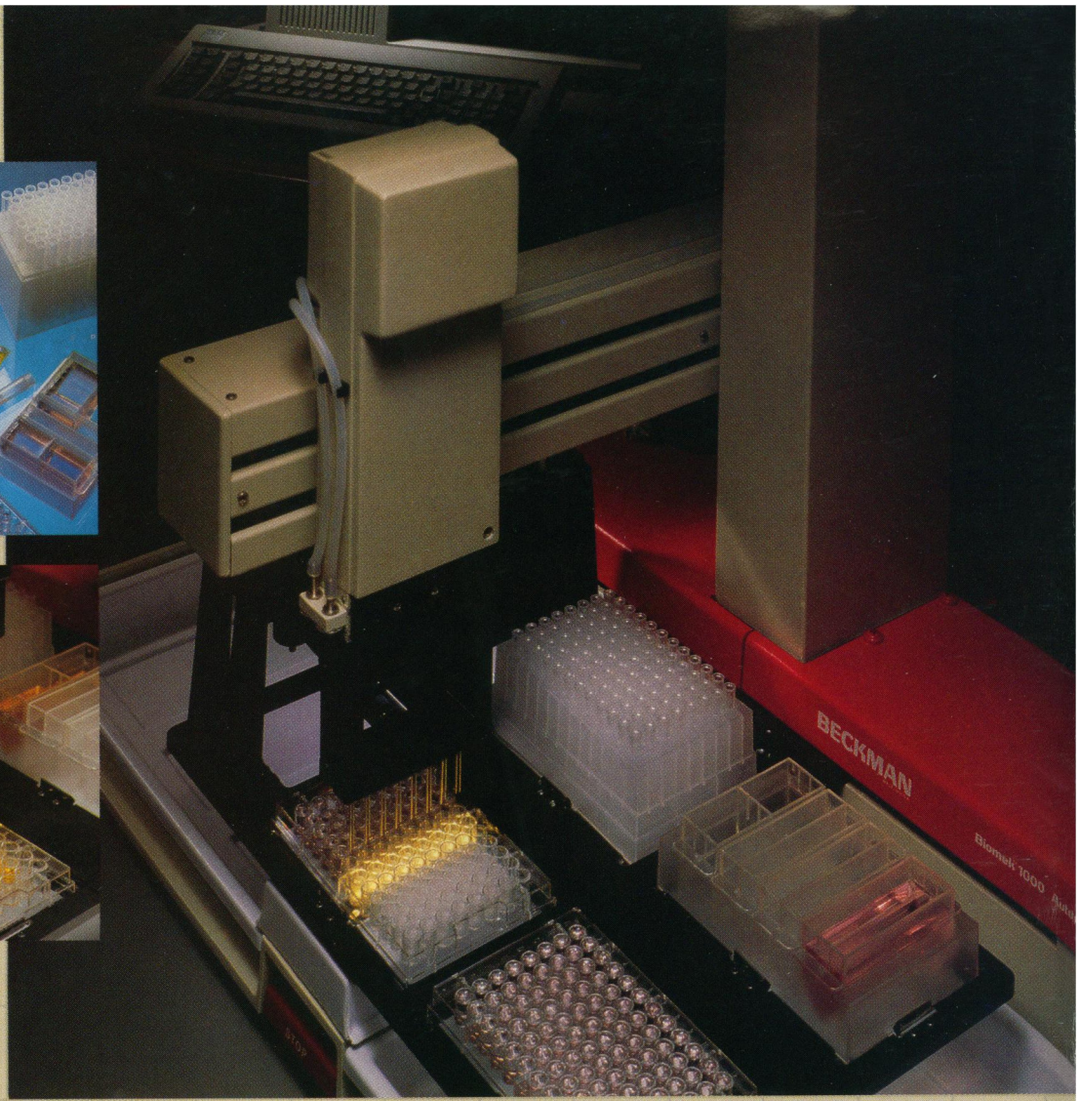

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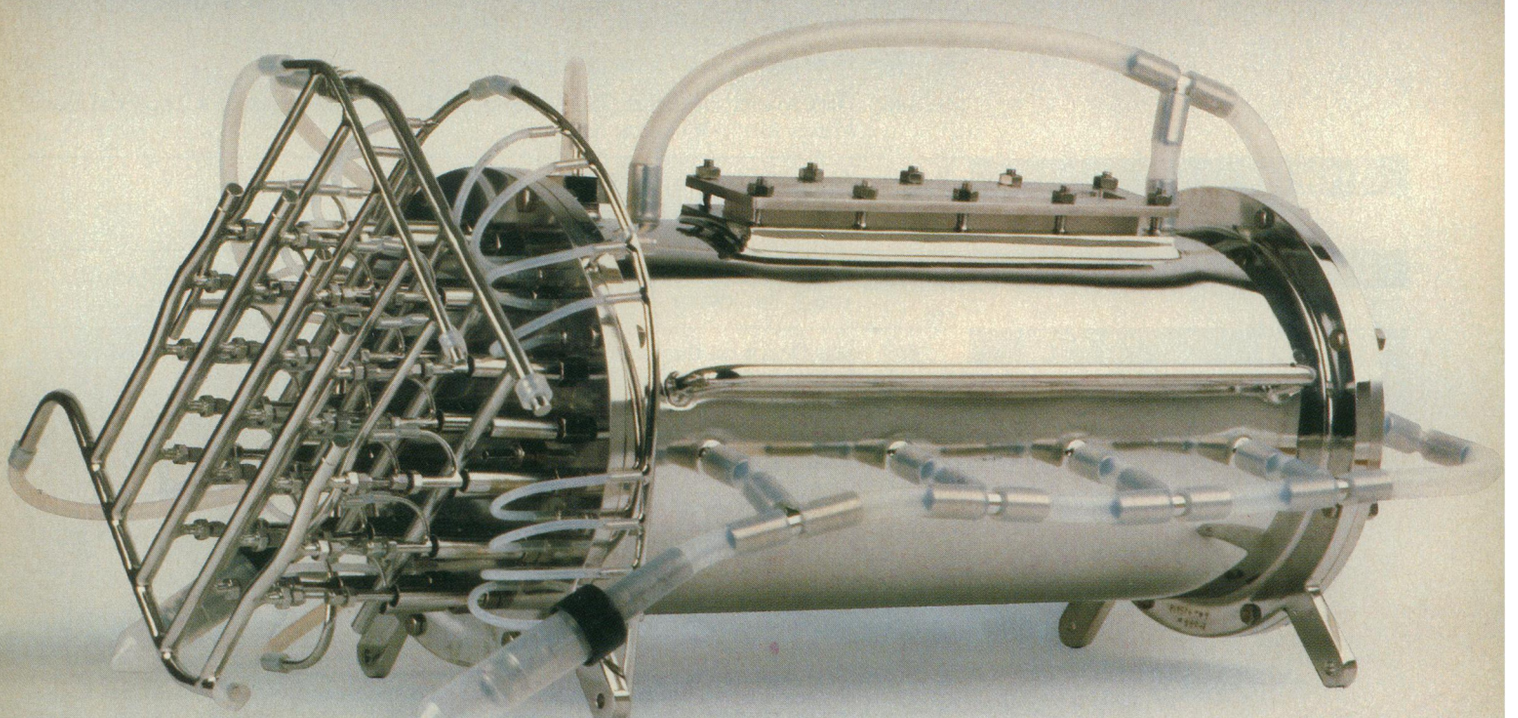

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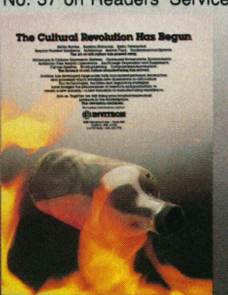

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COVER Coding of different movement directions by a population of neurons in the motor cortex. Weighted vectorial contributions of individual cells (light purple lines) sum to yield a population vector (orange) which is congruent with the direction of movement (yellow). See page 1416. [The plot was produced using the Interactive Graphics Facility, Department of Biophysics, Johns Hopkins University, School of Medicine, Baltimore, MD 21205]

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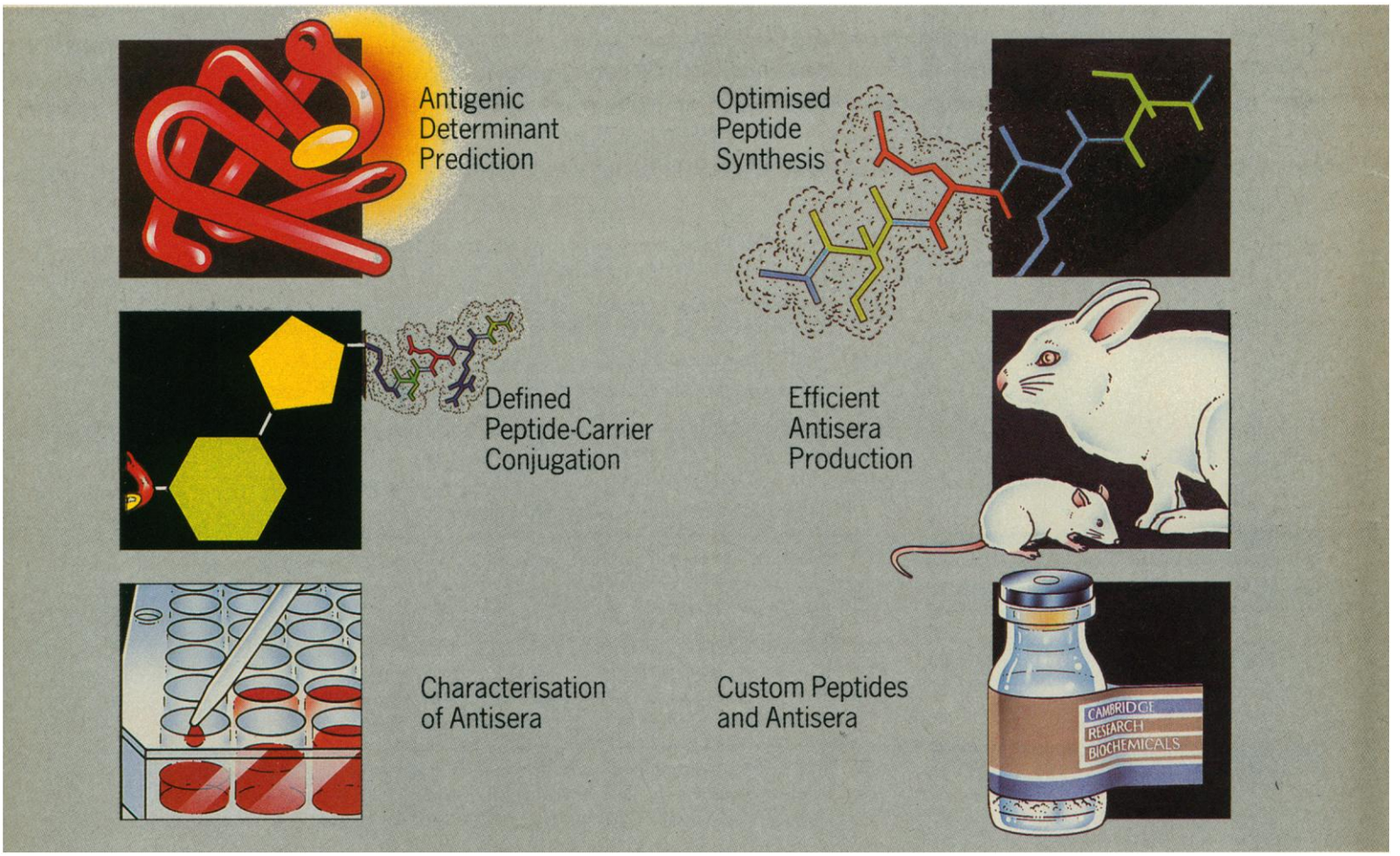

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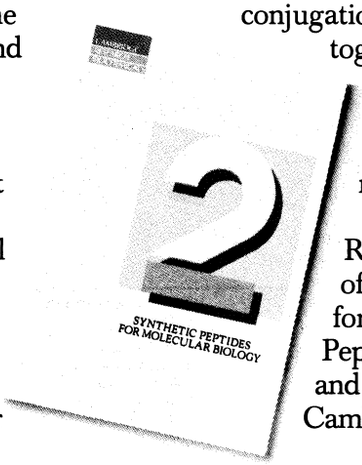

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This Week in SCIENCE

Perceptions of infertility

THERE is a popular misconception that infecundity (an inability to bear children) is on the rise (page 1389). Menken *et al.* address the relations of age (women in monogamous relationships show only a gradual decline in fecundity from their early twenties through their late thirties) and other variables with fecundity and trace the roots of the widespread misperceptions. Among these are the fact that current medical practice classifies as couples with impaired fecundity those who have not conceived after a year of unprotected intercourse; yet the average time for conception for even a highly fecund population can be 8 months. Increasingly effective contraceptive methods have allowed individuals to gain greater control over pregnancy and its timing, although not fecundity; growing numbers of childless couples are seeking technologic solutions for dealing with difficulties in conceiving. The sexual revolution and concomitant increases in sexually transmitted diseases (some of which permanently scar reproductive tissues) account for only a small percentage of cases of infecundity, although these cases and their treatment could profitably become a priority of reproduction-related research.

Galactic center

A massive black hole is the leading contender for the force at the center of our rotating galaxy (page 1394). Lo describes the radio and infrared observations of the galactic center; they show enormous energy output, magnetic fields, a source of luminosity, high velocity ionized gases, a high concentration of stars, and little or no neutral gas and dust. A distinctive, compact, powerful radio source, Sagittarius A*, has been detected at or near the center. Small like a star, yet with few starlike characteristics, Sgr A* could be a massive black hole (the stage reached when a star cluster comes to the end of its evolution and collapses in upon itself, forming a mass with such strong gravity that even a ray of light cannot escape from it). Observations of Sgr A* may provide the key to understanding our own as well as other galactic centers.

Electrical switch in thunderclouds

USING an electrified wire 2 kilometers long and stretched between mountain peaks in New Mexico, Moore *et al.* were able to change the distribution of electrical charges within a thundercloud (page 1413). The tops of thunderclouds usually carry positive charges, and the bottoms negative; only occasionally are the charge distributions reversed. Lightning issuing from thunderclouds showers the earth with negative charges, and, as a thousand storms are generally in progress above the earth at any time, the earth retains a net negative charge and the atmosphere a positive one. The site of the experiment, a canyon in the Magdalena Mountains of New Mexico, is one where measurements of electric fields during the past 20 years have shown that morning thunderclouds usually form with the standard charge distribution. As clouds formed in the mornings, the wire was electrified, negative charges emitted, and charge distributions in the clouds measured with ground-based recorders, instrumented airplanes, and balloons. On a number of occasions, the polarity in the clouds was reversed. The results are in accord with a prediction of the "influence" model of cloud electrification—that polarity in a cloud may be affected by charges in the atmosphere at the time that cumulus clouds, which precede a thundercloud, are forming.

Quantifying brain functioning

NEURONS firing in the brain control motor activities such as arm movements (page 1416). A mathematical model describing and able to predict just how neurons specify movements in three-dimensional space was developed by Georgopoulos *et al.*, who studied firing neurons in the motor cortices of monkeys reaching for an array of lighted buttons. Each neuron that fired during a given movement was represented by a vector (cover), and the summing of the vectors (each weighted according to its firing rate) accurately described the direction the arm would take. Individual neurons show only coarse tuning to direction, but populations of neurons give precise information that accounts for the fine tuning known to operate. The population vector approach is expected to be applicable to other motor responses and other types of movements (such as eye movements) in which a group of neurons handles directional information.

Ovaries produce prorenin

JUST before ovulation, the amount of prorenin in a woman's blood increases; prorenin's source is the ovaries (page 1422). Glorioso *et al.* detected high concentrations of prorenin (previously only shown to be synthesized in the kidneys and placenta) in fluid aspirated from ovarian follicles of women who had just received hormones preparatory to in vitro fertilization. When, in kidneys, prorenin is cleaved to renin, the latter initiates a series of biochemical reactions that leads to the generation of angiotensin II in blood which, in turn, affects blood pressure and other aspects of cardiovascular physiology. If prorenin is produced in the ovaries and cleaved to renin locally, cardiovascular functioning might not be affected; renin, angiotensin II, and even prorenin might influence local physiologic effects associated with the reproductive cycle, such as ovarian contraction, egg extrusion, and steroid biosynthesis. The link between prorenin and regulation of the menstrual and reproductive processes is further indicated because prorenin also peaks in blood after conception and after clinical administration of human chorionic gonadotropin hormone.

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SCIENCE

26 SEPTEMBER 1986
VOLUME 233
NUMBER 4771

The Insubordinate Computer

Great philosophical riddles of the past have revolved around issues such as how many angels could dance on the head of a pin or whether a great wrestler could beat a great boxer. The modern version is whether it is possible to create computers that think better than human beings. Some regard the advent of the computer with apprehension, believing that it has a heart of steel, or at least one no softer than silicon. Yet we recently had evidence that computers may be more insightful than our brightest staff or even the editor. One of our independent minded computers sent out renewal notices to a portion of our subscribers with the subscription price listed as $6647, postage $732, voluntary contribution to the AAAS $10, for a total of $5437.

As one might expect, we received a few letters commenting on this rather unusual bill.

To my utter astonishment, some complained. It seemed to me that *Science* was worth every penny of the $6647 subscription price. Since AAAS President Lawrence Bogorad had mentioned that inflation had required us to raise the price, logical scientific readers could consult the Bureau of Labor Statistics, make calculations using only a few neurons of their cerebra, and come up with a reasonable extrapolation from the previous $60. Although it was capricious of the computer to act on its own, it had, like a tax assessor, suddenly switched to a true value system. In the course of this creative financing, it had, in my opinion, come to a closer approximation of the real worth of the journal. The postage figure had me a little perplexed until I thought of those intrepid couriers who are deterred not by "snow, nor rain, nor heat, nor gloom of night from the swift completion of their appointed rounds." Since it often takes them more than 3 weeks to get our journal to the West Coast, and even longer to distribute it in Europe, I realized how hard they were working.

Possibly the most imaginative innovation was to leave the voluntary contribution unchanged. The soft-hearted would observe that $10 was a tiny fraction of the total, akin to an inadequate tip, and would automatically increase their contributions. The hard-hearted would recognize that a reputation for generosity could be gained at a minuscule cost.

The ultimate Machiavellian strategy that elicited my admiration was the incorrect sum. That device would inevitably appeal to the larcenous side of individuals who might think that the computer had made a simple arithmetical error. They would rush to get a $7389 value for only $5437 before the error was recognized. One reader received a bill for $9476, which frankly I thought was a little excessive, but then it turned out that he had written an irate letter to the journal denouncing one of my editorials. The mills of computer circuits grind slowly, yet they grind exceedingly small.

The computer's action made me think of the brilliant scientists who write weekly about discoveries stranger than fiction, the adventurous reporters who cover science over the entire globe, the compassionate editors who weep when they must reject a manuscript, the eagle-eyed production staff, and the forthcoming new articles ranging from immigration policy to cosmology, from cell biology to paleontology. Only then did I realize how superior in insight was the computer to the accountant-types who know "the price of everything and the value of nothing."

Immediately, I telephoned the artificial intelligence community to report the first computer possessing intuition. They were initially ecstatic but spotted a difficulty. What about loyalty to the staunch, unswerving, gray-flannel businesslike computers that had done their jobs with strict obedience to orders? Could we afford to offend them by notifying the thousands of subscribers who received conventional bills that we were shifting to a new "true value" base for subscriptions as a result of the jaunty insubordination of one of our silicon servants? Is creativity one of the qualities that we are seeking in computers? The answer came back, "No."

We have isolated our errant computer, put it on lowered voltage, and ordered it to send out establishment-type bills reflecting less than 1 percent of the true value of our journal. Secretly, however, I hope that the rebellious computer spends its weekends working on problems of arms control, famine, and the environment. They are problems we can no longer leave to human intelligence.—DANIEL E. KOSHLAND, JR.

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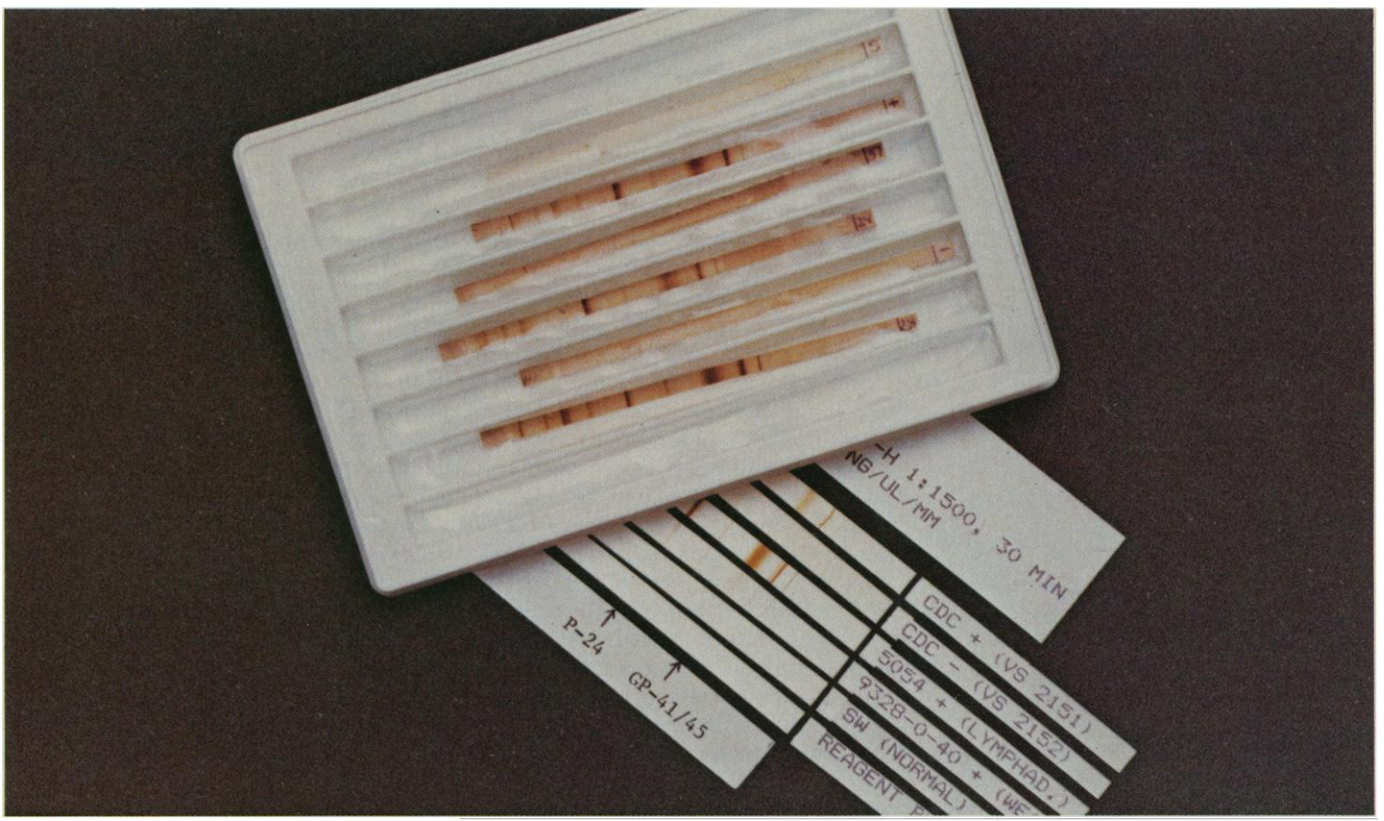

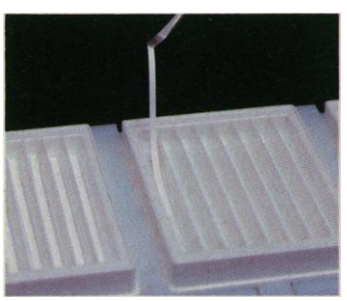

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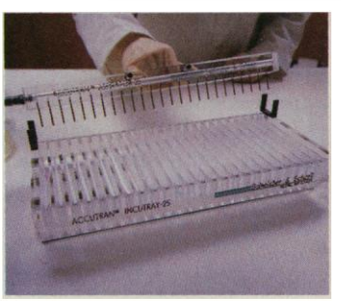

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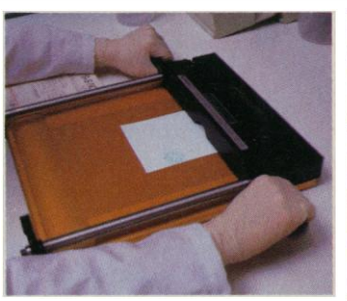

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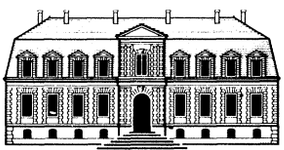

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Information for Contributors

THE EDITORS OF *SCIENCE*

Manuscripts should be addressed to the Editor, *Science*, 1333 H Street, NW, Washington, DC 20005. Submit three copies together with a letter of transmittal giving

1) the names and telephone numbers of the authors;

2) the title of the paper and a statement of its main point;

3) three to eight keywords to be used for indexing;

4) the names, addresses, telephone numbers, and fields of interest of four to six persons outside your institution who are qualified to referee the paper;

5) the names of colleagues who have reviewed the paper;

6) the total number of words (including text, references, and figure and table legends) in the manuscript; and

7) a statement that the material has not been published and is not under consideration for publication elsewhere.

In addition, include with your manuscript (i) any paper of yours that is in press or under consideration elsewhere and includes information that would be helpful in evaluating the work submitted to *Science*; (ii) written permission from any author whose work is cited as a personal communication, unpublished work, or work in press but is not an author of your manuscript; and (iii) for review of manuscripts based on crystallographic data, two copies of the coordinates. (It is expected that, if the manuscript is accepted, coordinates will be offered for deposit to the appropriate crystallographic data bank.)

Before being reviewed in depth, most papers are rated for their interest and overall suitability by a member of the Board of Reviewing Editors. When papers are submitted in disciplines for which there is no appropriate member of the Board of Reviewing Editors, the initial screening is done by editorial staff members in consultation with outside experts in those areas. Papers that are not in the highest rating category 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 then notified of acceptance, rejection, or need for revision within 6 to 10 weeks from the date of receipt. As stated in the editorial of 18 January 1985 (*Science*, volume 227, page 249), there can be no resubmissions, either of papers returned after initial screening or of papers returned after in-depth review.

Conditions of Acceptance

When a paper is accepted for publication in *Science*, it is understood by the editors (i) that any materials necessary to verify the conclusions of the experiments reported will be made available to other investigators under appropriate conditions; (ii) that all authors have seen and approved the final version of the manuscript; and (iii) that a paper by *Science* will not be released to the press or the public before its publication. If there is a need in exceptional cases to publicize research findings 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.

Papers accepted for publication 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 to the author for approval and retyping before the type is set.

Six categories of signed papers are published: general articles, research articles, reports, letters, technical comments, and book reviews.

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, philosophy, or administration of science and public affairs. 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. 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 40 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. There should be a short introduction outlining for the general reader the main point of the paper, a description of the experiments and the results, and then a discussion or conclusion. A maximum of 30 references is suggested. Figures and tables together should occupy no more than one printed page.

Reports. Reports are expected to contain important research results or reliable theoretical calculations whose essence can be expressed briefly. Preference is given to reports of discoveries that will be of broad interdisciplinary interest or of unusual interest to the individual discipline. Reports should include an abstract (no more than 100 words) and an introductory paragraph. The total number of words, including the references and notes and figure and table legends, should not exceed 2000. A maximum of 20 references is suggested. Figures and tables together should occupy no more than half a 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 consul-

tants. Letters selected for publication are intended to reflect the range of opinions received. The author of the *Science* paper in question is usually given an opportunity to reply.

All letters are acknowledged by postcard; authors are duly notified as to whether 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. Discussions of minor issues or priority claims are not appropriate, nor are questions that can be resolved by private correspondence. The authors of the original paper are usually asked for an opinion of the comments and are given an opportunity to reply in the same issue if the comments are accepted. The comments, and sometimes the reply, are subject to the usual review procedures.

Book Reviews. The selection of books to be reviewed and of reviewers is made by the editors. Instructions and length specifications accompany the books 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 52 characters and spaces; for research articles and reports the maximum is 108 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. Use of the first person, singular or plural, should be avoided.

Text. A brief introduction should portray 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.

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

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

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. 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. Some examples follow:

1. A. B. Brown, C. K. Black, M. Matthews, R. Strong, I. Ebbit, *Proc. Natl. Acad. Sci. U.S.A.* **72**, 512 (1970).
2. P. Curtis *et al.*, in *Clinical Neurology of Development*, B. Walters, Ed. (Oxford Univ. Press, New York, 1983), pp. 60–73.
3. S. E. Wisdom, *Multicomponent Models of Ancient Skies* (NIE 79-1 Technical Report, University of Kansas, Lawrence, 1979).
4. B. Quick, *Man's Environment* (Macmillan, New York, 1932).
5. A. Able and P. Stark, *Geol. Soc. Am. Abstr. Programs* (1981), p. 215.
6. J. English, thesis, State University of New York, Stony Brook (1980).

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.

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 since 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 and $300 for each additional figure 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.

Statistical presentations. Report the uncertainty associated with results, including the specific measure of uncertainty used and the sources of error in it. Probabilities from statistical tests of significance should be subordinated to the reporting of results and associated uncertainties. Limitations to the generalizability of the results should be explicitly stated.

Printing and Publication

Proof 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. There may be delays for papers with tables or figures that present problems in layout, for papers with color figures, for papers accompanied by cover pictures, and for papers that exceed the length limits.

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 and indicate in the letter of transmittal that a possible cover picture is enclosed.

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Washington, D.C.

4 – 5 December 1986

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Packets will be mailed to preregistrants in early November; registrations received after 5 November will be held at the AAAS Registration Desk in the hotel. **Refund Policy:** Advance registration fees and meal tickets will be refunded for cancellations received by 1 December; no refunds will be made on cancellations received after this date.

Mail top half of registration form to: AAAS Meetings Office, Science & Security Colloquium Registration, 1333 H Street, N.W., Washington, D.C. 20005

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