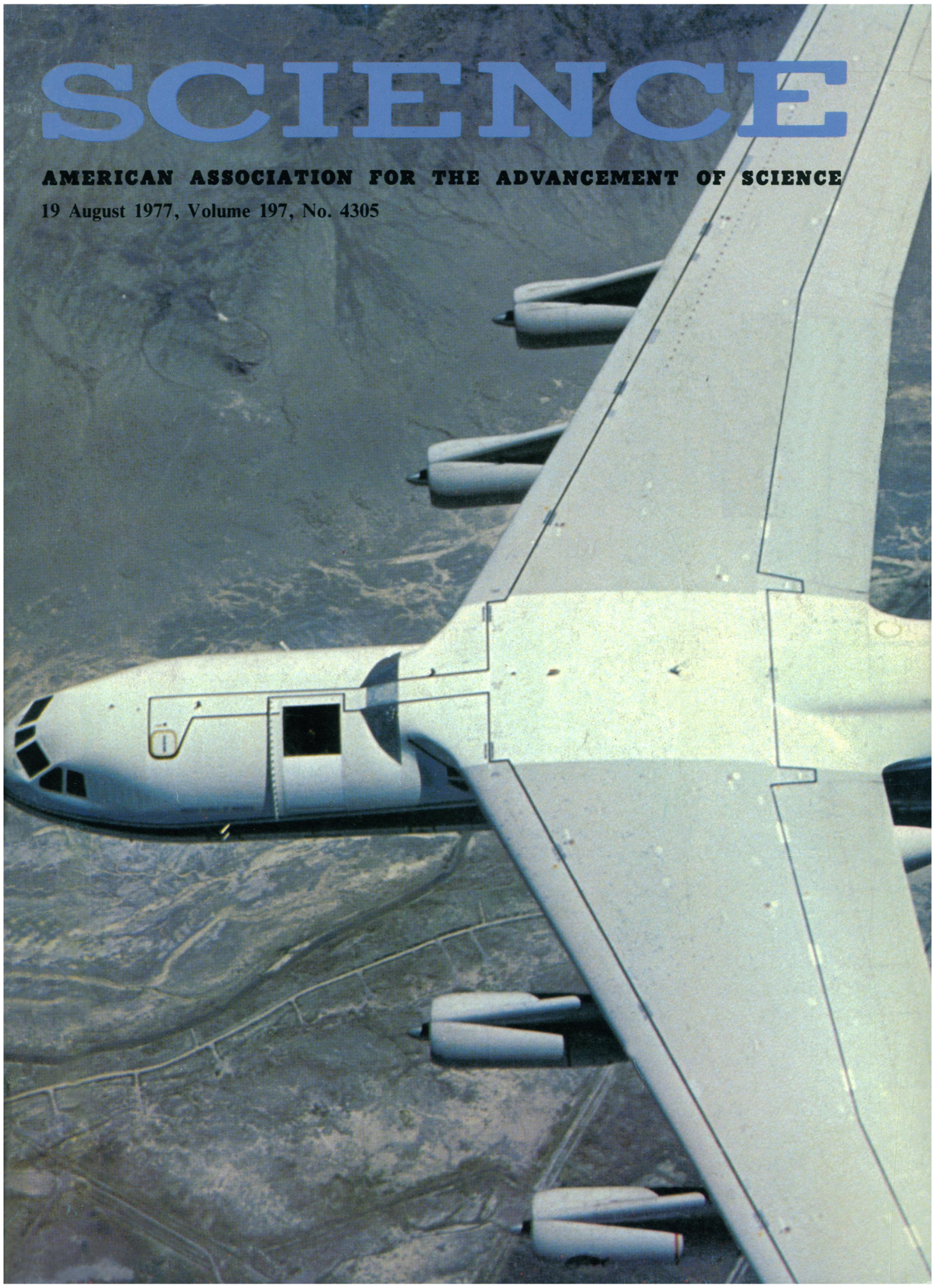
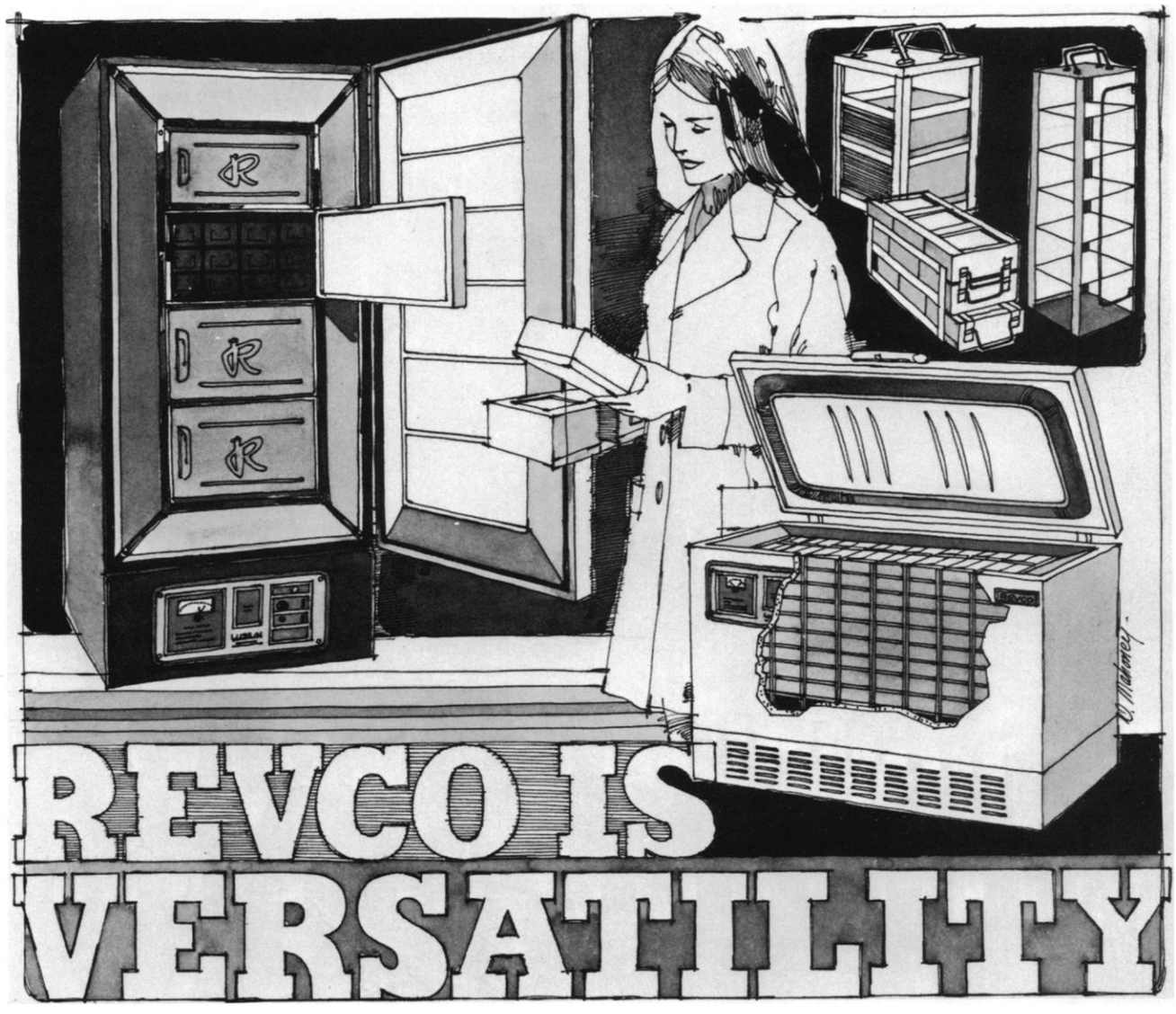


SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

19 August 1977, Volume 197, No. 4305



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19 August 1977

Volume 197, No. 4305

SCIENCE

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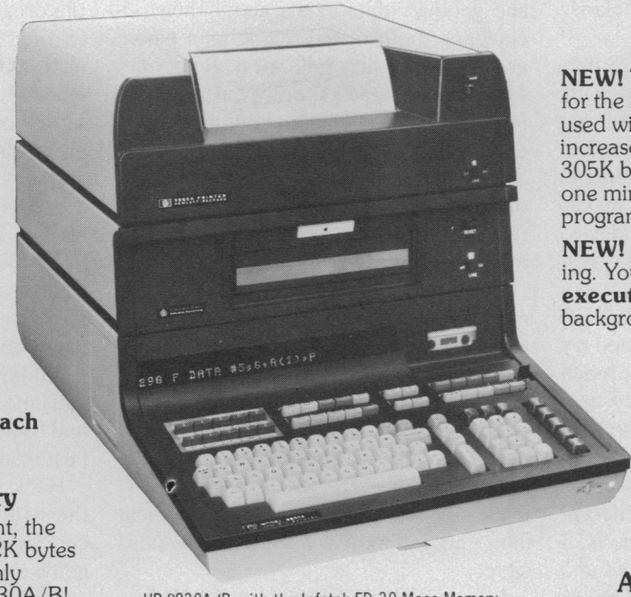

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Dexamethasone, [6,7-^{3}H(N)]-
Estradiol, [2,4,6,7,16,17-^{3}H]-
Estradiol, [2,4,6,7-^{3}H]-
Prednisolone, [6,7-^{3}H(N)]-
Progesterone, [1,2,6,7-^{3}H(N)]-
Testosterone, [1,2,6,7,16,17-^{3}H(N)]-
Triamcinolone acetonide, [6,7-^{3}H(N)]-
R5020-^{3}H (manufactured by New England Nuclear under licensed agreement of ROUSSEL UCLAF)

α-Adrenergic Receptor Studies
Dihydroergocryptine,9,10-[9,10-^{3}H(N)]-

β-Adrenergic Receptor Studies
Dihydroalprenolol hydrochloride, *levo*-[*propyl*-2,3-^{3}H]-
Propranolol hydrochloride, DL-[^{3}H(G)]-
Propranolol hydrochloride, *levo*-[4-^{3}H(N)]-

Cholinergic Receptor Studies
Choline chloride, [*methyl*-^{3}H]-
(QNB) Quinuclidinyl benzilate, DL-[*benzilic*-4,4′-^{3}H(N)]-
Tubocurarine chloride, *dextro*-[13′-^{3}H(N)]-

Dopamine Receptor Studies
Dihydroxyphenylethylamine, 3,4-[*ethyl*-1-^{3}H(N)]-
Dihydroxyphenylethylamine, 3,4-[*ethyl*-2-^{3}H(N)]-
Haloperidol, [^{3}H(G)]-
Spiroperidol, [1-*phenyl*-4-^{3}H]-

Amino Acid Receptor Studies
Aminobutyric acid, γ-[2,3-^{3}H(N)]-
Glycine, [2-^{3}H]-

Opiate Receptor Studies
Enkephalin (5-L-methionine), [*tyrosyl*-3,5-^{3}H(N)]-
Enkephalin (5-L-leucine), [*tyrosyl*-3,5-^{3}H(N)]-
Enkephalinamide (2-D-alanine-5-L-methionine), [*tyrosyl-ring*-2,6-^{3}H]-
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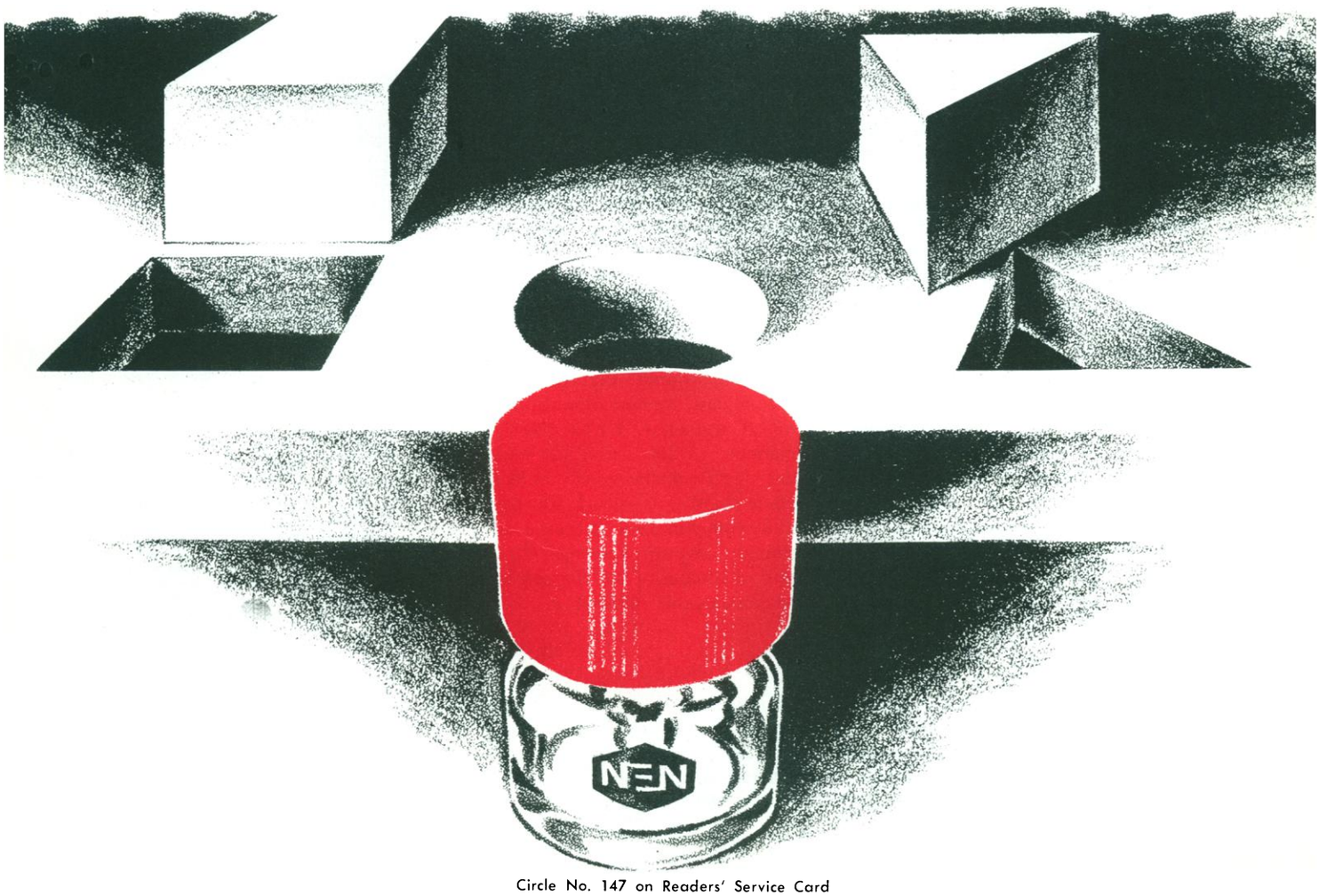

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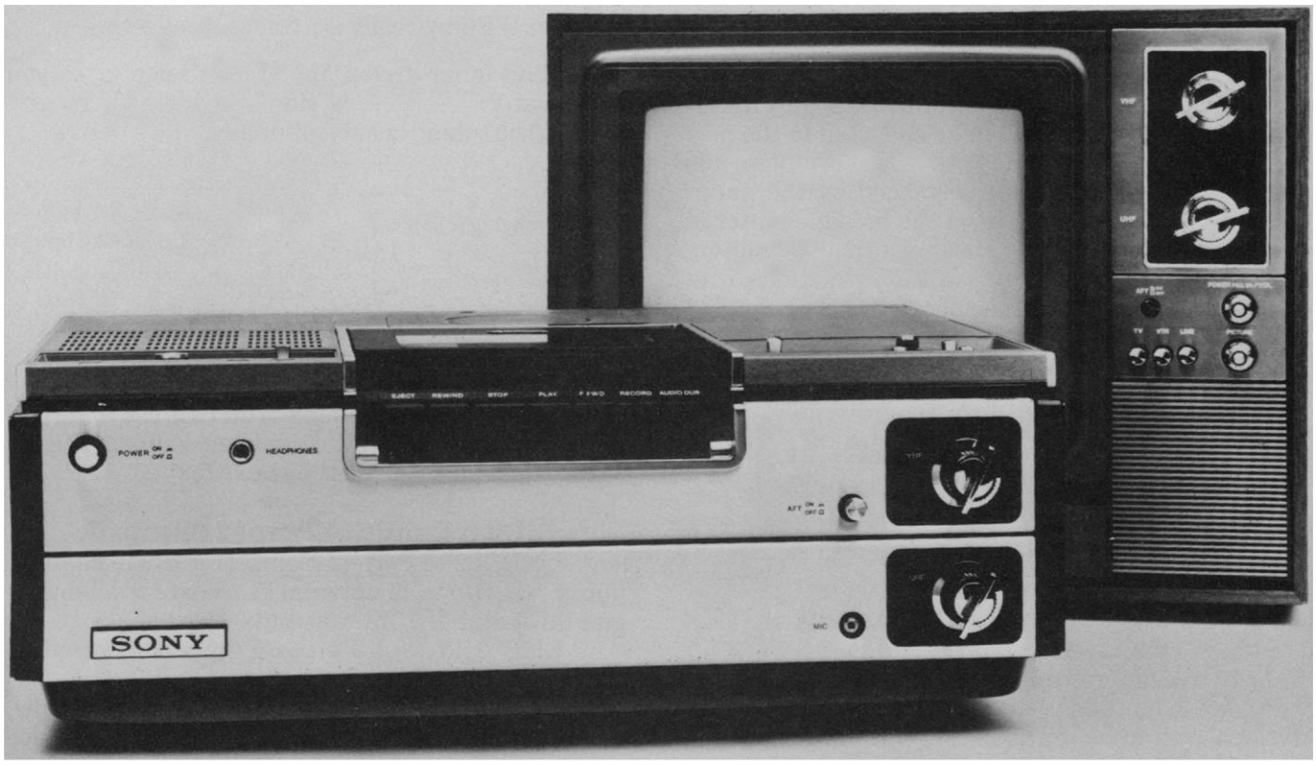

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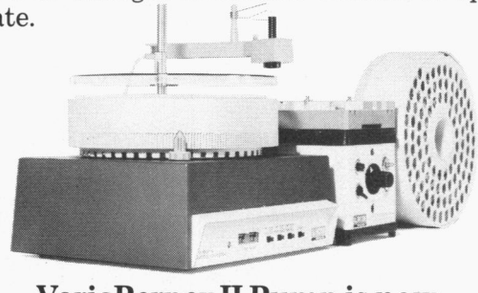

VarioPerpex II Pump is now better than ever

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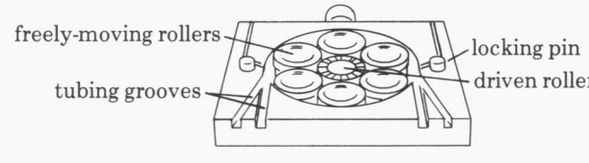

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19 August 1977, Volume 197, Number 4305 **SCIENCE**

Recombinant DNA

In 1973 new opportunities in genetic research had become apparent. Enzymes had been discovered that permitted splitting and recombining DNA at highly specific sites. The new techniques facilitated the preparation of comparatively large quantities of specific genes. More than 90 percent of the recombinant DNA work involved use of the K-12 strain of *Escherichia coli*, a nonpathogen. However, some of the molecular biologists early became concerned lest the new technique be misused. In particular, some feared that unusual pathogenic forms of K-12 might be created. Accordingly, the scientists imposed on themselves a moratorium on certain types of recombinant DNA research.

The scientists, however, underestimated the publicity dynamite in DNA. They did not foresee what the media could do with a topic laden with emotion. They did not foresee that public alarm could lead toward what some have called frightening legislation. The clamor reached a peak earlier this year. During the growth phase, a small band of scientists were alone in trying to avoid excessive regulation of their research.

During the past few months there has been a remarkable shift and crystallization of opinion. Suddenly the molecular biologists have become nearly unanimous in opposing features of the new federal legislation. They have been joined by a large contingent of allies not engaged in recombinant DNA research. These include the National Academy of Sciences and most of the biological community. The American Society for Microbiology, whose membership is especially capable of evaluating the risks of use of K-12, has taken a leadership role. Its former president, H. O. Halvorson, has been active and effective in a campaign directed at Congress. Seldom has Capitol Hill received so many letters and visitations from scientists. In consequence, action on legislation is temporarily in abeyance.

Mere concerted action of biological scientists would not alone have been effective. What has changed the atmosphere has been the emergence of a large amount of information about K-12. Some of this had been accumulated over decades. Some comes as a result of experience during the past several years of working with K-12 containing recombinant DNA. Much of this information was summarized in a 13-page letter dated 14 April 1977 from Roy Curtiss III of the University of Alabama to Donald Fredrickson, director of the National Institutes of Health. Dr. Curtiss was one of the scientists who had originally sounded warnings about recombinant DNA research. After years of thorough and painstaking study, he had reluctantly convinced himself that the dangers, if any, were minimal.

During June a broadly knowledgeable interdisciplinary group of about 50 met at Falmounth, Massachusetts, to plan further experiments aimed at evaluating the safety problems. In the course of the meeting, evidence about the extent of hazards of K-12 was presented. In a letter to Dr. Fredrickson dated 14 July 1977, the chairman of the group, Dr. Sherwood L. Gorbach, of Tufts University School of Medicine, wrote as follows:

> The participants arrived at unanimous agreement that *E. coli* K-12 cannot be converted into an epidemic pathogen by laboratory manipulations with DNA inserts. On the basis of extensive studies already completed, it appears that *E. coli* K-12 does not implant in the intestinal tract of man. There is no evidence that non-transmissible plasmids can be spread from *E. coli* K-12 to other host bacteria within the gut.* Finally, extensive studies in the laboratory to induce virulence in *E. coli* K-12 by insertion of known plasmids and chromosomal segments coding for virulence factors, using standard bacterial genetic techniques, have proven unsuccessful in producing a fully pathogenic strain.

Public fears may yet overcome scientific judgment, and what many scientists believe to be bad legislation may be enacted. However, the relevant committee chairmen and their staffs are now fully aware of the new information about K-12. During and after the current congressional recess a modified version of the legislation may emerge.—PHILIP H. ABELSON

*Both Gorbach and Curtiss feel that more experimental evidence should be accumulated on this point.

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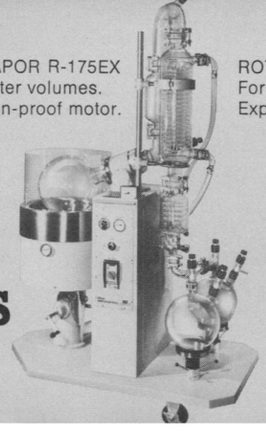

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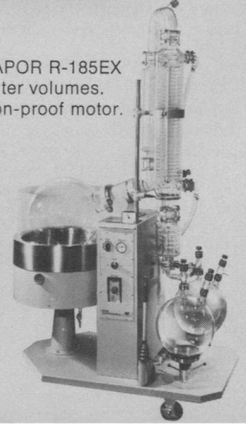

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Call for Contributed Papers

Following the success of the contributed-paper sessions in Denver, AAAS will again have such sessions at its next Annual Meeting in Washington, D.C. (12–17 February 1978). Contributions must be submitted according to the instructions given below, by **14 October 1977**. *All contributions must be submitted (and signed) by a AAAS member or fellow* (although this person need not be one of the authors). Contributors will be informed about where and when they will make their presentations in late November 1977. Contributed paper sessions will be of two types: *slide sessions* and *poster sessions*. In the slide sessions each contributor will have 15 minutes to present his material and entertain questions; a 35-mm (2 × 2) slide projector will be available for use. In the poster 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 he can discuss his work at length with all interested parties. (See *Science*, 28 June 1974, page 1361).—ARTHUR HERSCHMAN

Instructions for Contributors

Type abstracts, using a clean (new) ribbon, on ordinary white bond paper (8.5 by 11 inches; 21.5 × 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 describe the subject. Also indicate whether the paper is to be presented at a slide session or a poster session.

It is very important to keep your abstract within the limits of a 5-inch (12.7-cm) square. If it is too wide, it will not be printed (only title and author will be printed); if it is too long, it may be arbitrarily cut. Note that your original will be our camera-ready copy, so type and letter as neatly as possible.

At the bottom of the page, left side, type the name and address of the person who should be contacted regarding the abstract (that is, the person we should notify of where and when the presentation should be made). On the right side, type the name and affiliation of the AAAS member or fellow who is submitting the abstract and have this person sign the abstract. *The privilege of submitting a contributed-paper abstract for the Annual Meeting is limited to AAAS members or fellows.*

Send the *original* together with two copies of your abstract to:

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AAAS–Newcomb Cleveland Prize: Contest Year Is Nearly Over

The deadline for nominations of papers for the AAAS–Newcomb Cleveland Prize is fast approaching. Readers are invited to nominate papers published in the Reports section of *Science* from 3 September 1976 to 26 August 1977. The prize of $5000 and a bronze medal is now given annually to the author of an outstanding paper that is a first-time publication of the author's own research.

Nominations must be typed and the following information provided: the title of the paper, issue in which it was published, author's name, and a brief statement of justification for nomination. Nominations should be submitted to AAAS–Newcomb Cleveland Prize, AAAS, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. Final selection will rest with a panel of distinguished scientists appointed by the Board of Directors.

The award will be presented at a session of the annual meeting at which the winner will be invited to present a scientific paper reviewing the field related to the prizewinning research. The review paper will subsequently be published in *Science*. In cases of multiple authorship, the prize will be divided equally between or among the authors; the senior author will be invited to speak at the annual meeting.

Reports

Detection of Lyman α Emission from the Saturnian Disk and from the Ring System

Abstract. *A rocket-borne spectrograph detected H I Lyman α emission from the disk of Saturn and from the vicinity of the planet. The signal is consistent with an emission brightness of 700 rayleighs for the disk and 200 rayleighs for the vicinity of Saturn. The emission from the vicinity of the planet may be due to a hydrogen atmosphere associated with the saturnian ring system.*

Radiation of the type H I Lyman α (1216 Å) has been detected from only one of the outer planets, namely Jupiter, with a reported brightness on the order of 2 kilorayleighs (*1*) [1 rayleigh (R) = $10^6/4\pi$ photon cm^{-2} sec^{-1} $ster^{-1}$]. Resonance scattering of solar Ly α and charged particle excitation in the outer atmosphere of Jupiter are thought to be the principal mechanisms for this spectral emission. It is reasonable to assume that mechanisms that give rise to H I emission in the jovian atmosphere may also be operating in the atmosphere of Saturn. This emission provides information on both the excitation mechanisms and the constituents of the upper atmosphere. In addition, if there is an atmosphere caused by outgassing from ring material, Ly α emission from the vicinity of Saturn is an indicator. Finally, the values of the Ly α emissions are also of use for the Mariner mission (Voyager) to Jupiter and Saturn, to be launched late in the summer of 1977.

Since the solar radiation incident at Saturn is smaller by a factor of 3.5 than that at Jupiter, one can expect a saturnian Ly α disk brightness of several hundred rayleighs or less. This lower brightness in addition to the fact that the saturnian disk subtends only 1/6 the solid angle of Jupiter (both planets at opposition) results in an expected saturnian Ly α flux at Earth that is more than 20 times weaker than the Ly α radiation coming from Jupiter. In addition, a strong Ly α background signal (typically 1 to 3 kR) due to terrestrial airglow makes detection of saturnian Ly α radiation even more difficult.

A statistically significant detection of Ly α emission from Saturn was obtained, for the first time to our knowledge, by a sounding rocket launched from the White Sands Missile Range, New Mexico, in March 1975. The rocket carried a 36-cm telescope and a sensitive spectrograph with a microchannel plate detector and obtained far-ultraviolet spectra (1160 to 1750 Å) of Saturn and two cool stars (α Aur and α Boo). The fine tracking capability of the telescope made it possible to point to 1 arc sec and permitted the use of very small spectrograph entrance apertures, thus reducing the background signal due to Ly α radiation from terrestrial airglow. A microchannel plate detection system made it possible to observe all spectral elements simultaneously and avoided the need for spectral scanning. The improvement in sensitivity of this instrument as compared to the single-slit scanning spectrometers flown on earlier missions by this laboratory was greater than a factor of 20 at 1216 Å (*2*).

The spectrograph, a dual-channel Czerny Turner with a LiF prism (*2*), recorded the spectrum of the target with one channel while the other channel monitored the spectrum of the airglow background over the same wavelength range from an area in the sky with a diameter of 58 arc sec, 400 arc sec away from the target. Two entrance apertures (diameters, 26 and 53 arc sec) were selected in flight for the target channel; their alternate use during the Saturn observation (5 seconds each, for a total observing time of 110 seconds) made it possible to distinguish between the spectrum emitted by the saturnian disk and that emitted by the total disk-ring system.

At the time of observation, Saturn's disk had an angular extent of 17 by 19 arc sec; the outer edge of ring A had an extent of 43 by 19 arc sec. The ring inclination and the phase angle were 26° and 6°, respectively, close to their maximum values. The geometry of the various entrance apertures with respect to the saturnian system at the time of observation is shown in Fig. 1.

From the data of Fig. 2, we derive a Ly α brightness of 700 R ± 50 percent for the saturnian disk and 200 R ± 50 percent for the vicinity of the disk; we did this by assuming that the source for

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