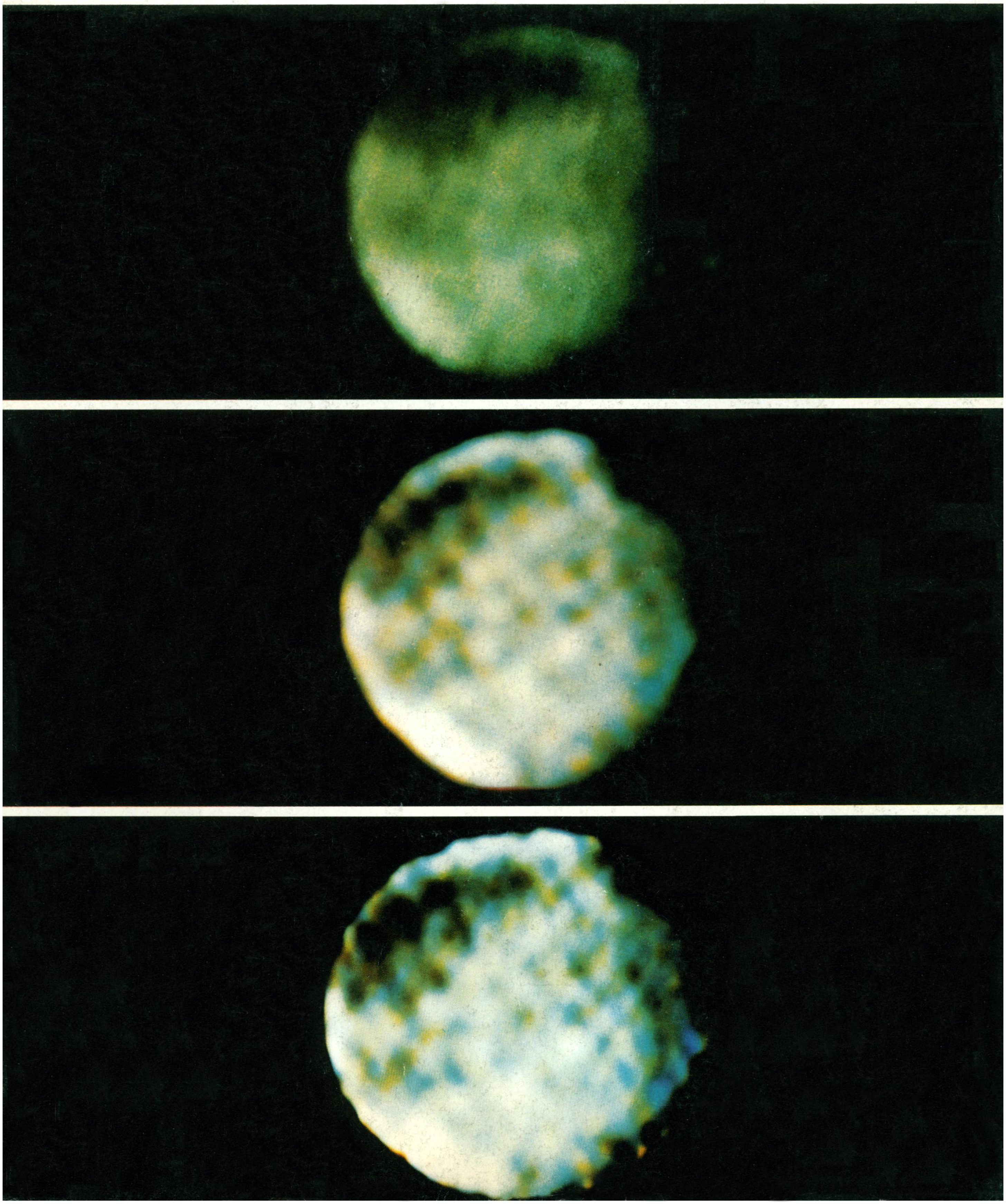
SCIENCE

26 March 1976

Volume 191, No. 4233

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



26 March 1976

Volume 191, No. 4233

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

REPORTS

PRODUCTS AND MATERIALS

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress. Postmaster: Send Form 3579 to SCIENCE, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005.

COVER

Color composite pictures of Ganymede. Each is a superposition of two monochrome images, with a third primary color artificially added. Top picture uses image data taken by the Pioneer 10 spacecraft. The remaining two pictures are from restorations of these data by linear convolution (middle) and by maximum entropy (bottom). See page 1237. [B. R. Frieden and W. Swindell, University of Arizona/NASA-Ames Research Center]

the resources that depend on energy, have been experienced recently and much more intensely than at any time in the history of the United States. With most Americans lacking in any personal experience with the realities of deprivation, this country luxuriates in debate, searching for near-zero hypothetical risks to man and environment from nuclear and fossil energy, while the far greater real risks of inaction grow and multiply.

The European determination and progress on the breeder highlights the importance of maintaining our momentum with this energy option so that it may be available if the great hopes for conservation and for other, more speculative, technologies are not fully realized in this century.

E. L. ZEBROSKI
L. E. MINNICK
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Notes

1. This commentary represents our personal views and does not necessarily reflect the views of EPRI or of electric utilities.

Marihuana Effects

Thomas H. Maugh II, in his article "Marihuana: New support for immune and reproductive hazards" (Research News, 28 Nov. 1975, p. 865), includes an account of our work which, unfortunately, is a mixture of information from two different sets of experiments (*1*). He states that we "observed a variety of abnormalities in the sperm of men who have smoked cannabis for many years. These abnormalities include changes in lipid concentrations, protrusions of chromatids from the nucleus, and marked changes in the balance of acidic and basic amino acids in the histone proteins that encapsulate the sperm DNA. The significance of these changes is unclear, however, as Stefanis has found no ill effects definitely associated with them." Our only finding from the sperm study was a low, arginine-rich protein (protamine) content in sperm nuclei, indicative of deviant maturation (*2*). Reproductivity of these donors seemed not to be affected. As stated in our article (*1*), "this would be consistent with our finding that despite the low protamine content, the sperm heads of the users display the normal species-specific shape which is an indicator of normal condensation and reproductive capacity" (*3*).

The other findings, incorrectly described by Maugh, were actually abnormalities in peripheral blood cells of chronic cannabis users, and they include the following: low membrane phospholipids, protrusions of heterochromatin from the nucleus, and changes in the normal complement of histones and nuclear acidic proteins. Since these findings were not associated with overt blood pathology, they may represent compensatory changes resulting from a primary effect of cannabis.

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References

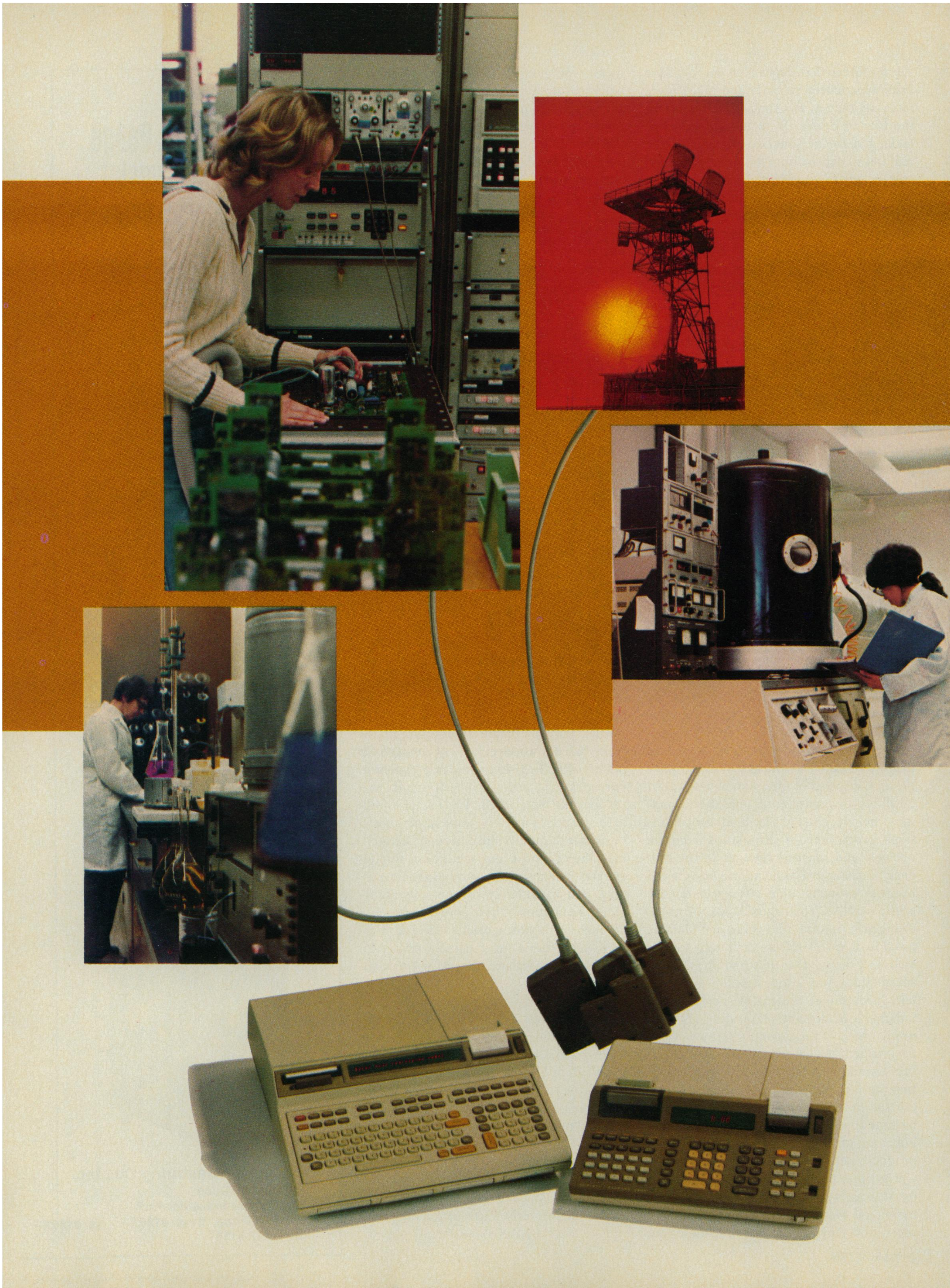
1. C. N. Stefanis and M. R. Issidorides, in *Marihuana: Chemistry, Biochemistry, and Cellular Effects*, G. C. Nahas, W. D. M. Patton, J. Idänpaan-Heikkila, Eds. (Springer-Verlag, New York, in press).
2. B. L. Gledhill, M. P. Gledhill, R. Rigler, Jr., N. R. Ringertz, *Exp. Cell Res.* **41**, 652 (1966).
3. J. MacLeod and R. Z. Gold, *Fertil. Steril.* **2**, 394 (1951).

"Extation"

There is a need for a single word to describe the status of a species whose population has been reduced to such a low level that it can no longer function as a significant part of its normal ecosystem [as in the case of the California condor (*Gymnogyps californianus*), the whooping crane (*Grus americana*), and the black-footed ferret (*Mustela nigripes*)] or to the point where there is considerable doubt whether the species remains extant [the status of the ivory-billed woodpecker (*Campephilus principalis*), the Eskimo curlew (*Numenius borealis*), and the Caribbean monk seal (*Monachus tropicalis*)]. The use of an adverb—nearly, probably, almost, perhaps—or phrase to modify the adjective "extinct" may merely mask our ignorance, implies an irreversible state, is wordier than necessary, and is probably conceptually incorrect. Extinction, like pregnancy and uniqueness, is not subject to degree. Further, such terms are basically numerical and only by inference convey any biological information.

I propose the word "extaille" (pronounced ex-tail) to fill the need expressed above. Extaille is based on the Middle English adjective "taille," meaning cut, trimmed, or limited. As a noun it can refer to what is left over after cutting and trimming. It is the root of the word "tailor" and of "tailings" (from a mine). The prefix "ex" brings the root into consonance with other words that describe the biological status of a species—"extant" and "extinct"—and further suggests a remnant "from" a formerly more abundant popu-

(Continued on page 1292)



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SCIENCE

Energy from Biomass

There has been much talk of solar energy, but most thought has been devoted to physical means of collecting sunlight. An obvious resource has had only nominal attention: energy, materials, and chemicals from plants and trees. For the coming decades in the United States, the major shift from oil and natural gas is likely to be toward coal and oil shale. In many countries, however, where there is little or no coal or oil shale, trees and plants could become important sources of energy and materials. Moreover, burning of fossil fuels yields carbon dioxide—a hazard of unknown magnitude. The use of trees and plants as sources of energy involves a closed cycle with respect to CO_2.

In comparison to the amounts of incident solar energy on earth, human utilization of energy is relatively trivial ($\sim 5 \times 10^{-5}$). The people of the United States consume an amount that is about 10^{-3} that of solar energy falling on it. Under favorable conditions, about 3 percent of solar energy can be fixed in photosynthesis. Thus, in principle, energy needs of the United States could ultimately be met by devoting only a small fraction of the land to this purpose. The same is true of the rest of the world. The present annual production of biomass on the land areas has been estimated at 100 billion tons (dry weight). This has an energy equivalent that is about a factor of 6 greater than current utilization of energy by the world's peoples. Moreover, these figures do not take into account the large additional production of biomass that might be achieved through agronomy and silviculture.

There is, of course, a long distance between potential and practice. Feeding the earth's billions of people has top priority though only a small fraction of the energy is represented by food. Perhaps a more restraining factor is the diffuse character of the biomass. Effective utilization of the potential might require many small conversion plants. This would facilitate return of nutrients to the land while cutting costs of transportation. But at present prices and with current technology, only a tiny portion of energy needs in the United States could be met today from renewable sources.

Ultimately, trees may be the preferred source of energy. However, effective use of them for other than direct burning involves complex technology. Cellulose and lignin must be separated and then processed further or the wood must be converted to carbon monoxide and hydrogen and from thence to methanol or methane. Plant materials lend themselves to anaerobic fermentation resulting in methane and CO_2 with the latter easily removed.

One potentiality that merits further study is the hydrogenation of wood which is known to yield combustible liquids.

The United States has so many possible energy sources and so much wealth that it can perhaps afford long controversies about what to do. Other nations cannot equivocate. They will adopt nuclear energy unless alternatives quickly become available. This will be true ultimately even in the tropical, less developed countries that have abundant renewable resources. Where will those countries find the billion or so dollars to buy a nuclear power plant? Where will they find the skilled technicians to operate the plants safely? Would the world not be better off and safer if such countries were obtaining their energy from biomass?

Thus, although there seems to be no great urgency in the United States to develop renewable energy sources, it would be desirable to give this matter high priority and substantial funding. The effort should include fundamental work in photosynthesis, plant genetics, artificial creation of new species, and related aspects of agronomy and silviculture. Research and development work should include imaginative approaches to better processes for utilizing plants and trees. Some of the efforts should be devoted to creating simple inexpensive devices that would enable rural peoples to obtain various types of energy including even electricity from biomass. With a moderate investment of money and scientific and technical personnel, we could perform work of immense global significance while moving toward long-term solutions to our own energy problems.—PHILIP H. ABELSON


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Manuscripts submitted to *Science* for consideration for publication can be handled expeditiously if they are prepared in the form described in these instructions.

Submit an original and two duplicates of each manuscript. With the manuscript send a letter of transmittal giving (i) the name(s) of the author(s); (ii) the title of the paper and a one- or two-sentence statement of its main point; (iii) the name, address, and field of interest of four to six persons in North America but outside your institution who you think are qualified to act as referees for your paper; (iv) the names of colleagues who have reviewed your paper for you; (v) the field(s) of interest of readers who you anticipate will wish to read your paper.

Editorial Policies

All papers submitted are considered for publication. The author's membership or lack of membership in the AAAS is not a factor in selection. Papers are accepted with the understanding that they have not been published, submitted, or accepted for publication elsewhere. Authors will usually be notified of acceptance, rejection, or need for revision in 4 to 6 weeks (Reports) or 6 to 10 weeks (Articles).

Types of papers. Five types of signed papers are published: Articles, Reports, Letters, Technical Comments, and Book Reviews. Familiarize yourself with the general form of the type of paper you wish to submit by looking over a recent issue of the journal, and then follow the instructions for that type of paper.

Reviews. Almost all Articles, Reports, and Technical Comments, whether solicited or not, are sent to two or more outside referees for evaluation of their significance and soundness. Forms showing some of the criteria reviewers are expected to consider are available on request.

Editing. Papers are edited to improve the effectiveness of communication between the author and his readers. The most important goal is to eliminate ambiguities. In addition, improvement of sentence structure often permits readers to absorb salient ideas quickly. When editing is extensive, with consequent danger of altered meanings, papers are returned to the author for correction and approval before type is set. Authors are free to make additional changes at this stage.

Proofs. One set of galley proofs or an equivalent is provided for each paper. Keep alterations to a minimum, and mark them only on the galley, not on the manuscript. Extensive alterations may delay publication by 2 to 4 weeks.

Reprints. An order blank for reprints accompanies proofs.

Writing Papers

Organize your material carefully, putting the news of your finding or a statement of the problem first, supporting details and arguments second. Make sure that the significance of your work will be apparent to readers outside your field, even if you feel you are explaining too much to your colleagues. Present each step in terms of the purpose it serves in supporting your finding or solving the problem. Avoid chronological steps, for the purpose of the steps may not be clear to the reader until he finishes reading the paper.

Provide enough details of method and equipment so that another worker can repeat your work, but omit minute and comprehensive details which are generally known or which can be covered by citation of another paper. Use metric units of measure. If measurements were made in English units, give metric equivalents.

Avoid specialized laboratory jargon and abbreviations, but use technical terms as necessary, defining those likely to be known only in your field. Readers will skip a paper they do not understand. They should not be expected to consult a technical dictionary.

Choose the active voice more often than you choose the passive, for the passive voice usually requires more words and often obscures the agent of action. Use first person, not third; do not use first person plural when singular is appropriate. Use a good general style manual, not a specialty style manual. The University of Chicago style manual, the style manual of the American Institute of Physics, and the *Style Manual for Biological Journals*, among others, are appropriate.

Manuscripts

Prepare your manuscript in the form used by *Science*. Use bond paper for the first copy. Submit two duplicates. Double-space title, abstracts, text, signature, address, references (including the lines of a single reference), figure legends, and tables (including titles, column headings, body, and footnotes). Do not use single spacing anywhere. Put the name of the first author and the page number in the upper right-hand corner of every page.

Paging. Use a separate page for the title; number it page 1. Begin each major section—text, references and notes, and figure legends—on a new sheet. Put each table on a separate sheet. Place figure legends and tables after the references.

Title. Begin the title with a word useful in indexing and information retrieval (not "Effect" or "New").

References and Notes. Number all references to the literature, footnotes, and acknowledgments in a single sequence in the order in which they are cited in the text. Gather all acknowledgments into a single citation, and keep them short ("I thank," not "I wish to thank"). Cite all references and notes but do not cite them in titles or abstracts. Cite several under one number when feasible. Use *Bibliographic Guide for Editors & Authors* with the few suggested revisions in *International List of Periodical Title Word Abbreviations* for abbreviations of journal names. If the journal is not listed there, provide the full name. Use the following forms:

Journal:	H. Smith, *Am. J. Physiol.* **98**, 279 (1931).
Book:	F. Dachille and R. Roy, *Modern Very High Pressure Techniques* (Butterworth, London, 1961), pp. 163–180.
Chapter:	F. Dachille and R. Roy, in *Reactivity of Solids*, J. H. de Boer, Ed. (Elsevier, Amsterdam, 1960), p. 502.

Illustrations. Submit three copies of each diagram, graph, map, or photograph. Cite all illustrations in the text and provide a brief legend, to be set in type, for each. Do not combine line drawings and photographs in one illustration. Do not incorporate the legend in the figure itself. Use India ink and heavy white paper or blue-lined coordinate paper for line drawings and graphs. Use heavier lines for curves than you use for axes. Place labels parallel to the axes, using initial capital and lowercase letters; put units of measurement in parentheses after the label—for example, Length (m). Plan your figures for the smallest possible printed size consistent with clarity.

Photographs should have a glossy finish, with sharp contrast between black and white areas. Indicate magnification with a scale line on the photograph.

Tables. Type each table on a separate sheet, number it with an Arabic numeral, give it a title, and cite it in the text. Double space throughout. Give each column a heading. Indicate units of measure in parentheses in the heading for each column. Do not change the unit of measure within a column. Do not use vertical rules. Do not use horizontal rules other than those in the heading and at the bottom. A column containing data readily calculated from data given in other columns can usually be omitted; if such a column provides essential data, the columns containing the other data can usually be omitted.

Plan your table for small size. A one-column table may be up to 42 characters wide. Count characters by counting the widest entry in each table column (whether in the body or the heading) and allow three characters for spaces between table columns. A two-column table may be 90 characters wide.

Equations and formulas. Use quadruple spacing around all equations and formulas that are to be set off from the text. Most should be set off. Start them at the left margin. Use the solidus for simple fractions, adding the necessary parentheses. But if braces and brackets are required, use built-up fractions. Identify handwritten symbols in the margin, and give the meaning of all symbols and variables in the text immediately after the equation.

Articles

Articles, both solicited and unsolicited, may range in length from 2000 to 5000 words (up to 20 manuscript pages). Write them clearly in reasonably nontechnical language. Provide a title of one or two lines of up to 26 characters per line and a subtitle consisting of a complete sentence in two lines with a character count between 95 and 105 for the sentence (spaces between words count as one character each). Do not break words at the ends of lines. Write a brief author note, giving your position and address. Do not include acknowledgments. Place title, subtitle, and author note on page 1. Begin the text on page 2.

Insert subheads at appropriate places in the text to mark your main ideas. The set of subheads should show that your ideas are presented in a logical order. Keep subheads short—up to 35 characters and spaces.

Provide a summary at the end.

Do not submit more than one illustration (table or figure) for each four manuscript pages unless you have planned carefully for grouping. With such planning many illustrations can be accommodated in the article. Consult the editorial office for help in planning.

Reports

Short reports of new research results may vary in length from one to seven double-spaced manuscript pages of text, including the bibliography. Short papers receive preferred treatment. Limit illustrative material (both tables and figures) to two items, occupying a total area of no more than half of a published page (30 square inches). A research report should have news value for the scientific community or be of unusual interest to the specialist or of broad interest because of its interdisciplinary nature. It should contain solid research results or reliable theoretical calculations. Speculation should be limited and is permissible only when accompanied by solid work.

Title. Begin the title with an important word (preferably a noun) that identifies your subject. The title may be a conventional one (composed primarily of nouns and adjectives), a sentence (containing a verb), or a structure with a colon (Jupiter: Its Captured Satellites). Limit it to two lines of complete words of no more than 55 characters per line (spaces between words count as one character each). Do not use abbreviations. Type the title in the middle of page 1.

Abstract. Provide an abstract of 45 to 55 words on page 2. The abstract should amplify the title but should not repeat it or phrases in it. Qualifying words for terms used in the title may be used. Tell the results of the work, but not in terms such as "____ was found," "is described," or "is presented."

Text. Begin the text on page 3. Put the news first. Do not refer to unpublished work or discuss your plans for further work. If your paper is a short report of work covered in a longer paper to be published in a specialty journal, you may refer to this paper if it has been accepted. Name the journal. If the manuscript has not been accepted, refer to it as "in preparation." Omit references to private communications. Do not use subheads.

Signature. List the authors on the last page of the text and give a simple mailing address.

Received dates. Each report will be dated the day an acceptable version is received in the editorial office.

Letters

The Letters section provides a forum for discussion of matters of general interest to scientists. Letters are judged only on clarity of expression and interest. Keep them short and to the point; the preferred length is 250 words. The editors frequently shorten letters.

Technical Comments

Letters concerning technical papers in *Science* are published as Technical Comments at the end of the Reports section. They may add information or point out deficiencies. Reviews are obtained before acceptance.

Book Reviews

The selection of books to be reviewed is made by the editors with the help of advisers in the various specialties; arrangements are then made with reviewers. A sheet of instructions accompanies each book when it is sent to the reviewer.

Cover Photographs

Particularly good photographs that are suitable for use on the cover are desired.

PRODUCTS and MATERIALS

Minicomputer Series

Series 60 Level 6 is based on a 6-million-byte-per-second Megabus data path that will allow expansion up to 16 million bytes of directly addressable memory. The system provides 64 vectored interrupts and 20 traps for identifying program error conditions. Its cycle time is 300 nanoseconds. A basic set of more than 100 instructions provides bit, byte, word, and multiple-word addressing capabilities. Packaging is modular, which enables the user to design a system to fit his needs. A basic configuration would include a choice among three processors, a controller for the interfacing of up to four peripheral subsystems, a communications processor with capacity of up to eight full duplex lines, a mass memory capable of controlling up to four disk drives, and a general interface. A variety of peripherals for mass storage devices, card readers, line printers, serial printers, a console-display unit, and teleprinter consoles. Software is also available for many applications. Honeywell. Circle 855.

Shatter-Proof Acid Bottles

Safemor bottles have a polyvinyl chloride coating. If the bottle breaks, the coating contains the cracked glass and the contents. The coating has a coefficient of friction 74 percent greater than that of dry glass; when wet, the coefficient of friction is 61 percent greater than that of wet glass. Therefore, these bottles are less likely to slip in the first place. They are available as containers of ammonium hydroxide and glacial acetic, hydrochloric, sulfuric, and nitric acids. Mallinckrodt. Circle 854.

Newly offered instrumentation, apparatus, and laboratory materials of interest to researchers in all disciplines in academic, industrial, and government organizations are featured in this space. Emphasis is given to purpose, chief characteristics, and availability of products and materials. Endorsement by *Science* or AAAS is not implied. Additional information may be obtained from the manufacturers or suppliers named by circling the appropriate number on the Readers' Service Card (on pages 1226A and 1286A) and placing it in the mailbox. Postage is free. —RICHARD G. SOMMER

Gas-Sensing Electrode

The GS-136 Universal electrode measures dissolved gases including carbon dioxide, ammonia, sulfur dioxide, nitrogen oxide, and hydrogen sulfide. Selectivity is achieved with a special internal filling solution and a hydrophobic membrane tip. The electrode body is made of Teflon for its resistance to various solvents. The electrode has an internal reference cell and is designed for existing *p*H-millivolt meters without need of any external reference electrode. Concentrations from less than 0.1 part per million to between 100 and 1000 parts per million are detectable. Lazaar Research Laboratories. Circle 865.

Packaged Computer Systems

The IPAC/16 and IPAC/32 include a processor, memory, peripherals and operating system, installation, and maintenance. IPAC/16 consists of a 16-bit model 6/16 with 64K bytes of memory, a 10M-byte disk, card reader, line printer, and Carousel 30 terminal in addition to the OS/16 MT2 operating system. The IPAC/32 consists of a 32-bit model 7/32 with 128K bytes of memory, the same peripherals, and the OS/32 MT operating system. Interdata. Circle 863.

Liquid Chromatograph

Model 6960 is a high-performance liquid chromatograph. It includes a fixed-wavelength detector, a constant-volume pumping system, and a sample-injection system. The dual-piston reciprocating pump is controlled by a servo loop for precise dispensing. Its minimum internal volume ensures rapid change or adjustment of carrier. The ultraviolet absorbance detector features a high signal-to-noise ratio, a wide linear absorption range, and rapid response. Accessories available include solvent programmers, columns, and other detectors. Tracor. Circle 857.

Micromolecular Still

The Microflex still performs simple distillation, molecular distillation, sublimation, or total reflux. Samples from 50 to 500 milligrams may be processed. The rotary magnetic receiver allows the collection of multiple fractions without disturbance of the vacuum in the system. The receiver accommodates all sizes of Microflex tubes. Kontes. Circle 856.

Osmometer Standards

Standard solutions are available in concentrations of 100, 220, 300, 323, 500, 900, 1100, and 1500 milliosmols. Special values are also available by request. These standard solutions do not require refrigeration and have a shelf life of 24 months. Precision Systems. Circle 858.

Peristaltic Pump

The VarioPerpex pump is a low-pulsation peristaltic pump with applications in gel filtration. Flow rates range from 0.6 to 800 milliliters per hour and a flow constancy of ± 0.5 percent per 24 hours. A roller system consisting of six peripheral rollers and one central roller operates without bearings. Tangential movement is so slight that no special arrangement is needed to hold the tubing in place. Pressure may be regulated which prolongs tube life. Silicone rubber tubing is standard and Tygon or Viton tubing is available. LKB Instruments. Circle 861.

Residual Chlorine Electrode

Model 97-70 directly measures residual chlorine in waste water, drinking water, and in other applications. All available forms are measured including chlorine bound to nitrogenous compounds. These electrodes will detect as few as 10 parts of chlorine per billion parts of sample. The principle of operation is to add iodide to the sample, which reacts with the residual chlorine to form iodine. The amount converted is measured. Orion Research. Circle 859.

Liquid Chromatography Columns

Prepacked columns feature a glass to Teflon seal with no "O" rings or other seals. Silica gel particles of 10- to 20-micrometer diameter are used to pack the columns and they may be used with dry or wet techniques and with nitrogen pres-

sure or solvent metering pump. A different material is packed into the ends of the columns to act as a metering device for the sample. This prevents formation of internal conical bands and band mixing. The columns may be repacked. Quantum Industries. Circle 860.

Line Printers

The 8200 series operates at up to 2400 lines per minute. The output is 80 columns wide on 8.5-inch paper. Features include full print line buffer memory, automatic top-of-form advance, advance speed of 400 inches per minute, interchangeable use of roll and fan-folded paper, and sufficient speed to print a core dump from a 64K minicomputer in less than 30 seconds. These are nonimpact printers that operate quietly with a minimum of moving parts. The paper drive uses only a high-speed stepper drive. Houston Instrument. Circle 862.

Top-Loading Balance

Model 180 is an electronic balance with a capacity of 180 grams and a sensitivity of 10 milligrams. Results appear in a digital display in 1.5 seconds. A time-integrating feature assures stability even under vibration. In addition to the 180-gram capacity, the device has a 20-gram overrange. Weights are precise to within ±0.005 gram. Arbor Laboratories. Circle 864.

Literature

Vacuum Components includes 64 pages of gauges, controls, valves, fittings, pumps, traps, and accessories. Varian Associates, Vacuum Division. Circle 845.

Xenon Illuminator is a brochure devoted to a product for operation in metallographs which currently use carbon arc or tungsten lamps. Buehler. Circle 849.

Laboratory Spill Control Center describes a system to control the six most common hazardous chemical spills in the laboratory. J. T. Baker Chemical. Circle 851.

Model CRT-1000 Data Acquisition and Readout System is the subject of a 4-page brochure that includes specifications and a description of available software routines. Labtest Equipment. Circle 852.

1976 Constant Temperature Baths and Circulator Catalog lists heating and cooling circulators and their uses. Brinkmann Instruments. Circle 853.

Some Hematoxylin Substitutes in Bio-

logical Microtechniques describes the use of synthetic dyes in various histologic procedures. Bio/Medical Specialties. Circle 866.

Cell Staining Characteristics is a three-section chart featuring staining of casts, cells, and other bodies. Regis Chemical. Circle 867.

Radiochemicals is a comprehensive catalog of labeled compounds, radionuclides, reference sources, liquid scintillation fluors, and radioimmunoassay products. New England Nuclear. Circle 868.

Gas Analysis News is a bimonthly technical newsletter for workers in gas analysis. Precision Gas Products. Circle 869.

The Essential Interface describes a parallel-to-serial data converter. Science Accessories. Circle 870.

Pressure Gauges lists a line of indicating and recording instruments to measure pressure, including metric scales with measurements in kilopascals. Weksler Instruments. Circle 871.

Vapor Analyzers is devoted to portable, continuous-monitoring infrared analyzers for toxic vapors and gases. Wilks Scientific. Circle 872.

Particle Counting and Sizing Instruments features instruments for gas and liquid analyses. Royco Instruments. Circle 873.

Protein, Polypeptide and Other Reagents of Biochemical Interest provides descriptions, specifications, and literature references for organic chemicals. Eastman Kodak. Circle 874.

Korvex Heat-Shrinkable Tubing is described in a 12-page catalog. Chemplast. Circle 875.

Water Stills is devoted to features, technical data, directions for using and cleaning, and accessories. Owens Illinois, Fluid Process Systems. Circle 876.

Milling Guide is an optical alignment tool for the measurement of residual stresses by the strain-gauge hole-drilling method. Photolastic. Circle 877.

Guide to Remote Access Packaged Software lists thousands of packaged computer programs and data bases from many fields. Each copy costs $28. Gregory Research Associates. Circle 878.

Neon Laser describes a line of gas lasers and mounting systems. Metrologic Instrument. Circle 879.

Nomarski Differential Interface-Contrast Microscopy is a reprint of four articles illustrated with graphs and four-color photomicrographs. Carl Zeiss. Circle 880.

Chromatography is a 44-page bulletin devoted to equipment for gas, thin-layer, and liquid chromatography. Circle 881.

BOOKS RECEIVED

(Continued from page 1260)

dent Association Bookstore, South Dakota State University, Brookings, ed. 3, 1975. x, 318 pp., illus. Paper, $6.

Coypright—Information Technology—Public Policy. Part 1, Copyright—Public Policies. Nicholas Henry. Dekker, New York, 1975. x, 140 pp. $14.50.

Crop Genetic Resources for Today and Tomorrow. O. H. Frankel and J. G. Hawkes, Eds. Cambridge University Press, New York, 1975. xx, 492 pp., illus. $39.50. International Biological Programme 2.

Grouting in Engineering Practice. Robert Bowen. Halsted (Wiley), New York, 1975. viii, 188 pp., illus. $19.50.

Growth and Development of the Brain. Nutritional, Genetic, and Environmental Factors. Proceedings of a symposium, New Dehli, Oct. 1974. Mary A. B. Brazier, Ed. Raven Press, New York, 1975. xiv, 400 pp., illus. $28.50. International Brain Research Organization Monograph Series, vol. 1.

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LETTERS

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lation. As a noun to stand for the condition of being extaille, I propose "extation." In unusual instances where a transitive verb is necessary, "extaille" could serve. Thus, one might write that the Eskimo curlew is extaille, or that loss of habitat was the cause of the extation of the ivory-billed woodpecker.

Other words describe population levels or status with other connotations. "Rare" refers to frequency of observation or occurrence and may or may not imply a reduced population level or an inability to function in an ecosystem. "Endangered" and "threatened" are more sociological than biological in nature. Most species to which the word "extaille" would apply would also be considered threatened or endangered, but the converse would not necessarily be true.

Strictly speaking, one might say that whatever causes the death of the last remaining individual of a species is the cause of extinction. In general parlance, discussion of causes of extinction are really related to the causes of extation, the factors that lead to a condition whence extinction is possible. From a conservation viewpoint, the causes of extation are much more important than the cause of extinction because it is easier and more feasible to control the destiny of a population than of an individual. Further, extation may be reversible whereas extinction is not.

The verb "become" is most frequently used to indicate the course of a species to extinction, and could also be used with extation. Despite the precedence of modern usage, and particularly Will Cuppy's famous essay (*1*), I suggest that the verb "go" is more appropriate. Thus, a species would go extaille or extinct. "Become" usually implies a positive goal orientation, whereas "go" implies a departure. In an economic analogy, one becomes wealthy, but one goes broke.

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PCB's in Bald Eagle Eggs

The continued threat of polychlorinated biphenyls (PCB's) is reported in a Research News article by Thomas H. Maugh II (19 Dec. 1975, p. 1189). I would like to emphasize the magnitude of the threat to natural fisheaters, such as bald eagles. Maugh notes that salmon and striped bass from the northeastern United States contain PCB's in concentrations from 5 to 20 parts per million and that 2 ppm is the upper limit adopted for edible fish. From a population of bald eagles with declining reproduction in northwestern Ontario I obtained a number of addled eggs during a period from 1967 to 1972 (*1*). The contents of these were analyzed for mercury and several organochlorines, including PCB's (*2*). The PCB concentrations in the three eggs in which that contaminant was measured were 25, 30, and 166 ppm, respectively (*3*). These levels are higher than those reported for bald eagle eggs in other regions of North America (*4*), and the last is among the highest on record for North American wildlife, amounting to nearly 0.1 percent of the entire dry weight content of that egg. I would not advise eating bald eagle eggs for breakfast.

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2. PCB's were analyzed by gas chromatography, using Aroclor 1260 as reference standard, with calculations averaged from peaks 8 and 10. Analyses were performed by the Ontario Research Foundation for the Canadian Wildlife Service.
3. Concentrations are expressed as parts per million of estimated fresh wet weight to be consistent with Food and Drug Administration bases for reporting. Levels are converted from dry weight [see (*1*)] by assuming 83 percent moisture in freshly laid eggs.
4. S. N. Wiemeyer, B. M. Mulhern, F. J. Ligas, R. J. Hensel, J. E. Mathisen, F. C. Robards, S. Postupalsky, *Pestic. Monit. J.* **6**, 50 (1972).

Solar Models

Roger K. Ulrich, in his article "Solar neutrinos and variations in the solar luminosity" (14 Nov. 1975, p. 619), seriously misrepresents my work (*1*) on stellar structure and variations of solar radiation. He rightly says that the described model "is physically untenable," but it is not my model, but rather, so to speak, the very opposite of mine, which he describes. With a solar core depleted of hydrogen, this element (not "heavy elements," as Ulrich says) diffuses inward, leaving the practically nondiffusing heavy elements in an outer shell, thus increasing the opacity in this shell (not "in the center of the sun"). There a superadiabatic gradient is formed, causing convection and leading to a fresh supply of hydrogen being transported to the core (not "causing the heavy material to be thrown out of the core"). Rightly, Ulrich says that "the diffusion time for the heavy elements . . . is quite long," but this is also my starting point. Curiously, while diffusion of hydrogen and the increased nuclear energy output are the main processes I considered, Ulrich's critique of my theory does not even contain the words "hydrogen" or "nuclear energy generation." My assumption that stellar cores are enriched by heavy elements in the prestellar process of condensation of diffuse matter during star formation may have been misunderstood by Ulrich as having been based on some process of diffusion inside the existing star.

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Öpik points out that my comments about his theory for solar variability do not accurately represent his model (*1*). This misrepresentation was inadvertent and resulted from my efforts to find a modification of Öpik's model which was consistent with the theory of diffusion as presented by Aller and Chapman (*2*). Competing processes operate in the diffusion theory, and it turns out that all elements diffuse toward the center of the sun relative to hydrogen. Rather than simply abandon Öpik's model, D. Elliott and I tried to make it work by the slight modification of allowing the elements to diffuse to the solar center and there trigger the type of transient convection zone envisioned by Öpik. Such a model would proceed essentially along the lines described already by Öpik and would represent a possible solution to the solar neutrino problem. Unfortunately, diffusion models of any sort do not work for the solar core because the rates for all elements to diffuse relative to hydrogen are so low as to require 10^{11} years before any modification of chemical composition can occur. The additional models for inducing transient mixing discussed in my article are in fact efforts to find a way of modifying the thermal diffusion theory by postulating an additional physical process.

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