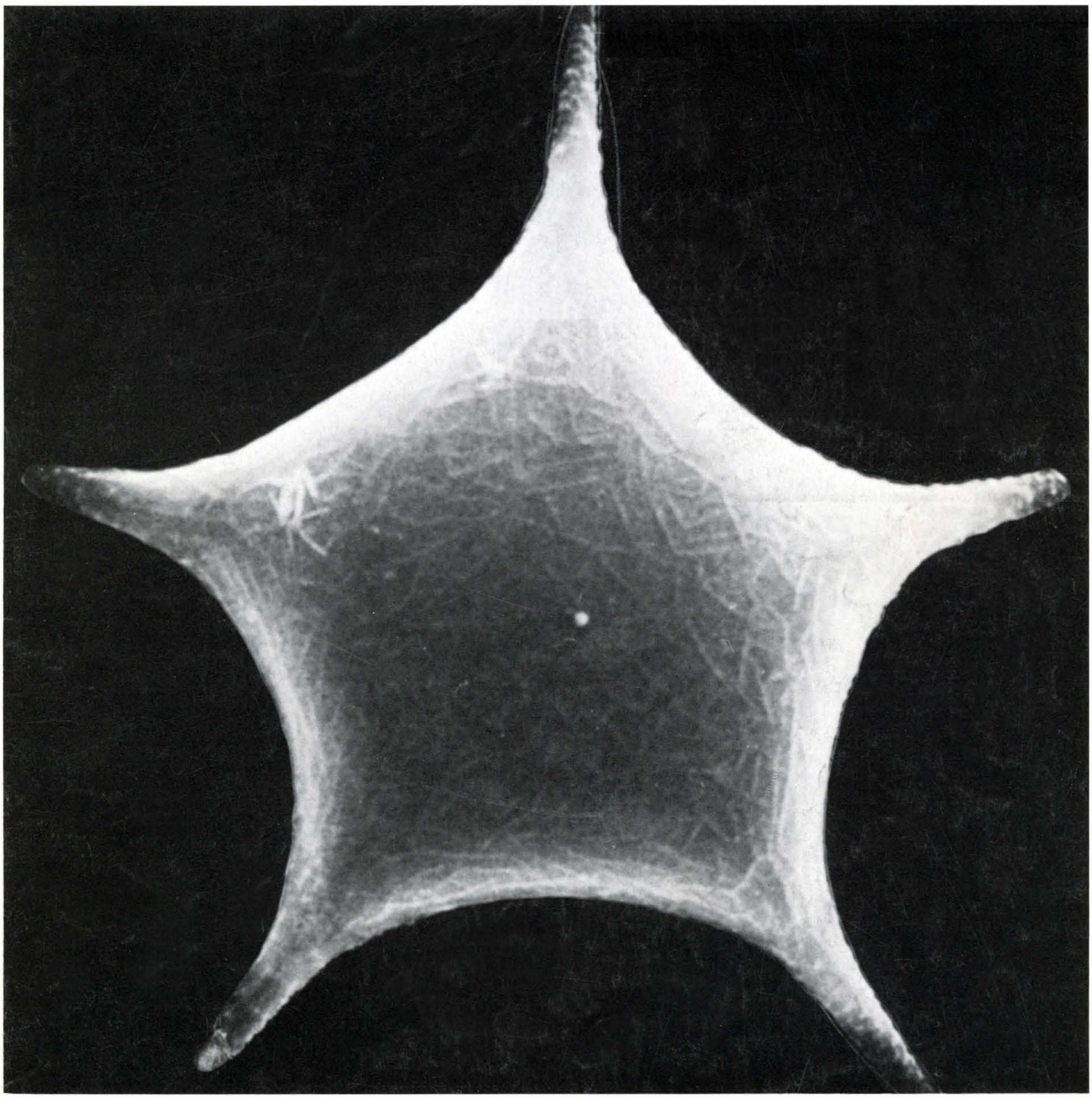
SCIENCE

29 June 1973
Vol. 180, No. 4093

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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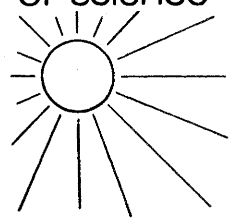

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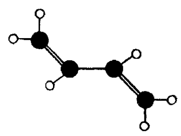

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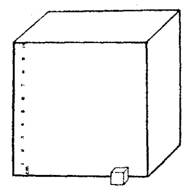

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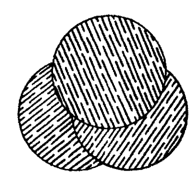

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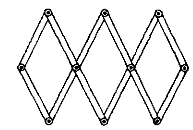

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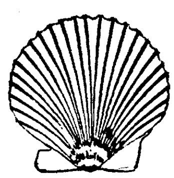

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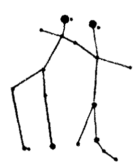

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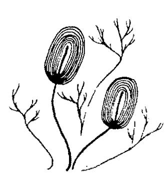

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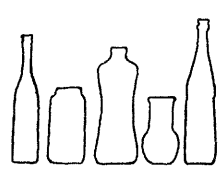

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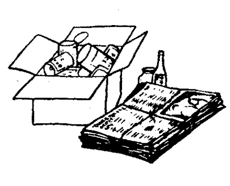

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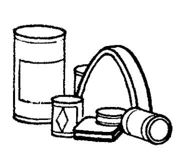

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29 June 1973

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SCIENCE

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REPORTS

COVER

Scanning electron micrograph of *Vallacerta siderea* (Schulz), a Late Cretaceous silicoflagellate species, from Fletcher's Ice-Island (T-3) core 437 sediments from the Alpha Cordillera of the Arctic Ocean (original size from tip of vertical point to base of star-shaped figure, 80 micrometers). See page 1360. [H. Y. Ling and Linda M. McPherson, University of Washington, Seattle; D. L. Clark, University of Wisconsin, Madison]

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LETTERS

Herbicide Orange Surplus

I would like to provide an addendum to Deborah Shapley's report "Herbicides: Agent Orange stockpile may go to the South Americans" (News and Comment, 6 Apr., p. 43).

IRI Research Institute's (*1*) interest in herbicides and brush control problems dates back nearly 20 years. A brush control project was initiated in 1954 at the request of Brazilian farmers, whose pastures were being invaded and overrun by noxious species of tropical brush including indigenous poisonous species. Experimental work was initiated to control a number of these species of brush such as "Leiteiro" (*Tabernaemontant fuchsiaefolia*) and "Amendoim" (*Pterogyne nitens*), and more than 2000 field plots were established in Brazil and Venezuela. The results of these studies and observations were published in four different bulletins and technical notes in English, Portuguese, and Spanish (*2*).

The basic ingredients of Herbicide Orange, 2,4-D and 2,4,5-T, have been sold and used commercially in Latin America for more than 20 years. These chemicals have controlled brush well in field applications and have improved pastures. However, their high cost has limited their use, and the surplus Herbicide Orange offers an opportunity to make some substantial improvements in pastures and livestock production at a significant saving to livestock producers.

There is a potential health hazard with the use of all agricultural chemicals. However, the possible hazard depends largely on how and where they are applied. The military applications of herbicides are reported to have been in the range of 27 pounds per acre, whereas the recommended applications to control pasture brush would be about 1 pound of 2,4,5-T per acre. Thus, the dosages are not comparable. Even common table salt can be a toxic and poisonous substance if taken at sufficiently high dosages.

It was found in the experimental studies that the most effective brush control in the tropics was obtained when herbicides were applied during the warm, wet season. These conditions are optimal for accelerated biodegradation, which would minimize the residue problem. Also it was found that the best results were obtained when animals were kept out of the sprayed pastures for 3 or 4 months following any spray application. When the pasture grasses are not grazed and allowed to grow vigorously, they provide a type of biological control against the resprouting noxious brush species. Thus, by following these two procedures, there is only a minimum possibility that toxic materials will build up in the food chain.

The livestock industry in Latin America is located largely in remote areas and requires very little labor. Thus the potential human exposure in the field is at a minimum. To our knowledge there have been no injurious effects to men or animals resulting from the field application of these herbicides in Latin America.

If it is recognized that there are potential risks in the use of Herbicide Orange, the decision to use it is essentially a problem of balancing the risks against the benefits. Any risks can be minimized by proper handling and application. The proposed project includes an extensive educational and demonstration program to assure proper handling. A realistic value judgment overwhelmingly indicates that the results of the proper application of Herbicide Orange would be favorable.

JEROME F. HARRINGTON
IRI Research Institute, Inc., One Rockefeller Plaza, New York 10020

References and Notes

1. IRI is a nonprofit organization founded in 1950. The name was changed in 1963 from IBEC Research Institute to IRI Research Institute, Inc.
2. L. R. Quinn, K. L. Swierczynski, W. L. Schilmann, F. H. Gullöve, *Experimental Program on Brush Control in Brazilian Pastures* (IBEC Research Institute Bulletin No. 10, New York, 1956); [*Programa Experimental de Contrôle de Arbustos em Pastagens Brasiletras* (IBEC Research Institute Bulletin No. 10, São Paulo, 1956); *Programa Experimental Sobre el Control de los Arbustos en los Pastizales Brasileños* (IBEC Research Institute Bulletin No. 10, New York, 1956)]; L. R. Quinn, *O Contrôle de Arbustos Nas Pastagens do Brasil* (IBEC Research Institute Nota Técnica No. 6, São Paulo, 1961); L. R. Quinn and J. B. Griffing, *O Contrôle do "Leiteiro" e do "Amendoim" em Pastagens* (IBEC Research Institute Miscellaneous Publication No. 2, São Paulo, 1958); C. E. Fisher and L. R. Quinn, *J. Range Manage.* **12**, 244 (1959); [*Contrôle de Três Espécies Importantes de Arbustos Praguejadores em Terras de Pastagem nos Estados Unidos, Cuba e Brasil* (IBEC Research Institute Nota Técnica No. 5, São Paulo, 1959)].

Energy Policy

In the issue of 23 February, excerpts from a speech by S. David Freeman are presented (News and Comment, p. 779) in which "solutions" to the energy crisis are proposed.

Freeman's major thesis is that ending the import restrictions on energy fuels would alleviate the energy shortage that some parts of the United States experienced during the winter and that the entire country faces in the future. The picture of cheaper energy flowing into the United States from foreign sources sounds inviting but is fraught with problems. First, increased dependence on foreign energy sources requires deep-water ports and better distribution facilities to move the oil or gas from the coasts to the centers of population. Neither of these presently exist, and both are opposed by various environmentalist groups.

A stepped-up American demand for foreign oil is certain to raise the price paid by consumers in Japan and Europe as well. An organization of oil-producing nations already exists that has at least once forced renegotiation of contracts and higher prices. What added purchases would do to our balance-of-payments deficit is another consideration.

The suggestion that abandoning wasteful patterns of energy consumption as a short-term solution to the problem is shear folly. However deplorable these policies may be, they will not change quickly. They are ingrained in the very operation of our society, and consumers will require extensive education and redirection to change. This is not even considering the cost of alternatives to millions of cars and brilliantly lighted cities. Changes such as these have seldom, if ever, happened quickly in the past, although they may be long-term considerations.

The controversy over the fairness of profits that may result if domestic oil prices are increased and controls removed from natural gas requires detailed examination. Certainly the position of the oil industry on the matter must be looked at critically. An interesting article diametrically opposed to Freeman's view appears in the newsletter of the *Oil and Gas Journal* of 5 February 1973 (*1*).

To suggest that the energy problem can be so easily solved seems to ignore too much. If it were so, there probably would not be an impending crisis in the first place.

It does not seem realistic to deplore runaway consumption while attempting to supply cheap energy by any method, either by holding prices artifically low or by increasing imports. It seems almost certain that energy will cost more in the future, and a large share of the cost will be borne by the consumer, for without the demand there would be less of a problem. Maybe in the end that is the only way our wasteful consumption habits will be changed.

RONALD D. STIEGLITZ
Ohio Department of Natural Resources, Division of Geological Survey, Columbus 43212

References

1. *Oil Gas J* **71**, No. 6 (newsletter) (1973).

The Speed of Light

Without wishing to detract from Evenson's new determination of the speed of light (W. D. Metz, Research News, 16 Feb., p. 670), I think the example used to illustrate its importance was ill-advised. The improved value for the speed of light is no more important in laser ranging now than it was 3 years ago, when this topic was discussed by Bender (*1*), who wrote "there are no important scientific experiments which we are prevented from doing" by the adoption of the conventional value of the speed of light.

The confusion seems to stem from a failure to appreciate the fact that the natural unit of astronomical measurement is the light-second, as is the case with nearly all measures of large terrestrial distances. The only purpose of converting light-seconds into kilometers is a psychological one. People do not like to think of the coordinates of an observatory or the distance between two cities in terms of light-seconds. Similarly, astronomical ephemerides are constructed in terms of astronomical units because an astronomer seems to feel that he can visualize an astronomical unit more readily than he can visualize 500 light-seconds. We are dealing with the inertia of heritage. The change from one adopted value for the speed of light to another in astronomical problems is simply a linear change of scale. It does not involve a change in physical model. In more concrete terms, the distance to the moon, as stated in linear measure, will change, but the residuals between observation and prediction will not. In terms of the physics of the problem, the new determination of the speed of light may be expected to have no more serious consequences than did the redefinition of the conversion factor between inches and meters some years ago. In this context, the only substantive question is, What is the measure of the standard meter bar in light-seconds?

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SCIENCE

Noblesse Oblige in Science

In the fall of 1972, the press carried the news of the award of the Nobel Prize for Physics to John Bardeen and his two co-workers. What is not generally known is the purpose for which Bardeen used his share of the prize. Bardeen, for whom this was a second Nobel award, used his share to set up an endowment fund at Duke University to support the London Memorial Lectures at Duke and to provide funds for the Fritz London Awards. The latter are a feature of the International Conferences on Low Temperature Physics sponsored by the International Union of Pure and Applied Physics.

London left Germany in the days of Hitler's rise to power to join the physics group of Oxford University. He later moved to Paris to become maître de recherche at the Institut Henri Poincaré. He went to Duke as a visiting professor in 1938, becoming professor of chemical physics in September 1939. A few years later, his initial appointment in chemistry was changed to a joint one with physics, a post he held until his death in 1954.

London's great interest in low temperature phenomena started when he was offered a fellowship by Imperial Chemical Industries to go to Oxford. At the time the offer came, a similar offer was made to Franz Simon, a colleague of London's. Simon was a gifted experimentalist, and the two men were to develop a program in low temperature at Oxford. The collaboration between the two, which began at Oxford, continued after London went to Paris.

Some time after London arrived at Duke, came physicist William Fairbank. He was an outstanding experimentalist working in the low temperature field, and the team of London and Fairbank made great progress toward understanding some of the puzzling phenomena taking place at extreme low temperatures.

The significance of London's contribution to theoretical physics in the area of low temperatures was well summarized by Felix Bloch* in June 1954, shortly after London's death:

> London's genius has not failed to impress those who were well acquainted with him and his work, and his influence has been far out of proportion to the external signs of his recognition. The lasting value of London's scientific achievements lies not only in the light shed on hitherto unexplained phenomena but also and particularly in his opening of new roads to be traveled in the years to come.

Bloch's evaluation of London's contributions was indeed prophetic in light of subsequent events. Bardeen, in his statement concerning the Duke gift in 1973, said of London: "He was one of the world's most distinguished leaders in theoretical aspects of physical phenomena at extremely low temperature. More than anyone else, he pointed out the path that eventually led to the theory of superconductivity, for which Leon N. Cooper, J. Robert Schrieffer, and I were awarded the Nobel Prize for Physics in 1972."

This is a time of growing anti-intellectualism, in which scientists are accused of narrow self-interest, of a lack of humanity, and of many other objectionable characteristics. In the face of this, it is heartening to note the following words of Bardeen in acknowledgement of an intellectual debt to one of his predecessors, Fritz London: "We are all very grateful to him for the deep insight that helped light the way to understanding."

In science, there still is, as there always has been, a spirit of noblesse oblige.—PAUL M. GROSS, *William Howell Pegram Professor of Chemistry (Emeritus), Duke University, Durham, North Carolina 27706*

* F. London, *Superfluids* (Wiley, New York, 1954), vol. 2, p. ix.

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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.

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