Instructions for Contributors

The Editors of *Science*

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.

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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.

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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.

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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, columns, 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.

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Journal: H. Smith, *Am. J. Physiol.* **98**, 279 (1931).

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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.

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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.

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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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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. See instructions for the preparation of manuscripts.

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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.

SCIENCE

5 October 1973

Vol. 182, No. 4107

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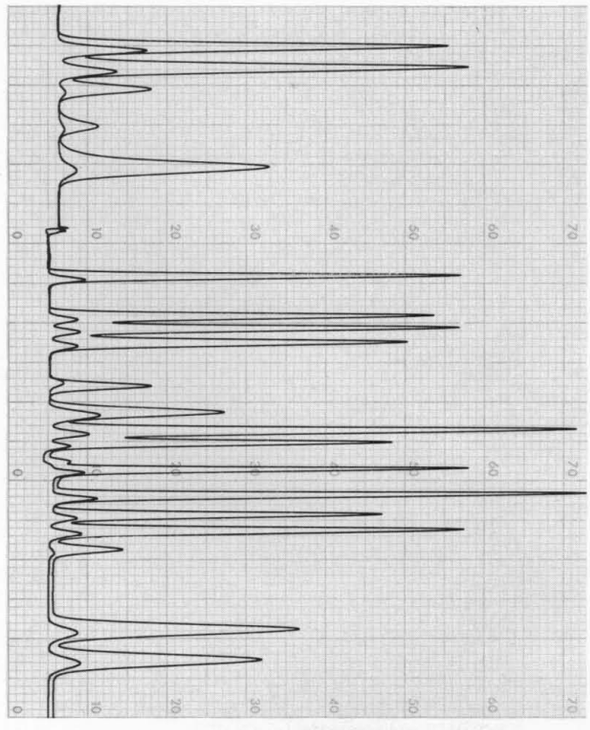

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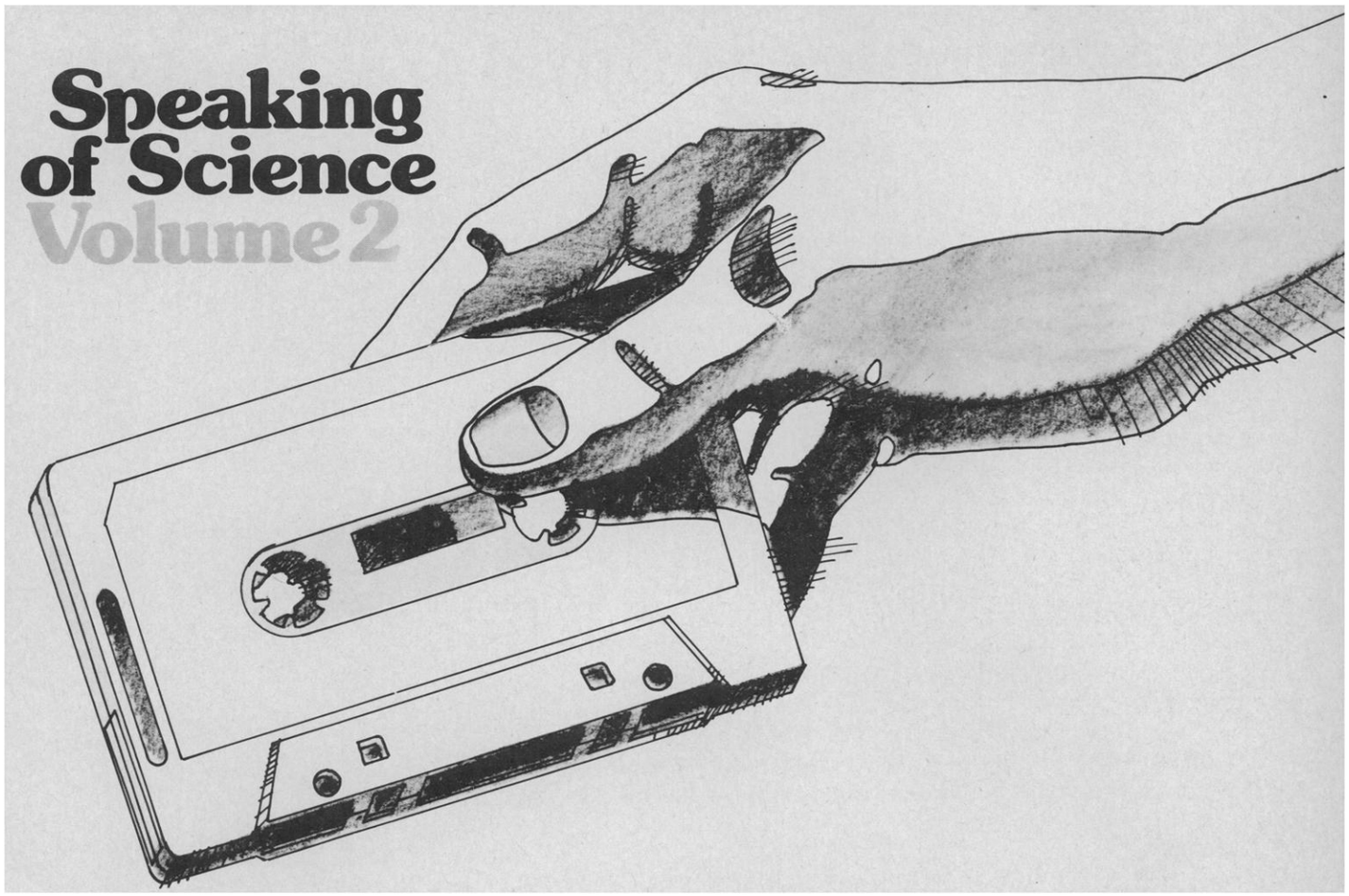

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5 October 1973

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Unrestricted basic research will be one of the most controversial issues in the U.N. Law of the Sea Conference. See page 15. [B. J. Nixon, Houston, Texas]

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so that they are trouble-free, but easy to repair if necessary. We have also learned lessons from Skylab about man's ability to react quickly and effectively to rapidly changing phenomena, to recognize and explore the unexpected, and to improve upon operating procedures with the accumulation of experience. The presence of scientists in space will prove valuable in reducing the complexity and cost, while increasing the reliability, of sophisticated experiments.

We hope that human achievement and social progress are "near and dear to the American people." In the past, they have generally been linked with pioneering exploration of new frontiers and with the accepting of challenges that go beyond the struggle for material comfort and luxury. History now brings us face to face with the next great frontier. Can we turn our backs on it and still preserve our humanity? In the words of Arthur C. Clarke, "The challenge of the great spaces between the worlds is a stupendous one; but, if we fail to meet it, the story of our race will be drawing to a close. Humanity will have turned its back upon the still untrodden heights and will be descending the long slope that stretches, across a thousand million years of time, down to the shores of the primeval sea" (*3*).

JOSEPH P. ALLEN
KARL G. HENIZE

Astronaut Office,
Lyndon B. Johnson Space Center,
Houston, Texas 77058

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1. *Economic Report of the President, 1973* (Government Printing Office, Washington, D.C., 1973).
2. National Science Foundation–National Aeronautics and Space Administration, Solar Energy Panel, *Solar Energy as a National Resource* (Department of Mechanical Engineering, University of Maryland, College Park, 1973).
3. A. C. Clarke, *The Promise of Space* (Harper & Row, New York, 1968), p. 314.

A Reasonable Deduction

Based on my measurements of the cover photograph of the bee sting (20 July) I have concluded that it cannot be properly termed a microphotograph, as described. The dimensions were 22.9 × 19.2 centimeters. In terms of human dimensional perspective, I would suggest that it be most properly classified as a macrophotograph.

However, having a relative concept of the actual size of the bee sting, and the procedures and steps required to produce the enlarged image for the cover, it would logically follow that the photograph should be classified as a photomicrograph. Continuing further on a logical course, and through reasonable deductions from the above information, the cover photograph would most correctly be characterized as a macrophotograph of a photomicrograph.

RICHARD H. MORRISON
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Minneapolis, Minnesota 55413

Agricultural Research Policies

While I share the concern expressed by Nicholas Wade (News and Comment, 18 May, p. 719) at the meager support given social science by the U.S. Department of Agriculture, I doubt whether any conceivable research in that field could have softened the disastrous impact on both rural and urban life of official policies. To accomplish this would have required an effective scrutiny of our entire system of values. On the whole, policy tends to influence research rather than vice versa.

I can testify that official policy has been involved. In 1945 the respected chief of agricultural extension in a southern state told me of his distress. "Until recently," he reported, "our instructions have been to do all in our power to aid the family farm. Now we are ordered to encourage the large, heavily financed and mechanized operation."

Yet at that time the family farm of moderate acreage was not beyond redemption. One of the Memphis newspapers had under way a campaign to encourage the small farmer by various means, including awards at an annual dinner. At the second of these dinners, the publisher chided his aides, saying that the well-dressed, prosperous guests were not the ones he wished to help. To his astonishment he learned that they were the same families that had been present the previous year.

Another experience in 1945 was instructive. This took place in a rich, cotton-growing area. Field workers lived in cabins without gardens, poultry, or other means of subsistence beyond wages. Land was plowed and planted up to the edges of the cabins. A friendly planter told me he was experimenting with cotton-picking machinery, remarking that, while cotton was selling for around 30 cents a pound, he intended to make money if it went down to 12 cents.

When I asked him what would hap-

pen to his workers, he replied cheerfully, "We'll let you worry about them in Cleveland and Detroit." Subsequent events have more than justified this prophetic remark. Farms have doubled in size and decreased proportionally in number; rural population has dwindled even more severely, while cities have been swamped with refugees faster than they can be assimilated into a sustaining urban life.

Despite the hard work and other handicaps of the small farm, it was a sound ecosystem, involving plants, animals, and human beings. Organic nutrients were recycled in place. Today plant and animal industries are largely separated in space. Animal wastes from huge feed lots have become a nuisance instead of a benefit. Even the humification of corn stubble by sprayed nitrogen fails to maintain a sufficient level of organic colloids in the soil to prevent the leaching of costly fertilizers, with its attendant damage to inland waters.

I have first-hand knowledge of the effort required in moderate-scale farming. Yet I submit that work is better than extensive unemployment. The burden of labor can be eased by various means. A farmer who understands the scientific basis of his craft certainly finds it more satisfying than one who goes by rule of thumb. Credit, fiscal policy, procurement and market facilities, and machine design can be tailored to redress the unbalance that now favors large operations.

Finally, as a teacher for many years, I have found that students from a farm background have a better-than-average capacity for sustained effort. Without exception, the colleagues whom I have interviewed agree with this judgment.

PAUL B. SEARS
Las Milpas, Taos, New Mexico 87571

Two reports by Nicholas Wade (News and Comment, 18 May, p. 719; 1 June, p. 932) critical of the U.S. Department of Agriculture (USDA) require some clarification. My comments are based upon 49 years of experience as a research scientist in the Agricultural Research Service (ARS), followed by 10 years as a collaborator.

Agricultural research has provided reserve foods for countries facing famine. It has eliminated much of the peasant-type farming and sharecropping in the United States. Farm mechanization and the breeding of crops suitable for mechanical harvesting have nearly abolished stoop labor on the farm. New pesticides keep worms out of apples and sweet corn and suppress most of the flies and bedbugs that formerly made life miserable. The development of tastier fruits and vegetables, and more attractive ornamental plants, surely contributes to social betterment. The breeding of crop varieties that are free from barbs or spines has eliminated painful experiences of farm workers (*1*). The control of pests and diseases has limited crop failures and resultant poverty. The control of cereal smuts in grain crops has stopped the blackened faces, smut spore inhalation, and explosions of threshers and combine harvesters that occurred in former years. Sociologists thus do not have a monopoly on social betterment. Extension agriculturists and home economists maintain close contact with rural residents and help solve many of their problems.

The enlargement of farms by the more able operators has been in vogue since the 19th century, particularly in marginal areas. This continued while many orators, journalists, and economists of the early 1900's were advocating smaller farms with more intensive culture and diversification. Meanwhile, economic surveys confirmed the opinion of farmers that larger land units were more efficient and provided a more adequate family income. Later, federal and state attempts to establish cooperative, small-farm colonies were a dismal failure. In the drier areas, even the 640-acre grazing homesteads could not provide a living income for a ranch family. Farmers also led the shift to mechanization, despite doubts by some agricultural experts. Mechanization often was quickly adopted by farmers who had been harassed by labor agitators.

Many state and federal agricultural branch stations and laboratories were established through pork-barrel politics, but Congress and state legislatures are not controlled by administrators or by scientists. Four regional utilization laboratories were established by Congress in 1938 after heavy pressure from chemurgists. This forced the abandonment of elaborate new laboratories of the Bureau of Chemistry in the USDA building in Washington, D.C.

An appreciable number of federal agricultural field stations and laboratories were established in states in which officials of the state experimental stations were reluctant to cooperate on the project. Legislators are constantly advocating a reduction in the number of state or federal field stations and

laboratories, but they insist upon retaining those in their own election districts. Their alternative then is to reduce appropriations at the existing locations. Administrators and legislators are obligated to accept or reject research projects that are supported by public funds. But often the active research scientist is better qualified to evaluate his project than are a host of administrators, legislators, or advisory panels.

Centralized control of all state and federally financed agricultural research would be a calamity. It would add additional administrative levels, which delay decisions. A single federal or state administrator or a legislative committee member might block an essential project that he regarded as unimportant. In 1942, a small national project for investigating air pollution was canceled by the ARS administrator. Frustrated scientists frequently are obliged to seek support from other federal or state agencies or from industrial firms who can conduct research that has been rejected by legislators or the scientist's superiors.

Federal agricultural administrators below the political appointment level have been experienced scientists. There is little evidence of a caste system. Nearly all scientists at two-man field stations receive ample literature and advice and have frequent contacts with scientists at other locations, which keeps them well informed. Many outstanding contributions have originated at such locations, for example, the development of hybrid sorghum, dwarf and erect sorghum, soil moisture conservation, and new disease-resistant varieties of crops. Nearly all of the federal agricultural scientists stationed at land-grant universities have dual appointments as faculty members, often as full professors. There is little evidence of their isolation from academic activities. At the 1973 commencement at Oregon State University, special distinguished honors were awarded to only four individuals. Two of them were federal agricultural scientists.

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The negative response of the Pound committee on agricultural research (*1*) (News and Comment, 5 Jan., p. 45) to the question: "Does the research by agricultural scientists reflect the highest standards of the scientific community?" indicates a disregard on the part of basic research scientists for mission-oriented research. The committee should take note of the recent study *Interactions of Science and Technology in the Innovative Process: Some Case Studies* (*2*) by the National Science Foundation, which reports that 84 percent of the decisive events in the history of ten major innovations arose from mission-oriented research or developmental activities. In the development of hybrid corn, hybrid grains, and Green Revolution wheat, the comparable figure was 87.5 percent.

Agricultural research receives its support primarily on the basis of its ability to solve problems and meet needs of people. Many of the problems are unique to a given region, state, or local area. They must be solved today, not 10 years from now.

The Pound committee offers scant evidence to support its contention that there is inadequate interaction between agricultural scientists and those in the basic disciplines. If there is a problem, at least part of it stems from the traditional reluctance of many "basic" scientists to become involved in research that has strong overtones of practical significance. The low status assigned in some circles to mission-oriented research can lead to statements such as this one from the Pound committee report: "Agricultural research is suffering . . . from a paucity of outstanding scientists."

A positive approach toward agricultural and mission-oriented research by groups such as the Pound committee would likely prove much more helpful than will their negative approach in attracting additional topflight young people and additional financial support for both basic and mission-oriented research. In short, the Pound committee has attempted to apply administrative solutions to what its members view as an image problem.

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5 October 1973, Volume 182, Number 4107 **SCIENCE**

The Federal Science Advisory Apparatus

The structure of the changed federal science advisory apparatus is now taking form. In many ways, the old plan has been preserved, but significant differences are present. Guyford Stever has been designated the President's Science Adviser, named chairman of the Federal Council on Science and Technology, and assigned responsibilities in the foreign exchange programs. He also heads a group whose function is similar to that of the old Office of Science and Technology. In these respects, his position is similar to that of the former adviser, Edward David.

There are major differences, two of which have been repeatedly emphasized. One is that Stever's position in the hierarchy is lower than that formerly enjoyed by David. A second is that Stever has great responsibilities as director of the National Science Foundation. A third major difference, and one that has not received much attention, is in the President's Science Adviser's source of advice. An important component of the previous system was the President's Science Advisory Committee (PSAC). This body of 18 experts was a weighty factor in science policy. In the early days of PSAC (the late 1950's), the committee functioned especially well. The tasks it worked on were largely related to the national defense. Members were physical scientists expert in those matters. With time, the problems changed, became more people-oriented—poverty, crime, transportation, and the environment, to name a few. It was no longer possible for a committee of 18 to include experts in all the areas.

Members of PSAC, being an elite group and occupying a lofty station in the scheme of things, fell victim to a common human disease: arrogance. This was manifested both publicly and privately, but mainly privately. Behind the scenes, PSAC attempted to wield great influence on the decisions and policies of the various governmental agencies. In the process, the part-time committee made full-time enemies. The major political blunder, however, was that members of PSAC occasionally disagreed publicly with the President. This occurred both in Democratic and in Republican administrations. Public and private squabbles are part of the democratic process, but when they occur in the President's own family, they add to his burdens and destroy the value of such an advisory group.

In his role as President's Science Adviser, Stever will find it necessary to seek counsel from scientists and engineers outside the government. In his position as director of the National Science Foundation, he already has access to many sources of advice. In addition, it appears that he will make some use of the potentialities of the scientific and technical societies. Many of these have organized committees on science policy matters. Some have established Washington offices.

On 10 September, Stever conducted a meeting of presidents or principal officers of most of the major scientific and engineering organizations. Societies totaling nearly a million members were represented. Stever indicated that he would welcome policy advice and recommendations concerning personnel. As specific problems arise, the appropriate organizations will be tapped. Thus it seems that a major difference between the new and the old apparatus will be the replacement of a small, formal, elite group by more broadly based ad hoc groups. The concept is worth a try. Whether it will be viable will depend on how effectively it is implemented by both sides.—PHILIP H. ABELSON

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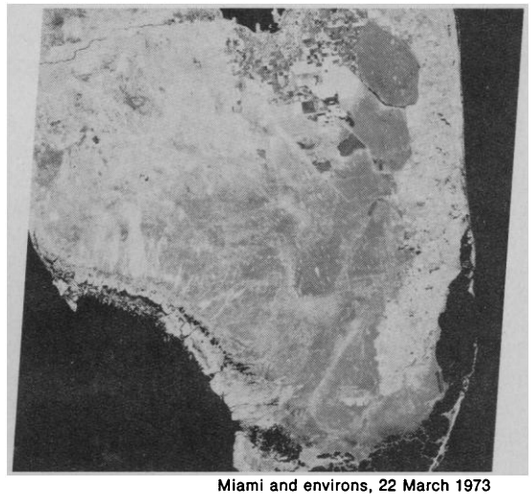
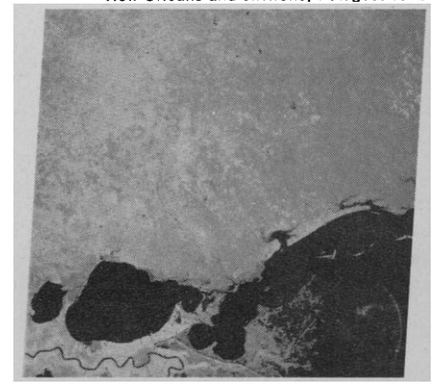


Miami and environs, 22 March 1973

New Orleans and environs, 7 August 1972



Mississippi delta, 7 August 1972

The U.S. Geological Survey, which runs the EROS program (Earth Resources Observation Systems), points out an opportunity to serve the public interest by calling to your attention that imagery is now available of just about any region on earth, except within some 900 miles of the poles.

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For the sake of preserving the earth's glory, let's learn how to look through mankind's new microscope-in-reverse. Let's assume that if Aristotle and his friends had had even ordinary microscopes, we'd all be happier today.

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