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.

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, 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.

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 the "Chemical Abstracts Service Source Index," CASSI, 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, *Amer. 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 capital and lower-case 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.

SCIENCE

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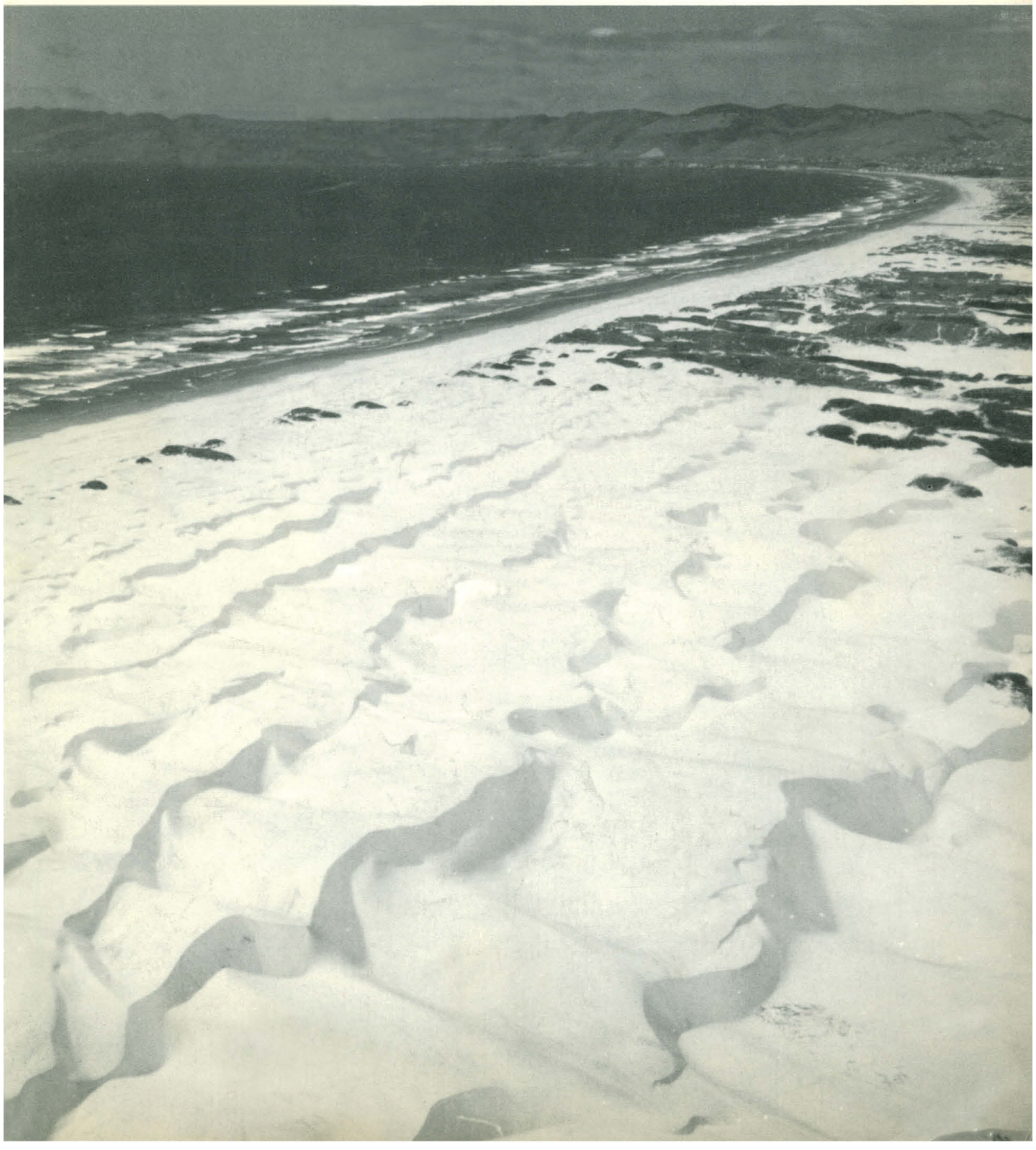
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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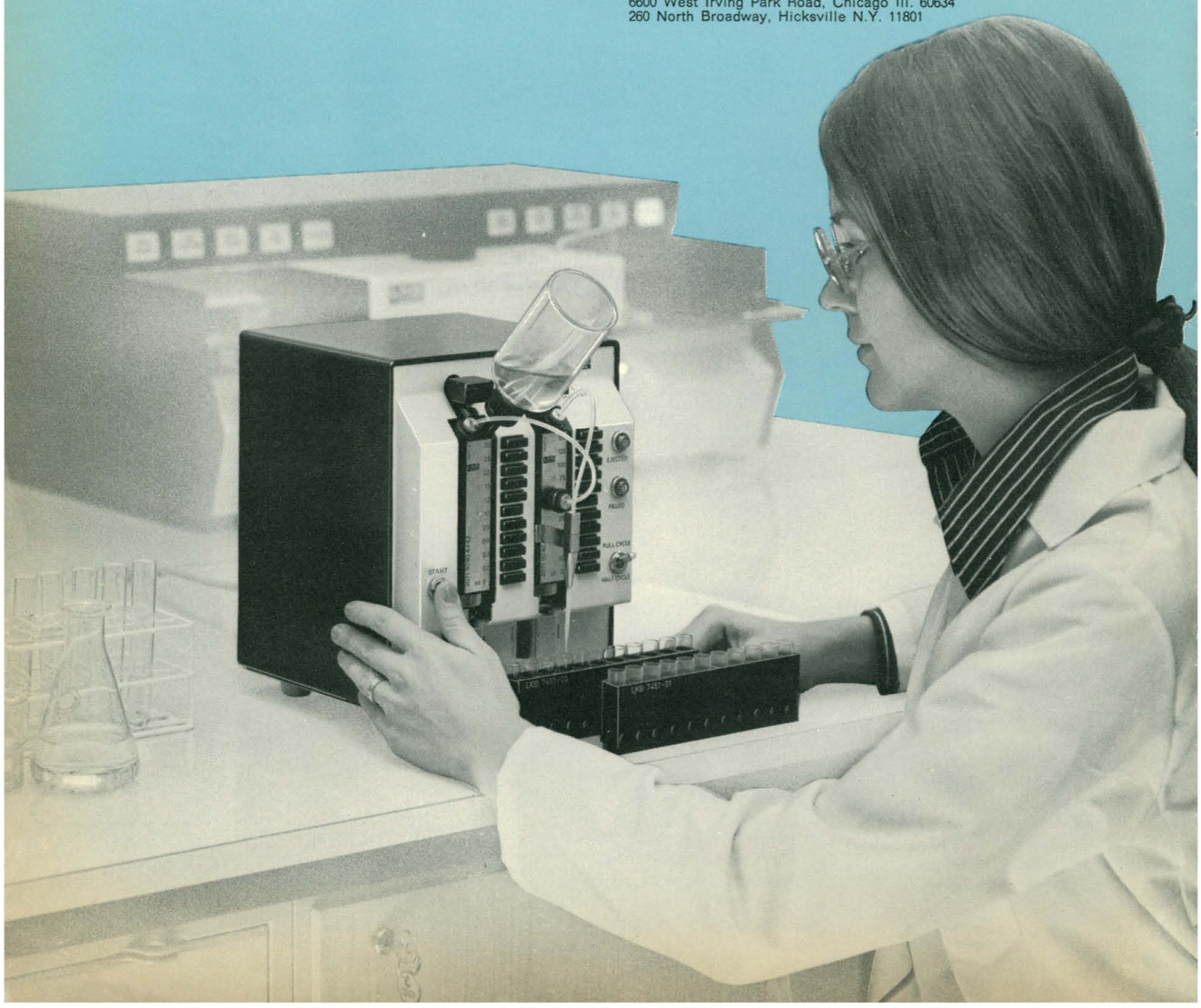


Written any books lately? Published lots of papers?

If not, how will they know you're productive?

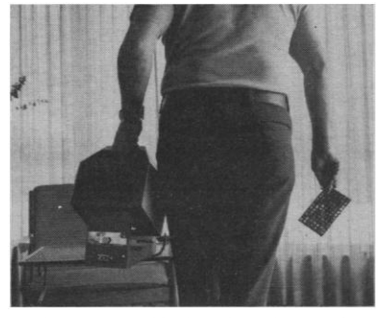
Back when natural philosophy was turning into science, natural philosophers tried to keep in touch by letter, being literate men. Within a few generations the various printed *Proceedings, Comptes,* and *Annalen* were providing better communication among peers than the unamplified quill. To this very day and in the pages of this very magazine, printer's ink demonstrates the respect of one's peers for one's work and thought.

Now glance at the "Reports" in this prestigious journal. You may be willing to admit privately that some of those peers of yours use a mysterious language all their own, just as you yourself in your own field are judged by your obvious ease in reading and writing the language of that field. Peers who can't understand each other are peers only in a stuffy, formal sense. Your *real* peers are a small bunch, perhaps no more numerous than the subscribers to Volume I of those *Annalen.*

In the meantime, the industry that spreads ink artfully on paper—which happens to include some of Kodak's best customers—has geared itself to consider 10^6 a modest order. A modern printing press that serves 10^3 savants must scream shamelessly for financial angels.

Kodak offers two viable alternatives when the true objective is communication at the cutting edge rather than enshrinement in an impressively bulging bookcase:

1. Publication by microfiche is for words, equations, symbols, drawings, photographs where color is highly desirable but unthinkable economically from a printing press. Right now arrangements can be made to send us a typed discourse with color slides or black-and-white illustrations and get back as many microfiche copies thereof as are needed to mail out to all believed capable of appreciating it. (But color photography is not eternally true.) If the content is to go through referees and editors before reaching us, that would be just fine. The reading devices should be comfortable



and personal. To be ubiquitous, they must cost little. The more people who need them and use them, the less they will cost. Many of those people might be students who read the prof's unique viewpoint before assembling to interact, not for the archaic purpose of taking notes.

2. Communication by super 8 film is for intellectual content better conveyed in action than verbally and by static graphics. The super 8 medium can join the microfiche as a respectable descendant of the book, which can itself continue to thrive for more popular entertainment and instruction.

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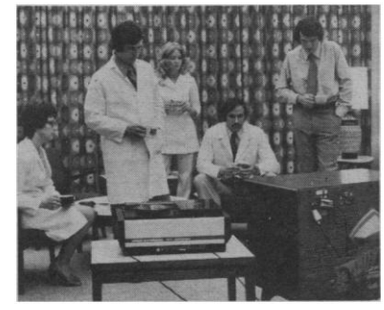

grading of coffee breaks for departments where creative thought is a job requirement.

The beauty part: Super 8 doesn't *have* to be read out by TV. The very same reel of film can also be consulted on a tabletop movie projector by an audience of one or shown to hundreds on a big screen in a large lecture room. It may have been exposed in a simple home movie camera without auxiliary lighting. If it is intended as a form of publication, labs anxious for the business of striking off copies can be found through almost any sizable phone directory.

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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Sand dune south of Pismo Beach, California. See page 20. [U.S. Navy]

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some string, a stone, an oil lamp, a pointer, a few pegs, and a gallon of water—we are convinced that we could achieve the required accuracy in one night's observation. Our philosophy is if we can devise an experiment today which was equally feasible 6000 years ago, it is fair game to use it to establish the limits of accuracy that could have been achieved. That a different method may have been used is of secondary importance.

To support our contention that an accuracy of 1′ is feasible, we quote from another letter (*1*) We received. O'Keefe writes, "There is no real problem about aligning within 1′. Remember that a rifleman will put 10 shots out of 10 within the innermost ¼-inch circle on a target 50 feet away using open sights and supporting his rifle with his hands. This is just about 1′. Given any kind of firm support, it is possible to point to a much higher accuracy. The last of the astronomers to prefer open sights to telescopic sights was Hevelius; I believe he got an accuracy greater than that of Tycho Brahe, whose errors were about 40″."

O'Keefe also mentions the possibility of transferring a meridian from one set up at a distance, as does Stephenson. O'Keefe further points out that such a reference meridian would differ by 4′ westward if it was only 6 km to the east. The transfer of such a meridian is by far a more difficult task than on-the-spot alignment, but we would be interested in an outline of the procedure and the result of a test experiment. Nevertheless, these questions are secondary to the question of the limit of precision that is feasible, which is Stephenson's main question. Even if we knew the exact procedure used, we could not know its accuracy. We can ask our physics students to repeat certain measurements a number of times in order to establish the standard deviation of the distribution, but only two pyramids were aligned with such accuracy. However, we can examine other constructions. In an article (*2*) in the London *Daily Telegraph*, A. R. Michaelis wrote:

> There is now to hand an all too short announcement that geophysicists in Uzbekistan have observed that the great masonry sextant of the Observatory of Samarkand has moved by 10 minutes of arc since it was built in 1428.
>
> This was published in Soviet Weekly on March 30, but did not mention the names of the scientists concerned. The famous observatory in Samarkand, now the oldest in the world, was built by the great Russian astronomer Ulugh Beg, who lived from 1393 to 1449. He was Governor of the Province, wrote poetry and history and loved building in a grand style.

Michaelis then continues by speculating that it would also be worthwhile to make an accurate survey of the constructions of Jai Singh II at Delhi, and at Jaipur, which were built in the 1700's.

Returning to Smiley's second point, there are many reasons why an east-west alignment cannot be accurately established. The angular width of the sun is about ½° and moves nearly 1° in azimuth per day at the equinoxes, giving immediately a ½° error between sunrise and sunset. This azimuthal difference is reversed between the two equinoxes but is not the sole source of error. The east-west condition is met only when the line of sight to the sun is a tangent to the earth's surface. The altitudes of the horizons perturb the result, which is also affected by the refraction of the earth's atmosphere. Furthermore, the refraction effect is different at sunrise and at sunset. It is therefore a fair conclusion that the east-west alignments show instead the Egyptians' well-known ability to construct right angles.

It is obvious that some questions will always be unanswerable and are thus of little use. As in many aspects of archeology, questions must be framed so as to give scope for objective tests. In the present case, if we can establish that a 1′ accuracy was not impossible, then the next stage of the debate is with the geophysicists.

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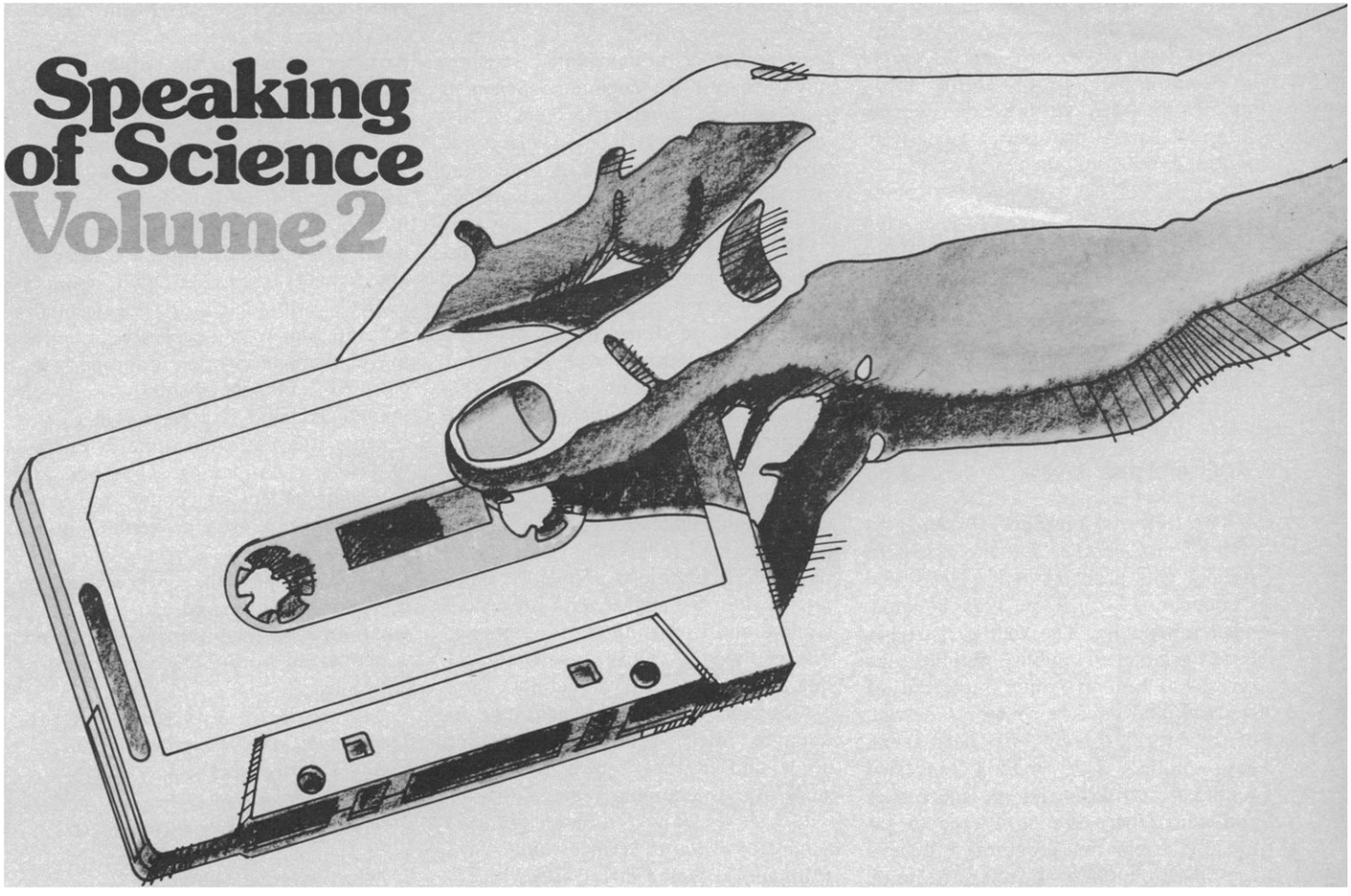
References

1. J. A. O'Keefe, personal communication.
2. A. R. Michaelis, London *Daily Telegraph*, 16 April 1973, p. 13.

Delayed Publication

The swiftness of publication of the work of the late 19th century scientists cited by Brecher (Letters, 12 Jan., p. 128) is impressive. Nevertheless, in the case of Alfred Russel Wallace's paper "On the law which has regulated the introduction of new species," one must add another parameter—geographical distance. Written in Sarawak



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6 July 1973, Volume 181, Number 4094 **SCIENCE**

Faulty Engineers or Neglected Experts?

Social scientists are being made scapegoats for the failure of dozens of domestic programs. The October 1972 issue of *Fortune* reports that "social engineers retreat under fire"—a main source of the shots fired being *Fortune* itself. Its staff writer Tom Alexander reports: "There's plenty of material for recrimination." He then recites the by now familiar catalog of failures of the domestic programs, failure to abolish welfare, poverty, school segregation, and so on—problems that have not been solved despite "record" investments.

The charges against social scientists are about as well founded as those brought in the early 1950's, equating social science with socialism. The discipline, as such, is no more at fault for the failure of many Great Society programs than the study of international relations is for the American involvement in Vietnam.

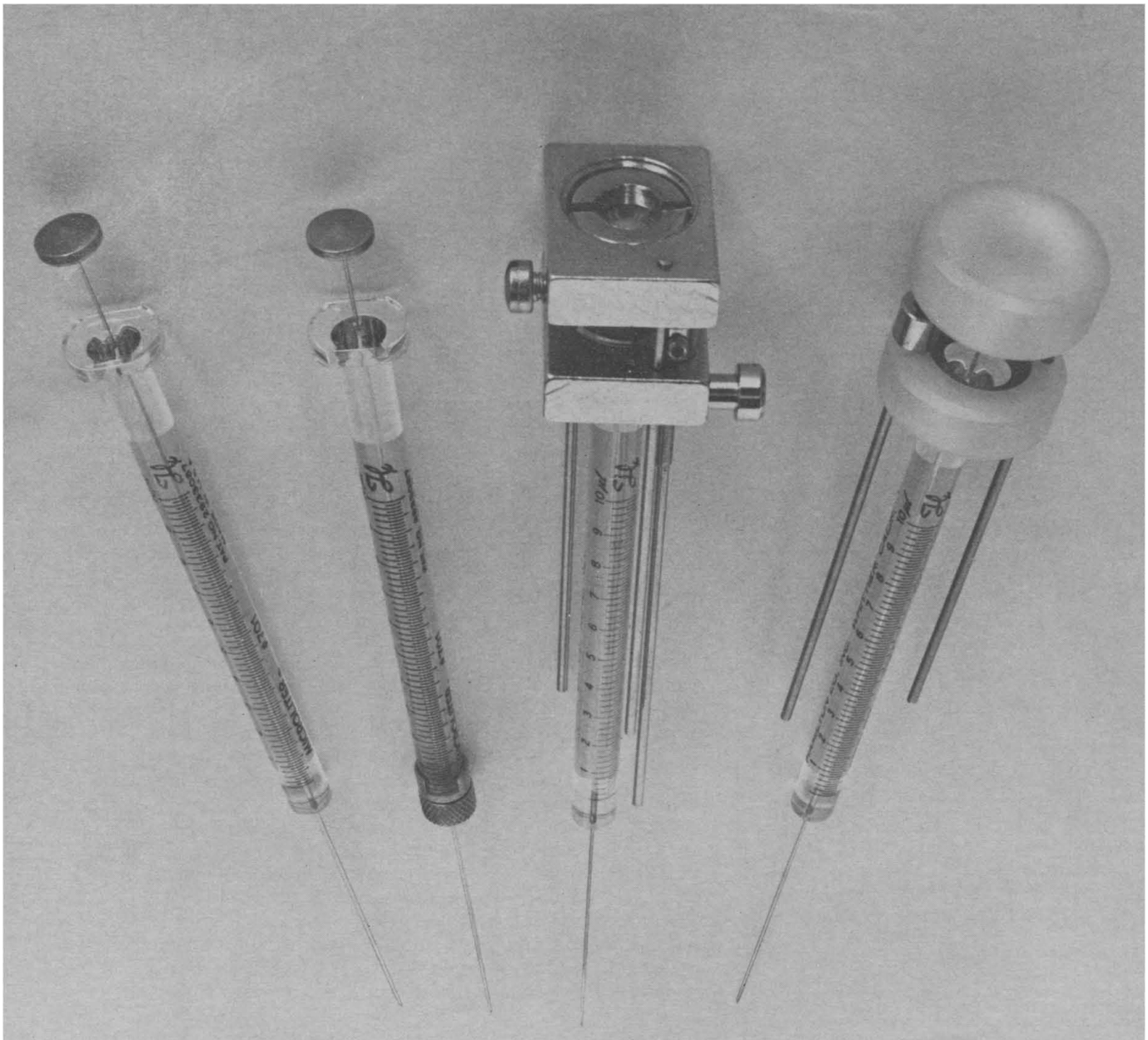
First, most programs did not receive the funds and manpower they *needed*. Alexander is, of course, technically correct: the investments in domestic programs reached "record" levels. But this does not make them high, and certainly not high enough.

Second, many solutions require tradition-bound citizens and legislatures to reexamine their views about the world, human nature, and human values. If they balk, and block progress, there is little a social scientist can—and maybe should—do. Thus, crime is usually ranked as the number one domestic problem. Recently the President, on the heels of the governor of New York, has sought to reinstate the death penalty because, it is alleged, all other efforts to turn back the rising wave of crime have failed. But the fundamental remedies that most social scientists favor have not even been tried. Many politicos prefer to grandstand against crime with "tough" speeches and suggest "tough" measures that they must know are either ineffectual or unconstitutional or both. Why point the finger at social scientists?

The social sciences could be more vigorous than they are—if the politicos would let them. The social sciences, as a group, have been the neglected branch of the sciences, receiving a mere 2 to 3 percent of the resource pie, and even that much only in recent years. No wonder there are fields in which little is known: how to help disadvantaged children catch up, for example, or how to respond to the growing dissolution of the family. But even in these areas social scientists can at least point to what will not work. The Coleman Report pointed out that the kind of efforts undertaken, at a cost of roughly $1.2 billion a year, had no discernible results.

If America now seeks to attend to its long list of social problems, an increased investment in social science is the order of the day—not a chopping of their sources of support. Furthermore, social programs, in which the findings of social scientists are utilized, must be allowed to go through the same research and development sequence that missiles and lunar landing crafts go through. An initial mistake made by social scientists was agreeing to the use of their theories in attempts to plan societal changes. They should have insisted on design or table-top or wind-tunnel models in order to initiate, not to bypass, the research and development sequence. We must stop trying to jump directly from sociological blueprints into multibillion-dollar programs.

We can no longer delay facing our domestic needs, and we cannot deal with them without the help of the social sciences. But the social sciences themselves will require much nourishment and fortification before they will be able to fully measure up to this mission.—AMITAI ETZIONI, *Professor of Sociology, Columbia University*, and *Director, Center for Policy Research, 475 Riverside Drive, New York 10027*



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