SCIENCE 30 September 1977

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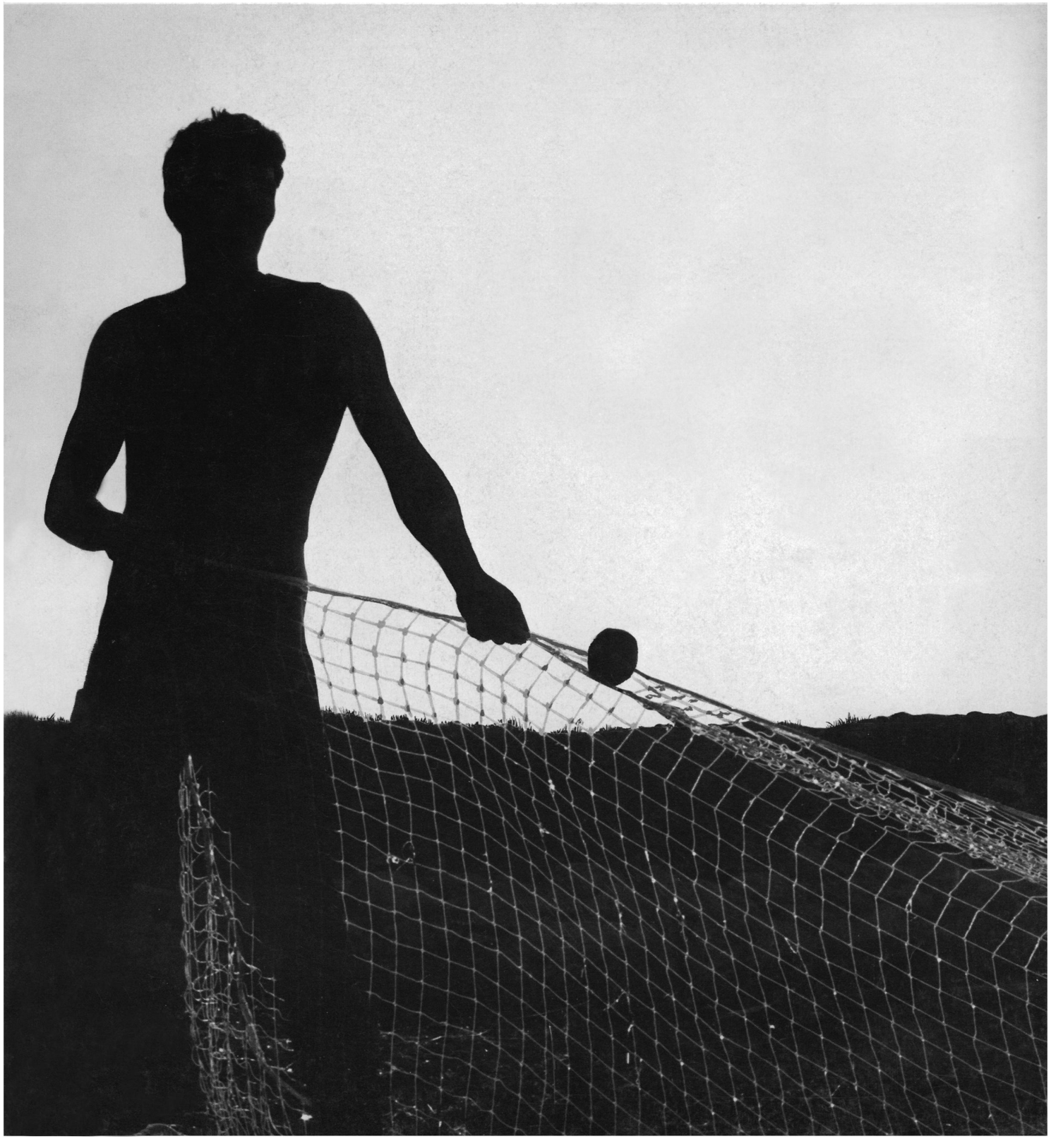
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



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30 September 1977

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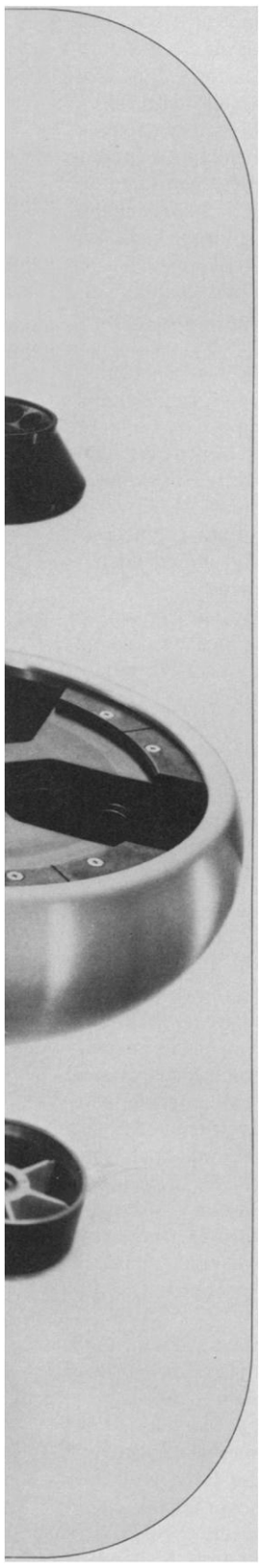
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

COVER

Researchers use a large shore seine to capture salmon and trout from near a power plant's warm water discharge into Lake Michigan. A unique fish tag that utilizes the property of thermoluminescence is allowing scientists to learn more about the average and accumulated temperature exposure experienced by these fish. See page 1364 [Daniel Giroux, Argonne National Laboratory, Argonne, Illinois].

an evolutionary line:



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LETTERS

Diesel Engines and Air Pollution

Frederick J. Hooven's encomium to the diesel-powered automobile (Letters, 2 Sept., p. 940) as a solution to automotive air pollution is puzzling in several respects. First, he fails to deal with the acknowledged problem of aldehydes and particulate emissions, and he might well have added "malodors" to this list. Second, he makes the statement that the diesel does not require "precise adjustments to maintain its low level of emissions" when in fact frequent precise adjustment and exquisite cleanliness of the fuel jets are the key to correct engine performance. Third, he pooh-pooh's the detrimental effect on air quality of quadrupling NO_x emissions from mobile sources by hypothesizing that gasoline-powered autos will probably do that poorly after a brief period of service because of inadequate engine maintenance. This may be correct, but the solution would seem to be periodic vehicle inspection and repair of defects in the same manner as most states now require inspection and repair for safety equipment.

The nature and amount of emissions from a poorly maintained diesel automobile are not mentioned, nor are the detrimental effects of incorrect engine operation (lugging) discussed. My studies of emissions from standard- and catalytic-muffler-equipped diesel buses show clearly that good maintenance practices are as essential for diesel as for gasoline engines if vehicles are to operate with minimum air polluting emissions.

Diesel-powered automobiles may be the apple of Frederick Hooven's eye, but they are not the solution to air pollution from mobile sources.

MELVIN W. FIRST
Department of Environmental Health Sciences, School of Public Health, Harvard University, Boston, Massachusetts 02115

Basic Research Productivity

William D. Carey's editorial on the future of basic science (26 Aug., p. 825) calls attention to the right problem at the right time. First, it is quite evident that whether or not the science community thinks the budget for basic science should be increased 100 percent or even 10 percent (above the inflation rate), the likely prospect is for flat or slightly decreasing budgets.

What credibility can the science community—including the economists, social scientists, and management scientists—have, when we show so little confidence in the strategies we recommend for other sectors of the economy. What about an honest attempt at a scientific, zero-based budget for U.S. basic research? If one can look for a radical reform of the welfare system with the incentives to work, why not a complex, productivity-related formula for funding academic units? If the Department of Defense can look hard at increasing efficiency to get more bang for the buck, is it not fair that we ask of ourselves that we produce more papers and graduate students for the same dollars (more miracles per megabuck)?

I recommend that AAAS meeting planners move to second Carey's motion by scheduling a symposium on zero-based science budgets, alternative funding mechanisms, and increasing efficiency of the science machine. Moreover, if we have the courage of our convictions, the science community should encourage congressmen Teague or Thornton and senators Kennedy, Stevenson, or Proxmire to schedule hearings on appropriate levels and alternative models for basic research funding.

RUSTUM ROY
Materials Research Laboratory, Pennsylvania State University, University Park 16802

Drinking Water: New Health Problem

Coal tar and asbestos have long been identified as powerful carcinogens. Paradoxical as it may seem, it has recently been found that a commercial coating made from these two carcinogenic materials has been applied to the interior surfaces of thousands of municipal water tanks and pipelines used for drinking water throughout the country for many years, with federal approval. Many cast-iron water mains have been dipped in coal tar. Asbestos cement pipes are also in use.

This situation surfaced at Pascagoula, Mississippi, in June 1977 because of taste and odor complaints and is being intensively studied by federal authorities. The Environmental Protection Agency (EPA) and the Food and Drug Administration have overlapping cognizance, and their respective roles were still not resolved as of early September. The EPA lab at Athens, Georgia, has shown that 17 different organic chem-

icals from the tar have appeared in samples of the water taken from the storage tank at Pascagoula, in the parts-per-billion range—some of them chlorinated benzene-type compounds, and nearly all of them toxic.

By coincidence, this problem came to light just after publication of the National Academy of Sciences' *Summary Report on Drinking Water and Health*, issued on 23 May 1977. The report, commissioned by EPA under the Clean Water Act at a cost of $1 million, strongly condemns both coal tar and asbestos as carcinogens, but does not emphasize that both are widely used construction materials in contact with potable water.

Resolution of this problem will be difficult because of the great cost of potential recoating and replacement of tanks and pipes, the large commercial interests and federal responsibilities involved, the strong scientific findings of a cancer hazard, and the federal obligation to ensure clean water and food.

ROBERT S. FORD
Robert Ford Associates, Post Office Box 1306, Pascagoula, Mississippi 39567

Medical School Tuition

In a quote in the briefing "Future doctors balk at bill" (News and Comment, 9 Sept., p. 1063), Jack O'Dowd, Northwestern University's director of university relations, appears to lay blame for the university's ". . . bungling the original announcement" of the rise in medical school tuition, and the subsequent lawsuit filed by the students, on the administration of the medical school. As in most universities, Northwestern's central administration makes the budgetary decisions. Individual schools have no more than advisory input. When the dean of the medical school went on vacation, he was told that no decision regarding tuition had been made. While he was on vacation, the university administration increased the tuition at the medical school by 57 percent and told the students about it by way of a press release. It is clear to the students that the medical school administration was opposed to the enormous tuition increase. The blame for the bungling of this affair and the subsequent lawsuit lies with the university administration, not with that of the medical school.

PAUL BROWNSTONE
Medical School Student Senate Tuition Committee, Northwestern University, Chicago, Illinois 60611

30 September 1977, Volume 197, Number 4311 SCIENCE

Public Opinion and Energy Use

A large fraction of the public behaves as if there were no energy problem. This summer gasoline consumption has been setting records. Sales of automobiles during August were at a peak for the month. Use of electricity has been at an all-time high. Consumption so far this year is more than 7 percent above that of a year ago. The present behavior is consonant with polls which indicate that a majority of citizens are uninformed about energy problems. Only 48 percent of the people know that we must import oil to meet needs.*

Our energy reserves and producing capacity continue to deteriorate. Four years ago the rate of domestic production of crude oil was 9.4 million barrels per day (mbd) and imports were about 5.7 mbd. Today, even with Alaskan oil, domestic production is 8.4 mbd while imports of crude oil and products are about 8.5 mbd. During the first 6 months of this year, imports were 31 percent above those of the corresponding period of last year. In part the spurt is related to decreasing availability of natural gas for industry. Low-priority consumers of natural gas are switching to oil products. Thus, when the next curtailment of foreign oil imports comes, the damage could be serious.

The facts about our vulnerable position are well known in Washington and among educated people generally. But we live in a democracy, and the pace of the nation's response to energy problems is being set by those who are not well informed. In one poll,* only 26 percent of the respondents lacking high school diplomas believed there was an energy shortage, in contrast to 58 percent for college graduates. Other surveys† have shown that those who believe there is an energy shortage are most willing to turn down thermostats, carpool, or buy compact cars. They tend to use less hot water, close off unused rooms, and insulate the attic. The behavior of these people contrasts with the half of the population that does not believe adding more insulation to their homes will help save energy. Half the people surveyed thought that one must decrease the temperature 5°F in order to save energy. They did not know that a decrease of a degree or two would be helpful.

Surveys† conducted during the natural gas shortage last winter revealed interesting behavior. At that time President Carter asked the people to set their daytime temperature at 65°F and nighttime temperature at 55°F. When polled by telephone, people said they were keeping their homes at 66°F during the day and 64°F at night. However, when pollsters went to homes carrying their own thermometers, they found that the average temperatures were 70° ± 2°F during the day and 69° ± 2°F at night.

In this instance the urging of a popular President was not very effective. Other surveys† have also shown that exhortation is of little lasting value. The most influential factor is cost. European countries have long influenced energy use by taxing it. However, in this country such a policy is at present not feasible. When asked, "Do you think it would be fair or unfair to you if gasoline taxes are increased until most people drive less?" 26 percent of the people thought it fair while 66 percent considered it unfair. Among those who believe that the shortage is real, the split was 40 fair, 53 unfair. In contrast, among those who believe the shortage not real, the split was 13 fair, 80 unfair.*

Conservation is the fastest means of meeting short-term energy problems. We will make little progress toward energy security until there is broader public belief in the reality of oil and natural gas shortages. An obvious need is better targeted communication. For example, our dependence on foreign oil should be made clear to all. There are many public interest announcements on radio about air pollution. They are effective. There are occasional items about energy but seldom if ever anything about oil imports. This lack should be remedied.—PHILIP H. ABELSON

*A. J. Parish, *New York Times*, 1 September 1977, p. 1. †J. S. Milstein, "How consumers feel about energy: Attitudes and behavior during the winter and spring of 1976–77" (Federal Energy Administration, Washington, D.C., June 1977).

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- Hypergeometric
- Gaussian (normal)
- Gaussian Inverse
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Permutation
Combination
Factorial

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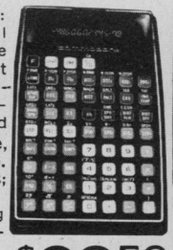

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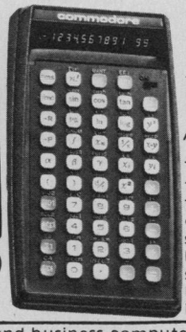

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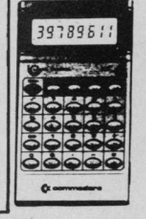

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Book: F. Dachille and R. Roy, *Modern Very High Pressure Techniques* (Butterworth, London, 1961), pp. 163–180.
Chapter: F. Dachille and R. Roy, in *Reactivity of Solids*, J. H. de Boer, Ed. (Elsevier, Amsterdam, 1960), p. 502.

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.

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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.

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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.

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.

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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.

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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.

AAAS–Newcomb Cleveland Prize
To Be Awarded for a Report Published in *Science*

The AAAS-Newcomb Cleveland Prize, which previously honored research papers presented at AAAS annual meetings, is now awarded annually to the author of an outstanding paper published from September through August in the Reports section of *Science*. The second competition year under the new rules starts with the 2 September 1977 issue of *Science* and ends with that of 25 August 1978. The value of the prize has been raised from $2000 to $5000; the winner also receives a bronze medal.

To be eligible, a paper must be a first-time publication of the author's own research. Reference to pertinent earlier work by the author may be included to give perspective.

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

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

Reports

Early Flakes from Sozudai, Japan: Are They Man-Made?

Abstract. *Some archeologists consider the lowest component of the Sozudai site to be evidence of a human occupation of southern Japan during the early Würm period. Others deny that the Sozudai objects are artifacts. With separate test procedures, flakes in the Sozudai assemblage were identified and compared to the standard developed by A. S. Barnes. These procedures indicate that flakes in the Sozudai assemblage are of human origin.*

The major controversy in Japanese Paleolithic archeology today centers around the identification of the oldest cultural remains in the Japanese Islands (*1*). It is now almost universally agreed that Japan was occupied during the later part of the last glacial period by cultures generally similar to other Eurasian Upper Paleolithic groups. Some archeologists believe that the remains of these Upper Paleolithic groups are the oldest so far found in the islands and that their creators probably arrived to find an uninhabited area in what is today Japan (*2*). However, a number of prominent archeologists are convinced that they have found sites and stone artifacts of earlier cultures. These earlier assemblages are assigned to the mid-to-early Late Pleistocene and might be generally aligned with the East Asian Chopper–Chopping Tool Tradition or with the "Early Paleolithic" (*3*). To those that favor the later arrival of human groups, all of the proposed earlier sites are suspect. The geological context of some finds is suspect, but more often the detractors simply do not believe that the crude objects said to represent the earlier cultural remains are man-made (*4*). Several typological discussions of the early materials have been presented (*5*), but until now identification or rejection of the early stone tools has been based on intuitive and subjective judgments. I present here an objective appraisal of one well-known early assemblage from the site of Sozudai in northeastern Kyushu.

Recently archeologists and physicists have begun to investigate the physical basis of flaked stone objects (*6*). Hopefully this research will eventually yield a theoretically based method for differentiating between naturally and artificially flaked stone objects. Such a method is not yet available. The most satisfactory means of making the differentiation between artificial and natural flaked stones remains the empirically based procedure developed in the late 1930's by Barnes (*7*). Barnes observed that assemblages of artificially flaked stones could be differentiated from groups of naturally chipped stones on the basis of the core angle between the surface struck and the scar left by the flake that was removed (Fig. 1). He found that in artifact assemblages this angle was acute in at least 75 percent of the cases, but that among naturally fractured stone 40 percent or more of these angles were obtuse. More recently Ascher and Ascher (*8*) pointed out that Barnes's method can be validly applied only if collecting and sampling procedures do not interject a bias into the measured population.

Sozudai is a multicomponent archeological site located on the 35-m terrace of Beppu Bay in northeastern Kyushu. It has been tested several times. The sample that I discuss here was recovered from a trench 3 by 4 m (designated trench P) excavated in 1964 by C. Serizawa and a field party from Tohoku University. Stones, which Serizawa believes are artifacts, are attributed by him to the early phases of the last glacial period. They were found in and near a buried gravel layer which was below and unquestionably isolated from overlying Jomon and late Paleolithic cultural horizons. The terrace on which the site is located was apparently formed during the Shimosueyoshi Transgression, which occurred during the Riss/Würm Inter-