SCIENCE

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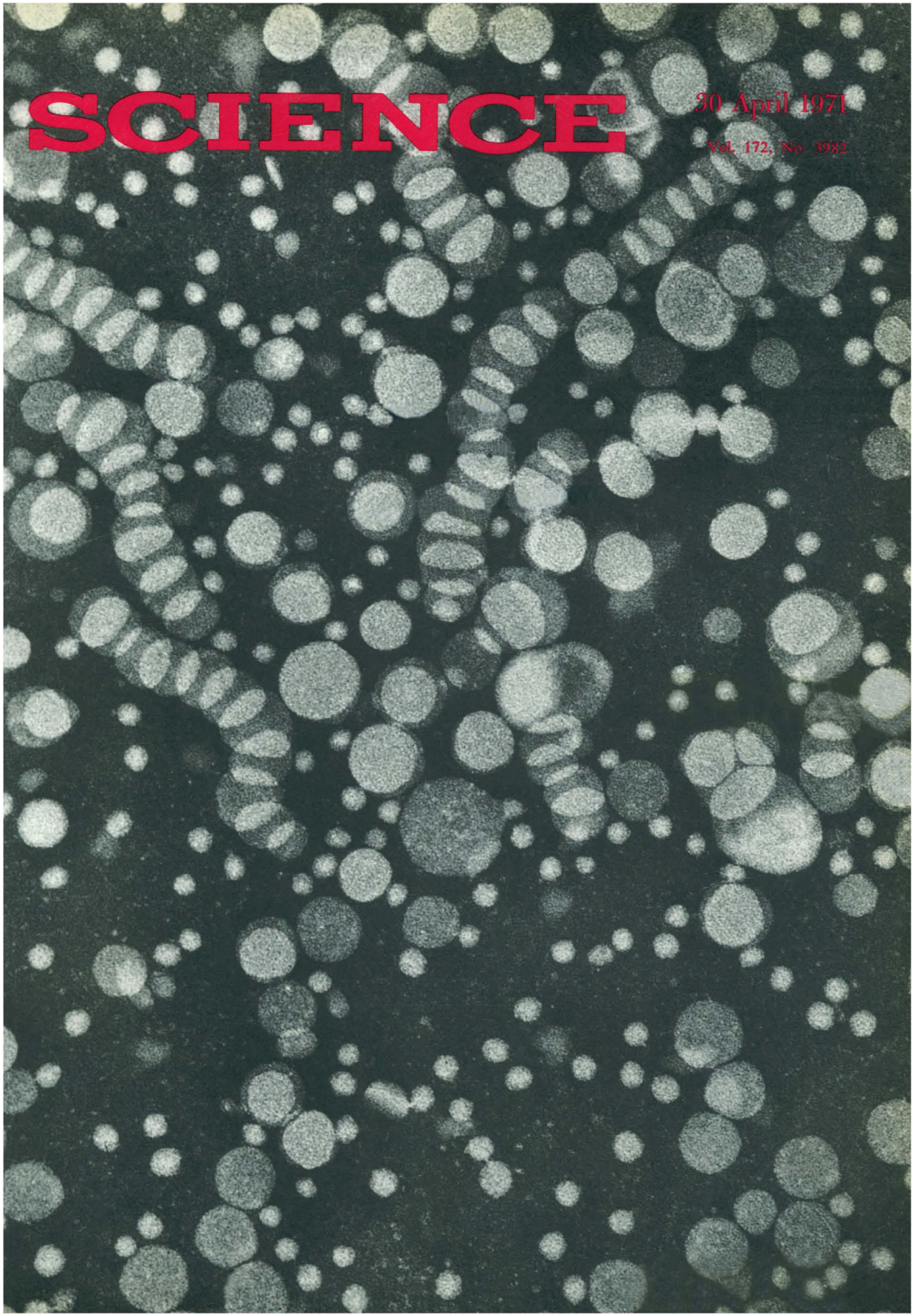

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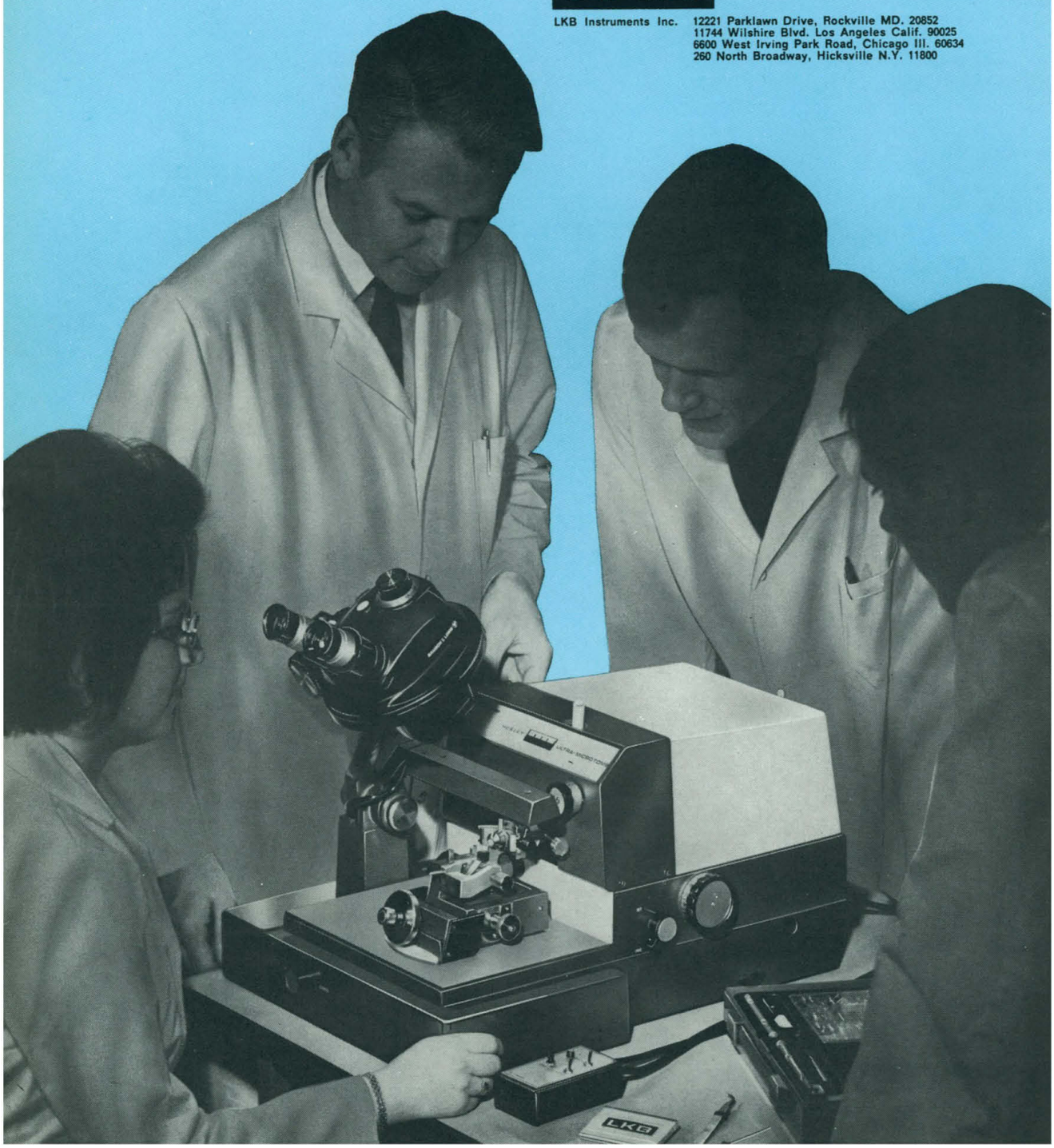

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SCIENCE

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COVER

Human serum lipoproteins from a patient with bile duct obstruction (cholestasis), separated by ultracentrifugation. Larger particles (400 to 600 angstroms), appearing as disks which tend to overlap, do not occur in normal serum. Smaller particles (about 200 angstroms) are normal spheroidal, low-density lipoproteins (about × 250,000). See page 475. [R. L. Hamilton, University of California School of Medicine, San Francisco]

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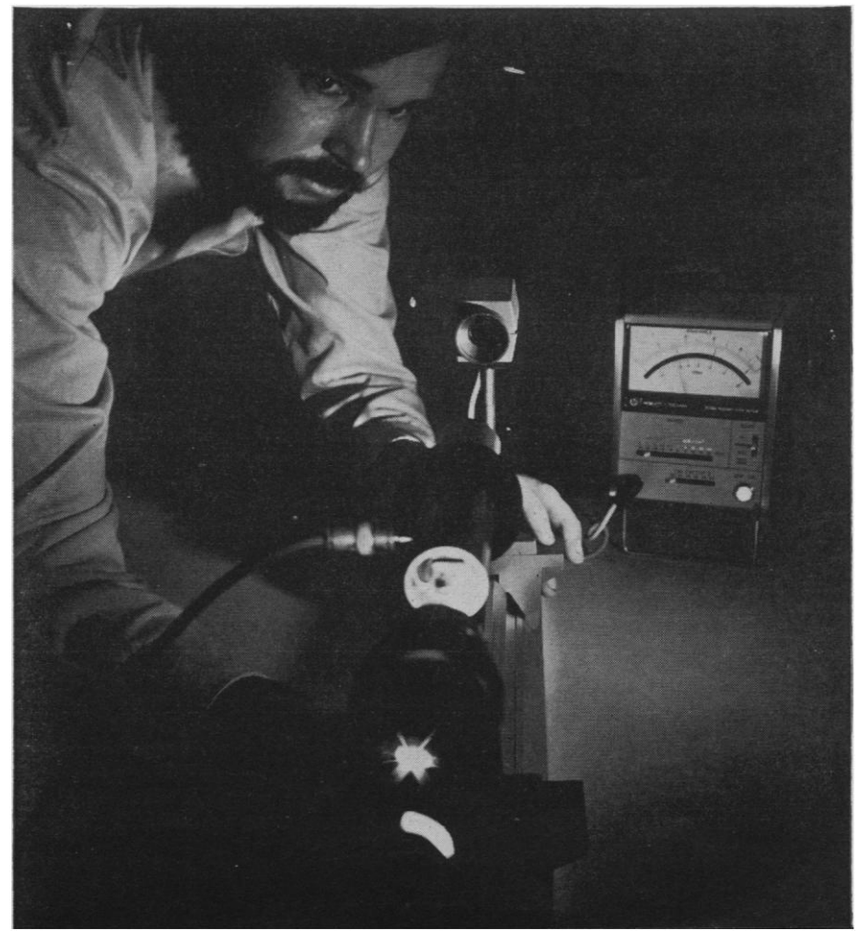

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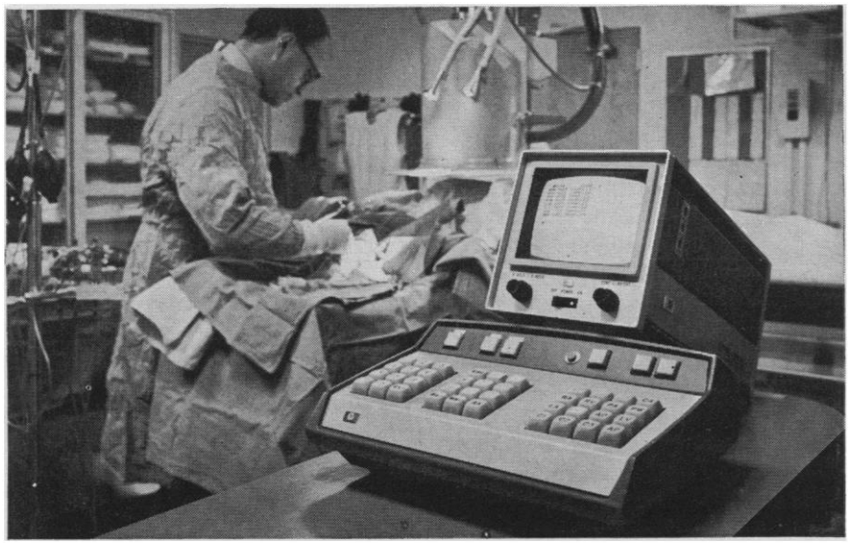

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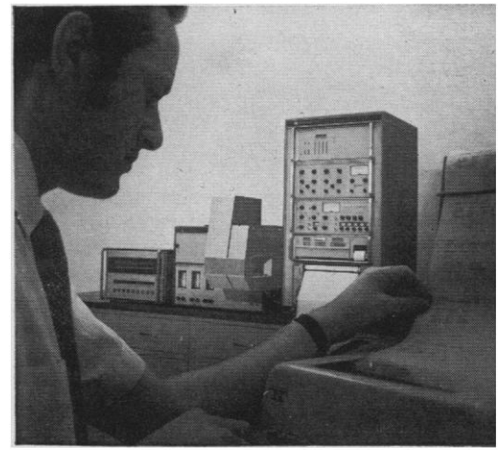

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LETTERS

Space Programs: Who Benefits?

In a letter "Manned space exploration" (26 Feb.), Warren Weaver deals harshly with the space program and particularly the manned space program, using peripheral statements from an advocate position given in a letter "Case for Apollo" (4 Dec. 1970) by A. W. England, and a "pathetic and ridiculous" 1966 list of space-related medical progress from the office of the then Vice President of the United States. The fact of the matter is, however, that the space program—manned and unmanned—is considered to be at the leading edge of science and technology, whether we like it or not. The term "science and technology" is used together advisedly, for this writer believes that the separation into art and commodity has served both ill in the past. So, now, there is a general malaise and disaffection with research and development and no major scientific or technical program, including research and development on a pollution-free engine or a billion dollars to support every qualified cancer research scientist, favored by Weaver, is likely to meet with endorsement by the electorate. And, as Bentley Glass indicates (8 Jan., p. 23), some of our peers no longer see endless horizons in science.

Let us be realistic about the space program. Weaver says, "It has become very clear that the space program is not, in essence, a scientific program." It never really was. It was started as a matter of national concern over the Soviet entry into space; in effect, as a prophylactic defense measure. To the extent that there is a segment of industry serving national needs, it served that need. As we became more sure of our technical ability in the field, it became a national goal over and beyond defense and an adventure of the human spirit. The mantle of science neither really gained prestige nor assured support, but science was utilized in its legitimate role as a guide and contributor to the list of desired accomplishments; it is questionable whether during the engineering phase of this immense task the science-user community could have had a greater influence. That phase is well along and it is now important to understand the more substantive arguments that Weaver "could easily state," but has not stated, against the space program in general and the manned program in particular.

It would appear that the ongoing questioning and reordering of our national priorities and the pervasive concern with the relevance of science and technology would deserve the most perceptive and informed dialogue that we are capable of. For what is really important is to decide how we respond to the public expression of faith implied by "If we can go to the moon, why can't we. . . ."

LEO STEG
General Electric Company,
Philadelphia, Pennsylvania 19101

Although fairly old (57), I am not old enough to accept Warren Weaver's head-in-the-mud opinion of space exploration. His comments sound like the criticisms of aeroplanes in 1930, or what may have been said to Queen Isabella in 1493. Such changes in technology as ocean-going ships, aircraft, and spacecraft have opened up new fields of exploration throughout the history of mankind, each one requiring a greater number of experts and dedicated men like astronaut Tony England. These groups, "monsters" according to Weaver, built our railroads, mined our coal, drilled for oil, and built our major industries. Some have needed controls, but they have all been "fed" with large amounts of American money; they demonstrated American initiative, and produced major benefits for the public.

At this stage, no intelligent man can oppose the space age. It has arrived, whether we like it or not, and it offers important advances in astrophysics, geophysics, and other sciences, possibly even biology. Of course, one can say that some of these sciences don't really *need* to be advanced, but Weaver's statement that "the space program is not really scientific" is demonstrably false. We must admit that much of the NASA budget he criticizes had to be spent on engineering developments, just as comparable funds had to be spent for similar purposes in nuclear physics. Few would doubt that science has been advanced by AEC's nuclear reactors, and I am sure that our scientific understanding of the solar system has been advanced by NASA's space missions. Hubert Humphrey may have selected poorly in lauding 31 "discoveries in space medicine that relieved human misery," but a good deal of recognized scientific research was not initially done for the purpose of relieving human misery! NASA research on solar flares, the solar

wind, and meteoroids may have been initiated with astronauts' well-being in mind, but astronomers value the results for quite different reasons, similar to those we place on the discovery of mascons, and the detailed quantitative analysis of lunar materials returned to earth (over 120 kilograms by Apollo manned missions versus 120 grams by the Soviet unmanned Luna 16).

The resignations over the past year of "numerous men engaged as scientists by NASA" may not support Weaver's nonscience argument as he thinks. These departures were a result of the cut in NASA's budget (as I well know!) by the Nixon Administration. They have led to unemployment among a productive group of scientists who could do little on the alternative goals of cancer research and automobile-engine design that Weaver suggests. (Of course, I am biased, but I suspect that major advances in space exploration, such as getting men to the moon and back, may enhance American morale and prestige far more than accelerating the attempt to save cancer victims, or diverting scientists to the political-economic problem of reducing harmful automobile exhaust.)

I hesitate to lecture Weaver on scientific exploration, but I think most AAAS members recognize that we seize on any new technique that can provide new data on the universe around us, or any new method of analyzing the data we already have—high-speed computers, electron microscopes, synchrotrons, and space probes. Instead of playing Don Quixote, Weaver should look for the ways we can *use* these "monsters" for scientific exploration.

THORNTON PAGE
Department of Astronomy, Wesleyan University, Middletown, Connecticut

Environment: Fanning the Flames

One hates to suggest that so distinguished a scientist as Philip Handler writes nonsense, particularly when much of his article on research support (15 Jan., p. 144) made good sense. However, his statement, "The predicted death or blinding by parathion of dozens of Americans last summer must rest on the consciences of every car owner whose bumper sticker urged a total ban on DDT," is certainly nonsense unless he meant to add ". . . and also urged the present heavy use of organophosphates." Handler seems not

to realize that the move to more toxic pesticides is due, not to bumper stickers, but to insect resistance to DDT. Insects live briefly and lay huge numbers of eggs, so they apparently will always become resistant to poisons before resistant strains of man can be selected. Is DDT now easy to ban because it does not kill most insect pests?

I failed to understand why Handler was not more concerned about the environment. His conclusion that natural disasters ("macroenvironment") "far exceed in human cost the relatively trivial damage yet done to man by the microenvironmental deterioration which concerns so many" did not reassure me.

In fact, his article moves me to suggest that the biologic nature of man must always put us at a competitive disadvantage during or after environmental changes. I assume that, as with the genetic message, the ecologic interactions of living things were produced by several billion years of trial and error evolution and that short-lived species with high rates of individual death (as in bacteria and insects) are able to adapt more rapidly. Chances are small that random mutation can produce a better adapted man within one (long) generation. Within the same time period, organisms with a high individual discard rate and rapid growth pass through many generations, with greatly improved chances for successful adaptation. Will broad-spectrum poisons normally degrade our long-term ecologic balance by favoring short-lived organisms? Presumably man survived and evolved in a world including natural disasters and disease, which caused individual deaths but no break in the continuity of the germ plasm. Insects survive a world with DDT, while evidence is accumulating that fish-eating birds do not survive. Considering their relative or absolute absence from the environment we evolved in, can we be sure that we and our life-support system can handle such recent environmental additives as mercury, cadmium, chlorinated hydrocarbons, asbestos, lead, photochemical smog, nitrous oxides, and so forth? If we are a tough or lucky species and survive, will we need or miss those that do not? If industrialized agriculture and human population increase together and we approach food monoculture, can we hope that resistant microbes or insects will not develop to produce results like those in Ireland in 1845?

To help compensate for biologic inflexibility, man has powerful tools, including science and technology, but their use tends to lead to changes. Can we learn enough to protect ourselves and the living earth we need? Is there a general principle that environmental change, whether immediately beneficial or not, should always be considered as a potential source of a long-term disadvantage to man?

JOE L. GRIFFIN
10211 Lorain Avenue,
Silver Spring, Maryland 20901

Handler says: "Indeed, virtually everything important now understood about cancer, and the most promising clues to future chemotherapy were provided by investigators who did not know that they were 'working on cancer'." The only advances in cancer research—including chemotherapy—which have produced any demonstrable improvement in the prevention or treatment of cancer in the past 20 years have come from scientists who were well aware that they were "working on cancer" because they had dedicated their lives to this mission.

For the past 20 years it has been fashionable in scientific circles to deride and otherwise put down mission-oriented research. Many years ago when I was at Cornell University Medical College the discoverer of the "Pap" test—one of the few real advances in the control of cancer in the past generation—was also there. He was a nobody. The "important" people were the wheeler dealers—people who had made no real contribution to medicine or to science but who were able to promote large sums of money. Many such people are now in the upper echelons of the scientific hierarchy. However, we cannot expect to restore public confidence in science until such persons are replaced by scientists with a record of actual achievement and of consistent action on behalf of the public.

IRWIN D. J. BROSS
Roswell Park Memorial Institute,
Buffalo, New York 14203

Not only do I endorse Handler's concern, but also I want to add emphasis to his contention that research is relevant to today's problems. The Food and Drug Administration is an important interface between the scientific community and mankind (including, of course, our scientists). In FDA we are in need of new approaches to many problems that may be new only because recent technological advances have made their recognition feasible. To this

end, we are urging the development of research approaches that recognize both halves of the risk-benefit ratio and which will help assess the risks that man encounters from the chemicals already widespread in his environment.

Since such research has an immediate need for application there will be many who will dub it "applied" research. However, the questions that it will answer are as fundamental to all of us as any "basic" research that could be undertaken. We need the understanding of the scientific community in seeking these crucial answers.

CHARLES C. EDWARDS
Food and Drug Administration, Washington, D.C. 20204

I have no desire to fan the flames of an unnecessary quarrel which appears to reflect overreaction to my statements by individuals with whom I agree in general but who are very deeply wed to particular points of view. It is because I am concerned for the environment and because I appreciate the biological lessons Griffin fights that I suggested that sparing use of chlorinated hydrocarbons at minimal dosages and only for specific purposes may be wiser than total ban and replacement by other chemicals whose consequences may be yet more disastrous. Nor do I in any sense derogate the contributions or imperative requirement for directed research. My concern is that we not so furiously pursue directed research, particularly in the newly fashionable multidisciplinary mode, that we injure our efforts in fundamental research—which is still the goose laying the golden eggs.

PHILIP HANDLER
National Academy of Sciences, Washington, D.C. 20418

Excessive Anonymity

It is well recognized that bureaucratic directives may often interfere with the proper performance of certain scientific research. Some years ago, shortly after the start of the civil rights movements, a furor was raised in the Northern press when it was learned that many, if not most, blood banks in Southern states maintained segregated donor blood supplies. The obvious reason for this segregation was that Negro blood was not to be transfused into Caucasians. The question of whether there was any scientific validity for such segregation was put to many eminent scientists in the blood banking field and elicited a unanimous negative. The stand taken by the scientific community was that as long as proper compatibility tests are performed, it matters not one whit what the source of the blood. As a result of the notoriety given the issue, and because of the unanimity of the opinion of the scientific community, the Department of Health, Education, and Welfare issued a directive forbidding segregation of donor bloods in blood banks where its control could be enforced.

Not only was it prohibited to make note of the racial origin of the donor on the blood container, it was also prohibited to make any note of the racial origin on the blood bank records. Thus the information as to whether Jack Jones who gave blood on a certain day to a certain blood bank was Negro, Caucasian, Indian, or whatever was lost forever.

Recently, as part of a study of the genetic control of antibody specificity, I tried to collect blood samples from Negroes who had produced certain antibodies. I wrote to many blood banks in many states requesting that they send me as many Negro-derived antibody-containing blood specimens as they could. The responses have been that if a Negro individual is being investigated at this very moment, then a specimen can be sent me. Blood bank personnel cannot screen their name files of individuals possessing antibodies to determine what the racial origins of these persons might be because the information does not exist. I find the situation deplorable, for a whole line of productive research may be closed to me or, if not actually closed, I will find that entirely unnecessary obstacles have been placed in its way.

For record-keeping purposes, racial differences are just as important as differences in sex and age. In these days of egalitarian movements, isn't it possible that there are those who might protest the notation of the sex or age of a donor on his registration card? Should we act to accommodate each such protest without examining all the implications?

Our societal responsibility is not only to deal equitably and justly, but also rationally. Attempts to implement the political belief that "all men are created equal" should not mandate the prohibition of the study of the differences between men.

HENRY GERSHOWITZ
Department of Human Genetics, University of Michigan Medical School, Ann Arbor 48104

30 April 1971, Volume 172, Number 3982 **SCIENCE**

On the Art of University Pruning

The present financial drought and the resulting need to cut back the activities of many universities *could* serve to saw off deadwood and to enhance the vitality, indeed quality, of the main plant in preparation, one would hope, for a new period of growth. As fond as one may be of rapid branching out and abundant blossoming, one must admit that the spring of the 1950's and 1960's fostered some rather wild, often unplanned offshoots, occasionally of poor quality. A pause in growth, if it does not last too long and does not cut too deep, could provide the needed time and incentive for review, for selective cutbacks, for consolidation, and for planning of future growth.

Unfortunately, most universities show little evidence of having mastered the difficult art of selective university pruning. Across-the-board cutbacks (for instance, budgets lower by 5 percent for all departments and schools), or a university-wide "freeze" on hiring or on raises, are the common pattern. Typically, a recent intrauniversity memo reads: "There has been considerable variability among the several schools of the University in increases in faculty salaries in relatively recent years. Obviously equity requires that those schools in which recent salary increases have been small be offered a larger option of increasing salaries than schools with the reverse history." Equity among divisions whose relevance to the university's main missions varies a great deal is the opposite of selective pruning.

Here and there half-hearted attempts at selective pruning are made; the budget of some divisions is not reduced, while everybody else is forced to give up 5 percent. However, only a few universities choose to *close* some divisions, which are not essential to their enterprise, and to *increase* the budget of others—or to rank their departments, promoting the fields in which the university may make a major contribution and achieve distinction, and neglecting the departments that seem unpromising or "hopeless."

Since pruning requires so much more leadership from university presidents, and an ability to mobilize consensus from the university community than across-the-board cuts, one ought not to be surprised that pruning is rarely practiced, but that it is practiced at all. Many universities now hit financially are just outgrowing a different sort of crisis, that of radical confrontations. The last crisis left in its wake a strong preference for "political" university presidents, who can deal with radical students, liberal faculties, and conservative trustees, with one goal in mind—to keep the university open without turning it into a garrison state. The president's highly "political" style seems to be particularly ill-suited for the strong leadership that pruning requires. In many universities, therefore, it is the faculties and the trustees who must find it in their hearts to demand that the pruning knife be wielded not with an eye to keeping everyone equally happy (or, more precisely, equally unhappy) but with an eye to the shaping of a greater university.

—AMITAI ETZIONI, *Chairman, Department of Sociology at Columbia University*, and *Director, Center for Policy Research*

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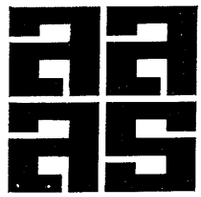

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4/30

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