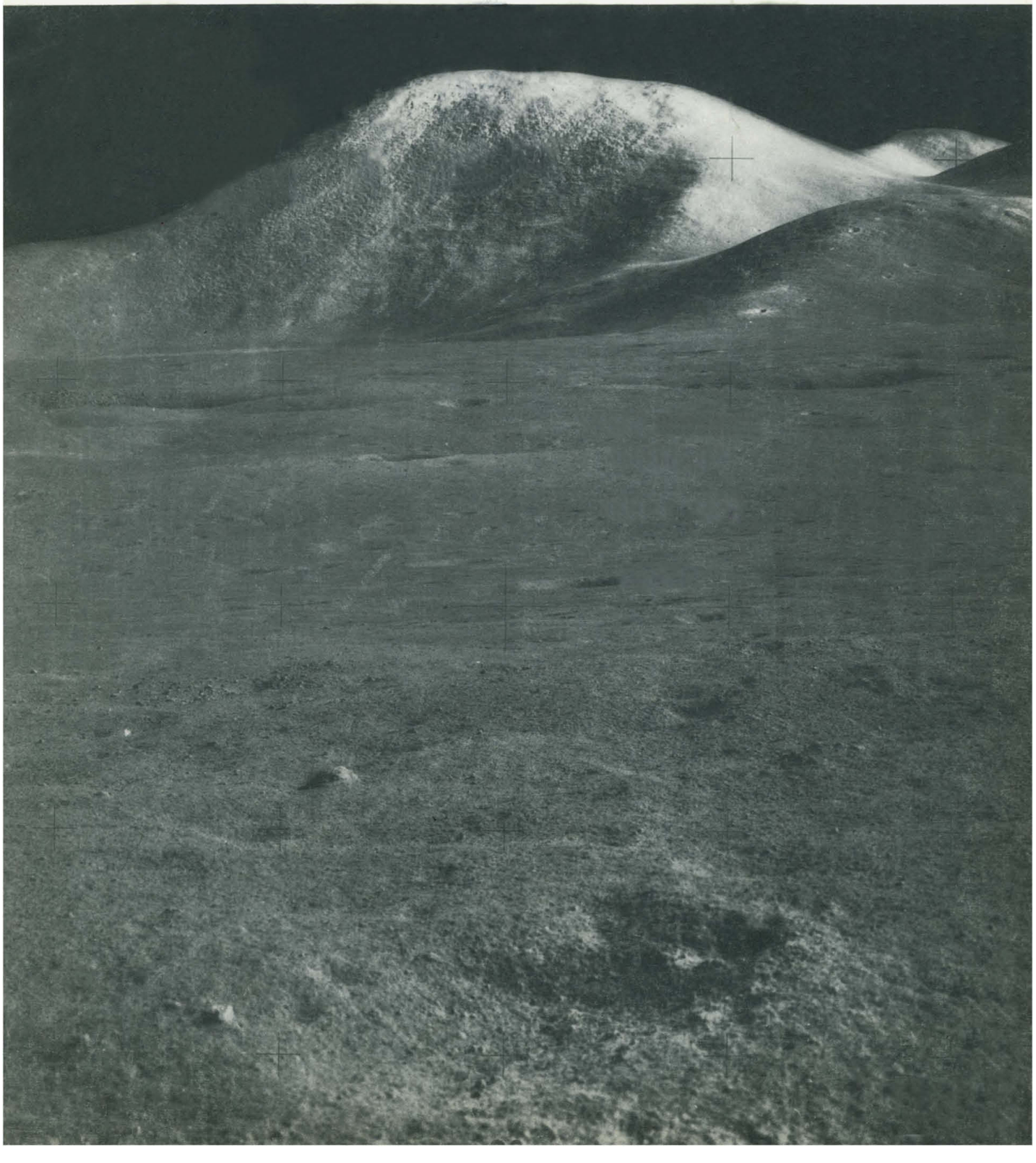
# SCIENCE

28 January 1972

Vol. 175, No. 4020

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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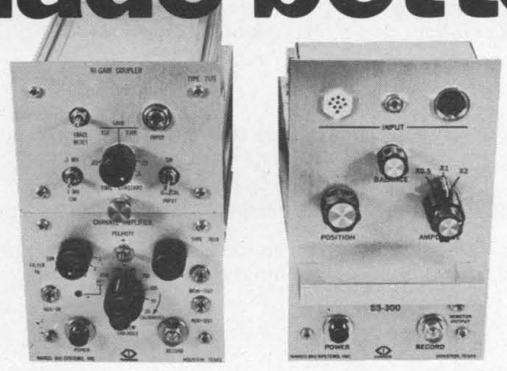


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AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





**COVER**

Mount Hadley, 12 kilometers northeast of the Apollo 15 landing site. The mountain rises more than 4500 meters above the cratered surface of Palus Putredinis (Marsh of Decay) in the foreground, and is a part of the Apennine Mountain front that forms the eastern margin of the Imbrium basin. See page 407. [Astronaut James B. Irwin, NASA]

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## Military Research and Development

Robert J. Bazell's report on the controversy over how much the United States should spend for military R & D (News and Comment, 20 Aug., p. 707) should have highlighted five critical points that underlie the debate.

First, the Federation of American Scientists (FAS), the General Accounting Office (GAO), and the director of defense research and engineering John S. Foster, Jr., all agree that the data do not permit precise comparisons between Soviet and U.S. military R & D funding. Foster says the error in official U.S. estimates of Soviet spending may be as large as 20 percent. This means that total military R & D expenditures in each country could be roughly equal; the Soviet Union may not spend more. Everyone also agrees that the rates of increase are clearly different; the Soviet effort grows more rapidly.

Second, Foster emphasizes that Soviet secrecy about their budget—and, more important, about their R & D programs —makes it difficult to gather and analyze the necessary data. Soviet secrecy about R & D is more important from our standpoint than Soviet secrecy about spending. (The FAS acknowledged this in their report but, oddly, did not give it great weight.)

Third, if about 80 percent of the secrecy that surrounds Soviet and U.S. R & D were removed, it would be in the interest of both countries. It would also clarify whether the U.S. government should take other action in R & D and in other areas. Less secrecy would help Foster and presumably please the FAS.

Fourth, there *may* be a valid analogy between Foster's argument that the Soviet Union could "assume technological superiority" and the arguments of a decade ago about the predicted decline in the U.S. trading position abroad. A few observers were aware in the early 1960's that the West Germans, Japanese, and others were developing the capability to seriously compete with large U.S. exporters of technological products, and that such a capability would ultimately lead to the balance-of-trade deficit we are now experiencing. Foster has been making a similar point for several years; we should recognize that past and current Soviet investments in military R & D *could* produce a substantial "national security R & D deficit" during the 1970's.

Fifth, arms control is critically needed to ensure international security and to relieve the economic burden of modern armament. With arms control, however, national security R & D should not be regarded as merely another component of the Department of Defense budget, ripe for massive cuts. If the United States is to maintain reliable arms control, we will need to (i) preserve a sophisticated strategic deterrent in whatever forms and at whatever levels are consistent with arms treaties agreed upon with the Soviet Union; (ii) avoid technological surprise; (iii) provide advanced strategic surveillance; (iv) supply U.S. allies with equipment tailored to their needs (rather than U.S. troops); (v) economize on U.S. military equipment costs through new "price dominated," rather than "better-performance-motivated," technological advances; and (vi) assess the technically complicated trade-offs between defense and arms control activities.

RODNEY W. NICHOLS
*Rockefeller University, New York 10021*

Advertising material received in November and December from the Federation of American Scientists (FAS), who are currently trying to increase their membership and raise funds, quotes the 6 May report of the prominent FAS Ad Hoc Committee on Military Research and Development (*1*). This report was also the subject of a news story in *Science*. The passage quoted in the advertisement reads, "This entire episode [the presentations of John S. Foster, the Defense Department's director of research and engineering, to various congressional committees] has been a classical numbers game featuring selective disclosure, questionable assumptions, exaggeratedly precise estimates, misleading language, and alarmist, non sequitur conclusions."

Such an intemperate statement on the part of some of our nation's most respected thinkers about a person whose unselfish devotion to his duty is almost proverbial surely needs some explanation. We know some of the members of the FAS committee, and also John S. Foster, and have long tried to understand the reasons for the disparity between their views. We have finally concluded that the reasons for the disagreement are not susceptible to logical analysis, but are based on different appraisals of what is best for the stability of our world. Foster wishes to assure the defense of this country even

against threats which are not absolutely sure to materialize but which *may* materialize. The FAS committee wants no defense measure adopted unless the threat which such a measure is to counter can be shown with certainty to be in the offing.

Foster wishes to expand our defense research in order to "minimize the possiblity of a technical surprise" (*2*). He is particularly afraid of such a surprise because of "the remarkable secrecy maintained by the Soviet Union over their R & D efforts" which "often leads to uncertainty about some areas of the longer term threat." In other words, he wants to be *sure* of our capability to defend ourselves—a difficult task but part of the responsibility of the officials of the Department of Defense. Foster cautions that his data are not precise, but he wishes to act in spite of the lack of absolute certainty. The FAS committee, on the other hand, demands that the motivation for defense expenditures be free from assumptions (assumptions, by their very nature, are questionable) and be based on precise numbers.

The four-man FAS committee does not oppose defense research under all conditions. The first page of their statement of 6 May (*1*) contains the passage "The Federation of American Scientists supports a vigorous program of research, and of development (R & D), on those weapons that are necessary to maintain a deterrent of unquestioned power." In view of this, we are unable to interpret the rest of the FAS statement, and its general tone, unless we assume that the committee insists on an *absolute* proof that the research to be undertaken be truly "necessary." Other parts of the FAS statement support this assumption. Naturally, in view of the tightness of the Soviet and Chinese security, immensely more effective than our own, such proof is very difficult to furnish—a point not brought out in the FAS statement. Nor does it bring out two other facts which support our need to stay, at least in research, well ahead of the Soviet Union. These are, first, the Soviet Union's shorter lead time, due in part to their more extensive building of prototypes—a practice resolutely opposed by the FAS committee. Second, the report does not mention that the Soviet government has the power to assign its scientists at will to military research. It is small wonder then that some Soviet scientists are terrified by the thought of a future in which some leader will say "The strategic balance has changed. We must exploit it."

We believe that the controversy between Foster and the FAS committee is the result of a difference in desires. If there is a chance that we are safe, the FAS committee does not want to strengthen our defense research. If there is a chance that we are in danger, Foster wants to strengthen our defenses.

EUGENE P. WIGNER
*Department of Physics,*
*Princeton University,*
*Princeton, New Jersey 08540*
ROBERT K. ADAIR
*Department of Physics,*
*Yale University,*
*New Haven, Connecticut 06520*

**References**

1. *Is There an R & D Gap?* (Report of the Ad Hoc Committee on Military Research and Development of the Federation of American Scientists, Washington, D.C., 1971).
2. U.S. Senate, Armed Services Committee, Subcommittee on Research and Development, *Hearings on Authorization for Military Procurement* (92nd Congress, 1st session, 1971).

## Stimulating Blood Donation

In his editorial "On stimulating the gift of blood" (13 August, p. 583), William Bevan supports H.R. 853, a bill to award a $25 federal income-tax deduction for "voluntary" blood donation. Not only could this bill cost the American taxpayers $30 to $40 million annually, but there is no certainty that it would accomplish its goal of increasing the quality and quantity of blood that is used in transfusion. A more basic question may also be raised, Is it right and necessary to convert most of our blood-donor population into one of de facto paid donors by legislative means?

The answer depends, as Bevan notes, on one's "faith in the altruistic principle." The principle appears not to work in the Soviet Union, where blood donation is rewarded by lavish government subsidies (*1*), but it is operative in England, Australia, and New Zealand, where voluntary donors supply 100 percent of the blood needs. That it can also work in the United States is shown by the successful operation of all voluntary, blood-donation systems in Seattle, Milwaukee, and other communities. Especially noteworthy is the success recently achieved in the recruitment of voluntary donors in New York City through the efforts of the Community Blood Council of Greater New York, which now

supplies 50 percent of the blood needs of that area.

Possibly H.R. 853 is needed to prod the American public into making the gift of blood that is so essential to the well-being of their less fortunate fellows and costs them only a few minutes of their time with slight physical discomfort. Even larger subsidies may be necessary to obtain kidneys, skin, and other tissues for the rapidly increasing demands of organ transplantation. On the other hand, cynicism and materialism may be less rampant than we are sometimes led to believe. Spared from legislation such as H.R. 853, perhaps we can yet follow the English example.


RICHARD H. ASTER
*Milwaukee Blood Center, Inc., Milwaukee, Wisconsin 53233*


**Reference**


1. J. Vaughn, *Transfusion* **7**, 212 (1967).


## National Register

Concerning the demise of the National Science Foundation's register of scientific and technical personnel (News and Comment, 1 Oct., p. 42), it should be mentioned that in the spring of 1970 the council of the American Sociological Association (ASA) voted to discontinue sending out questionnaires for the national register. This regrettable action was taken on the grounds that the ASA could not control the uses made of the data by government agencies and other persons and thus might subject the membership and other sociologists to inquiries to which they had not given their specific consent. The issue is related to a more general concern with the use and abuse of data banks (*1*).

Whatever the merits of this decision, the discontinuation of the national register is a blow to those who, like myself, have been engaged in research on the career lines of scientists and related problems. The register, with all its deficiencies, has been the most valuable instrument for tracing, on a large scale, the professional histories of individuals. It is to be hoped that a new, improved phoenix will rise from the ashes.


WALTER HIRSCH
*Department of Sociology, Purdue University, Lafayette, Indiana 47907*


**Reference**


1. P. H. Rossi, *Amer. Sociol.* **5**, 389 (1970).

One aspect of the usefulness of the national register is not mentioned in Gillette's account of its discontinuation. In contrast to an ad hoc survey of a particular field, all respondents to the register were required to declare what they considered to be their field of greatest scientific specialization or competence. In this way the "bandwagon" aspect was avoided that is so frequently associated with ad hoc surveys, and which often results in the overstatement of the degree of professional commitment to a particular field at a given time.

For this reason, despite the register's shortcomings, there was little reason to suspect it of bias. Useful conclusions concerning manpower trends over a decade could be drawn from the register's figures with a much greater degree of assurance than from two ad hoc surveys made 8 to 10 years apart.

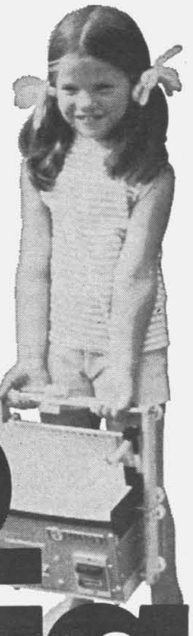
Particularly in interdisciplinary fields, ad hoc surveys can lead to erroneous conclusions about actual manpower. It is possible for an individual who described himself to the register as a chemical oceanographer to appear simultaneously on survey lists of "nutritionists" (through an interest in marine amino acids), "atmospheric scientists" (through an interest in air-sea material exchanges), and "public health workers," (through a faculty appointment in a department of a school of public health). The choices available in the register were carefully designed so that such side issues were identified, but the respondent was placed firmly in the field of his maximum professional competence.

JOHN LYMAN
*Department of Environmental Sciences and Engineering, University of North Carolina, Chapel Hill 27514*

### Apology to Rhine and Soal

During the past year I have had some correspondence with J. B. Rhine which has convinced me that I was highly unfair to him in what I said in an article entitled "Science and the supernatural" published in *Science* in 1955 (26 Aug., p. 359). The article discussed possible fraud in extrasensory perception experiments. I suspect that I was similarly unfair in what I said about S. G. Soal in that paper.

GEORGE R. PRICE
*1A Little Titchfield Street, London, W1P 7FG, England*



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SCIENCE



# NSF: A Look Ahead

One cannot long occupy the director's chair at the National Science Foundation without being struck by the fact that creative science in the United States is in a state of transition. And much of the feedback associated with this fermentation is focused on NSF, which in this country is often equated with creative science and scientists.

Science, as one of man's highest and greatest intellectual achievements, has had a pervasive and protracted influence on man, his way of life, and his environment. And nowhere has its power for change been so dramatic as in the United States. Most scientists hold that the destructive forces let loose by science can be properly focused and wisely used. Accomplishing these ends necessitates a major effort on the part of science and scientists—an effort dedicated to serving all of society and all of man. And while few can agree on the exact details, all concerned believe that science is indispensable for a future in which man is in reasonable harmony with his physical and social environment.

Historically, the National Science Foundation has devoted a large proportion of its resources to the pursuit of disciplinary science—research and science education motivated solely by the intrinsic needs of a discipline or the creative needs of individual scientists. This kind of programming has been highly successful and must continue, for it is the bedrock of all scientific enterprise. However, there must also be a heightened awareness of the requirements placed on all science, and for this reason a significant share of the total resources available to NSF in the future must be devoted to the social and technological needs of the nation. This, however, does not mean that the Foundation should be diverted from its earlier and historical purpose; in fact, this diversification should be construed as a means of strengthening that purpose.

To ensure success, this additional objective must have the cooperation of academic scientists, because a large number of the more creative scientists reside in academic institutions, and also because society and the nation have great need of broadly trained scientists who are highly motivated and capable of pursuing careers associated with the public interest.

To bring the best of science to bear on the social and technological problems of society requires at least three steps. A larger number of the most creative members of the scientific community must be encouraged to associate themselves with the great problems of man and society; for even though not all of the world's ills have a scientific or technological base, the thought patterns of science and its intellectual-material accomplishments are proof that science has much to offer society. The research and training institutions associated with creative science and the mechanisms used to support science must be more clearly focused and receptive to both the immediate and long-term interests of man and society. The National Science Foundation, as one of the most important federal institutions to promote the progress of science, must focus a larger portion of its resources on all of science—not just on academic science.

The social milieu within which the NSF finds itself has changed so markedly and so rapidly that we must not fail to accept the challenges offered by these new and pressing opportunities. We should recognize that, although science is one of the great cultural accomplishments of man, public support on the scale required for man's survival can be justified only as the needs of the larger society are recognized.

—W. D. MCELROY, *Director, National Science Foundation*

On 1 February 1972, Dr. McElroy will become chancellor of the University of California at San Diego.

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## BOOKS RECEIVED

*(Continued from page 406)*

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**Development of Mathematical Logic.** R. L. Goodstein. Springer-Verlag, New York, 1971. viii, 150 pp. $10.

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