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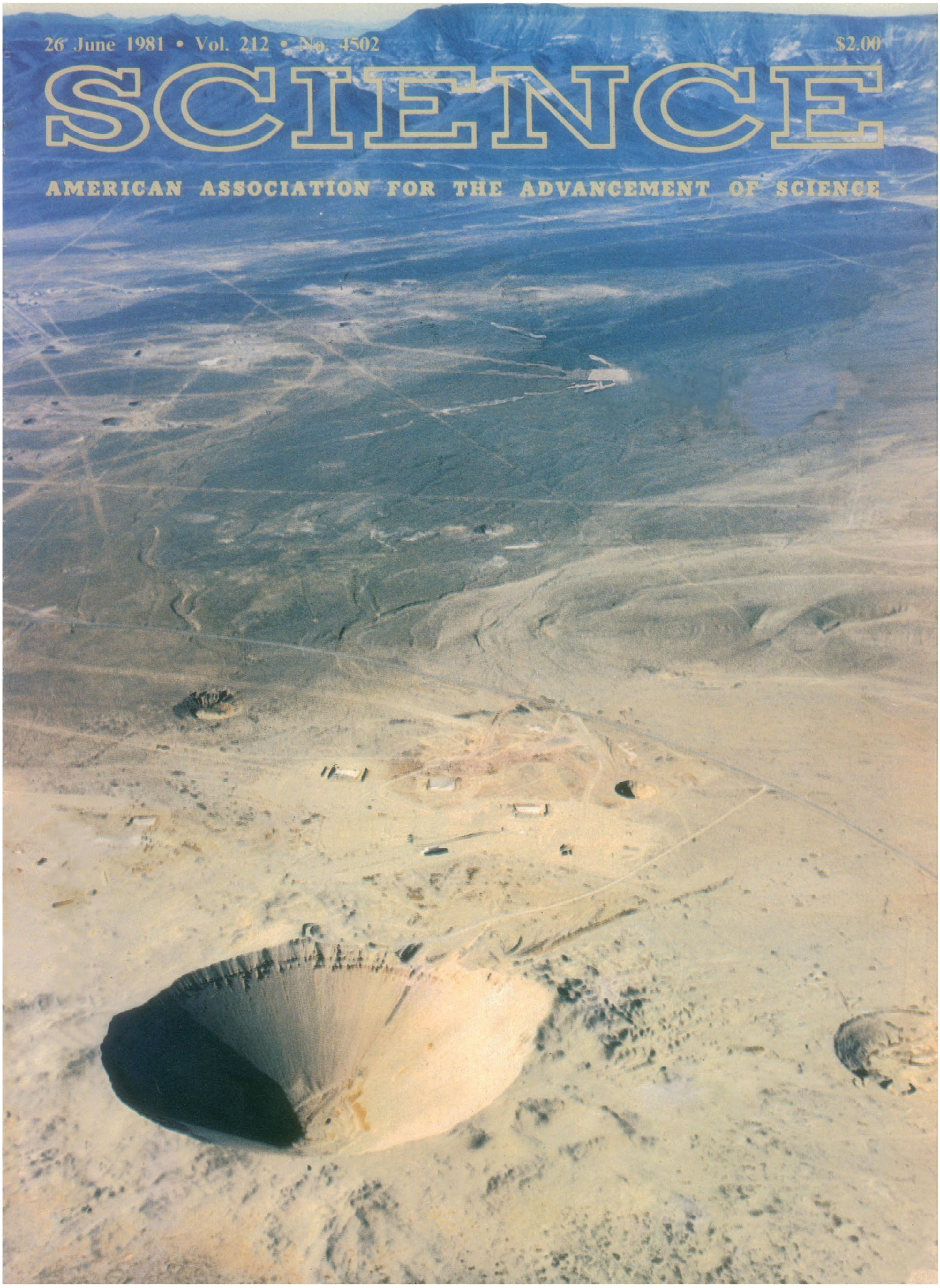

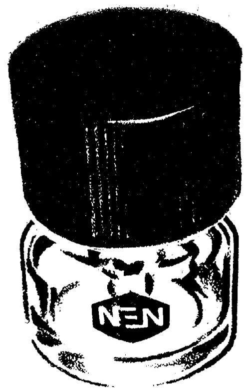

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COVER

View westward across Yucca Flat, Nevada Test Site, Nye County, Nevada. Sedan Crater, formed in 1962 by a 100-kiloton nuclear explosive, has a diameter of 370 meters, a depth of 98 meters, and a volume of 5 million cubic meters. Yucca fault scarp extends horizontally across center of photograph. See page 1457. [Photograph courtesy of U.S. Department of Energy, Las Vegas, Nevada]

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THE LEADING EDGE

#1 in a series of reports on new technology from Xerox

About a year ago, Xerox introduced the Ethernet network—a pioneering new development that makes it possible to link different office machines into a single network that's reliable, flexible and easily expandable.

The following are some notes explaining the technological underpinnings of this development. They are contributed by Xerox research scientist David Boggs.

The Ethernet system was designed to meet several rather ambitious objectives.

First, it had to allow many users within a given organization to access the same data. Next, it had to allow the organization the economies that come from resource sharing; that is, if several people could share the same information processing equipment, it would cut down on the amount and expense of hardware needed. In addition, the resulting network had to be flexible; users had to be able to change components easily so the network could grow smoothly as new capability was needed. Finally, it had to have maximum reliability—a system based on the notion of shared information would look pretty silly if users couldn't get at the information because the network was broken.

Collision Detection

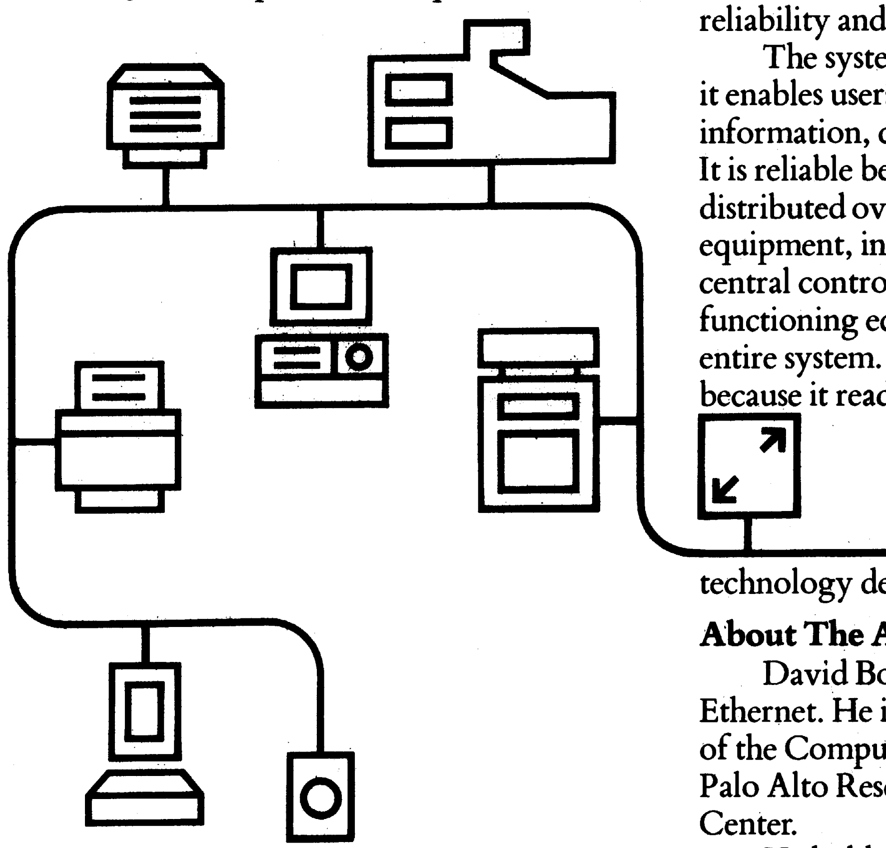
The Ethernet network uses a coaxial cable to connect various pieces of information equipment. Information travels over the cable in packets which are sent from one machine to another.

A key problem in any system of this type is how to control access to the cable: what are the rules determining when a piece of equipment can talk? Ethernet's method resembles the unwritten rules used by people at a party to decide who gets to tell the next story.

While someone is speaking, everyone else waits. When the current speaker stops, those who want to say something pause, and then launch into their speeches. If they *collide* with each other (hear someone else talking, too), they all stop and wait to start up again. Eventually one pauses the shortest time and starts talking so soon that everyone else hears him and waits.

When a piece of equipment wants to use the Ethernet cable, it listens first to hear if any other station is talking. When it hears silence on the cable, the station starts talking, but it also listens. If it hears other stations sending too, it stops, as do the other stations. Then it waits a random amount of time, on the order of microseconds, and tries again. The more times a station collides, the longer, on the average, it waits before trying again.

In the technical literature, this technique is called carrier-sense multiple-access with collision detection. It is a modification of a method developed by researchers at the University of Hawaii and further refined by my colleague Dr. Robert Metcalfe. As long as the interval during which stations elbow each other for control of the cable is short relative to the interval during which the winner uses the cable, it is very efficient. Just as important, it requires no central



control—there is no distinguished station to break or become overloaded.

The System

With the foregoing problems solved, Ethernet was ready for introduction. It consists of a few relatively simple components:

Ether. This is the cable referred to earlier. Since it consists of just copper and plastic, its reliability is high and its cost is low.

Transceivers. These are small boxes that insert and extract bits of information as they pass by on the cable.

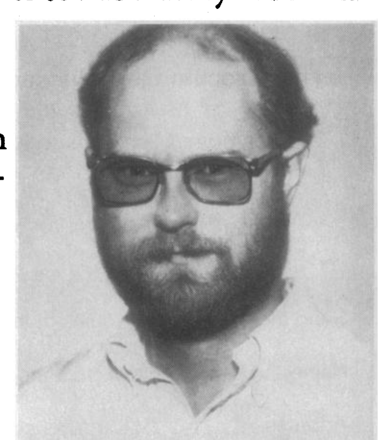
Controllers. These are large scale integrated circuit chips which enable all sorts of equipment, from communicating typewriters to mainframe computers, regardless of the manufacturer, to connect to the Ethernet.

The resulting system is not only fast (transmitting millions of bits of information per second), it's essentially modular in design. It's largely because of this modularity that Ethernet succeeds in meeting its objectives of economy, reliability and expandability.

The system is economical simply because it enables users to share both equipment and information, cutting down on hardware costs. It is reliable because control of the system is distributed over many pieces of communicating equipment, instead of being vested in a single central controller where a single piece of malfunctioning equipment can immobilize an entire system. And Ethernet is expandable because it readily accepts new pieces of information processing equipment. This enables an organization to plug in new machines gradually, as its needs dictate, or as technology develops new and better ones.

About The Author

David Boggs is one of the inventors of Ethernet. He is a member of the research staff of the Computer Science Laboratory at Xerox's Palo Alto Research Center.



He holds a Bachelor's degree in Electrical Engineering from Princeton University and a Master's degree from Stanford University, where he is currently pursuing a Ph.D.

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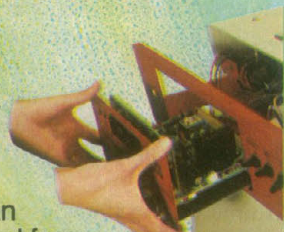

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that desired link until it was demonstrated to be an artifact (due to human conniving) because it did not meet the anatomical criteria predicted for the missing link according to theory. Thus, while evolutionary theory calls for a "missing link"—or more accurately, a series of such links—it also specifies the criteria by which any suspected link may be evaluated as factual, artifactual, or anomalous. In short, a theory must incorporate means for self-correction. Evolutionary explanations qualify as theories on these grounds.

But whether evolutionary theory is valid or not is only half the question in the present debates. For some reason most scientists are so busy defending their own discipline that they fail to see that the crux of the matter lies in the creationist camp. Can creationist accounts of life qualify as scientific theories? No—on no account. They are neither predictive nor postdictive. They do not limit what is possible in history; or, if they do (as in stating the age of the earth), they fail to do so in verifiable or falsifiable ways. Neither do they set criteria for the evaluation of data as fact, artifact, or anomaly. These creationist explanations have not even accrued epistemological validity through a history of accumulated research. Indeed, quite the opposite. And worst of all, creationist accounts are authoritarian, based primarily upon revelation rather than reason. Creationism is therefore not science; it is dogma.

It is time that the cards be placed on the table. The creationists are playing a nasty game of double standards. They use Popper to argue that evolutionism is not a theory; they do not point out that according to Popper's criteria, creationism is not a theory either. Indeed, according to Popper's criteria, creationism is not even science. Popper at least grants evolutionism *that* status (*4*). Thus, whether or not Popper's ideas are truly applicable to the present case, the creationists bear the brunt of the criticism which they wish to redirect at evolutionism.

It is time to stop the nonsense. Scientists and creationists alike need to start thinking more deeply about just what science is. This may be a philosophical and historical issue, but a little commonsense thinking by all concerned would not hurt. In fact, careful thought is needed very badly, for, as Alfred North Whitehead said, "When we consider what religion is for mankind and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation as to the relations between them" (*5*). At least let us not be blind to their differences in making that decision.

ROBERT ROOT-BERNSTEIN
*Salk Institute,
San Diego, California 92138*

References

1. B. Halstead, *New Sci.* **87**, 215 (1980).
2. M. Beckner, *The Biological Way of Thought* (Univ. of California Press, Berkeley, 1968), especially pp. 159–172.
3. R. D. Carmichael, *Logic of Discovery* (Open Court, Chicago, 1930); D. Hull, *Philosophy of Biological Science* (Prentice-Hall, Englewood Cliffs, N.J., 1974); A. Szent-Györgyi, *Introduction to Submolecular Biology* (Academic Press, New York, 1960), pp. 3–4.
4. K. Popper, *New Sci.* **87**, 611 (1980).
5. Quoted from I. G. Barbour, *Issues in Science and Religion* (Harper and Row, New York, 1966), p. 12.

Applied Social Science

Mazur (Letters, 22 May, p. 875) observes that social scientists have not constructed better social systems than laymen have. . . . Our failure to design improved social systems is due as much to our failure to esteem social scientists who do applied research as it is to the general lack of social scientific progress which Mazur implies. When applied social research and the development of social theory are done well, they become complementary processes. We need to hone the methodological tools and analytical skills that facilitate dovetailing of theory construction with social research which has an applied orientation. In fact, the feedback between theory and application is inadequately understood and is itself in need of further study (*1*).

Research into fundamental social processes continues to be needed. However, the substantial drop in federal monies available to social research requires that we seek alternative sources of funding in a marketplace which can be expected to demand that practitioners' concerns be taken into account. If we meet the challenge, the social sciences may benefit more than they are harmed.

LAURENCE CHALIP
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University of Chicago,
Chicago, Illinois 60637*

References

1. H. A. Simon, *The Sciences of the Artificial* (MIT Press, Cambridge, Mass., 1969).

Erratum: The legend to the photograph of spoil from strip mining (News and Comment, 15 May, p. 759) incorrectly reads: "Kentucky argued to bar this completely, but only after a fight." The caption should have read, "Kentucky *agreed* to bar this completely, but only after a fight."

Erratum: In the article "New A-bomb studies alter radiation estimates" (News and Comment, 22 May, p. 902), the reference to C. P. Knowles' research should have read: "power of the Little Boy bomb," not "Fat Man bomb."

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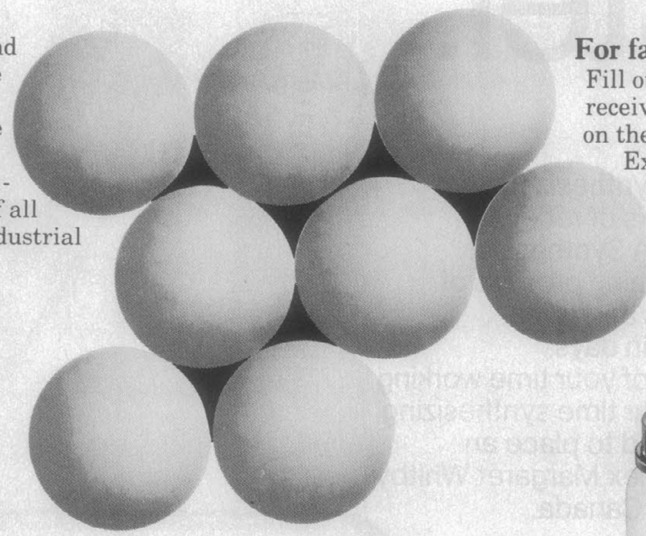

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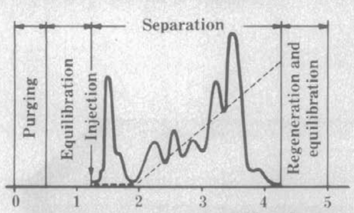

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SCIENCE

Charting a Course for Science

The naming of a White House science adviser has ended long months of suspense, and the appointment itself is an agreeable one. What remains to be seen is whether light will soon be shed on the course of national policies toward science, engineering, and education in the coming years.

From the sidelines, it seems safe to predict that the United States will invest heavily in science and technology throughout the 1980's. Counting both government and industry outlays, helped along by continued inflation, we will have little trouble in aggregating $1 trillion or more of expenditures on research and development over the course of this decade. When investment in productivity-building technology is added on, encouraged by tax incentives and burgeoning defense requirements, the scale in cumulative terms is numbing.

Then comes the question of what it is all to be in aid of. Current indications are that the bulk of the effort will focus on two predominant objectives, both of which have articulate constituencies: industrial productivity and the improvement of national security assets. Our science and technology "policy," if left to itself, will very likely emerge essentially in those terms. Aside from the merits of this agenda, which can be argued to a standstill, it seems to follow that the nation's policy for science and technology will be not nearly as pluralistic and eclectic as it was in the three preceding decades. What it means, should things turn out this way, is that science will travel on a narrower road, with fewer opportunities for browsing in the quiet side streets of scientific curiosity and surprise.

At least as troubling is the prospect that science as a method of inquiry into the social and cultural base of our nation and the emerging nations will be undervalued or even dismissed. Serious questions begin to arise. Will we address the meanings, the uses, and the limits of massive military and technological power? Will we assume simplistically that our political technology is advancing in wisdom and competence sufficiently to pace a national economy that will be scaled at $3 trillion to $4 trillion? Will we do enough to monitor social trends under the stress of such a superheated national economy? Will we take a different view of justice and generosity relative to the distance we are putting between ourselves and the Third World? These things matter just as much as the strength of our forces or the edge we regain in international markets.

Nor can we take for granted universal applause for the scale of scientific, technological, and economic exuberance that has been posited here. If the course we take is a thoughtless one, geared entirely to our own national preferences, it may well occur to some resentful nations that limits should be set on our power and leverage. Such limits, overt or indirect, could take the form of denial or diversion of basic resources and assets—minerals, fuel, rights of air and sea passage, exploration and extraction privileges, and the like. This is a game at which new skills are being honed, and they are not to be underestimated. What is needed on our side is not a retreat from global cooperation in science and technology as much as reorientation and fresh initiatives.

The conventional wisdom, with much evidence to support it, is that we are entering upon a stretch of conversatism in matters of both political economy and social policy. In such an abrupt turnaround, confusion of purposes is to be expected, and policies for science and technology will tend to adjust at the margins to uncertain signals, including some that are strongly ideological. The historians of science record too many dark chapters where science was captured by ideology, on the left and on the right of the political spectrum. If science ever has to stand and fight, ideology is its natural opponent.

As a new science adviser comes on the scene in the still formative months of new political leadership, he will find that he is on a fast track with too little time and few resources relative to what is on his plate. We wish him well.—WILLIAM D. CAREY