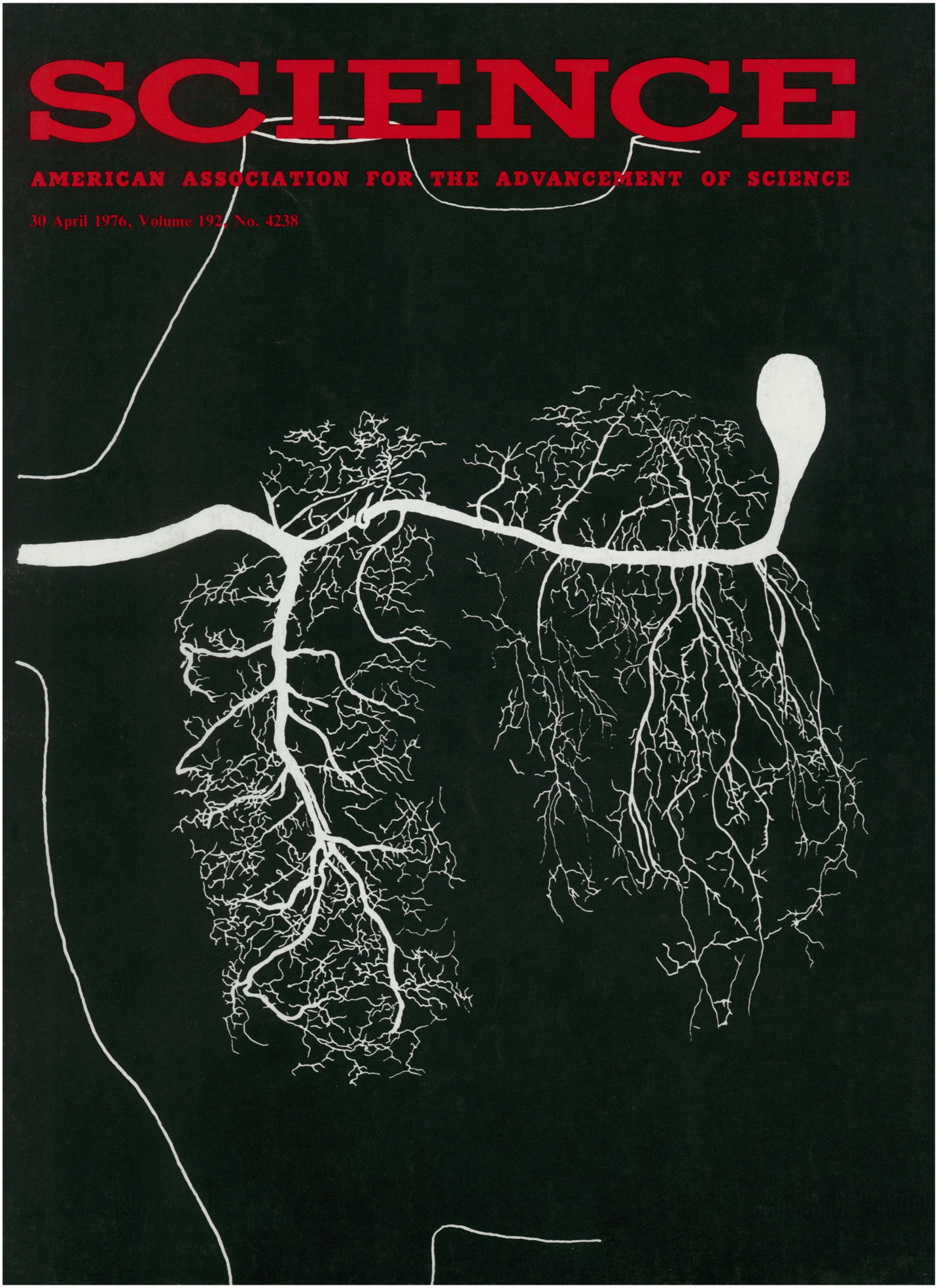
# SCIENCE

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

30 April 1976, Volume 192, No. 4238

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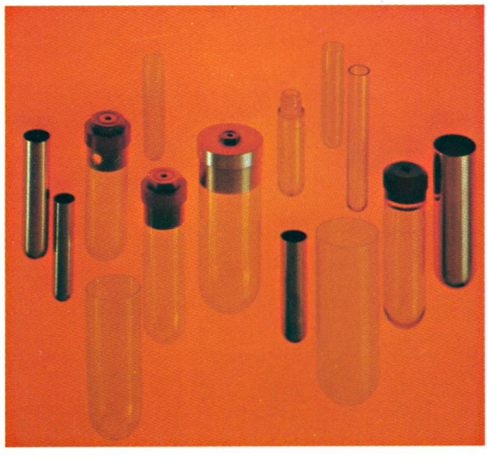

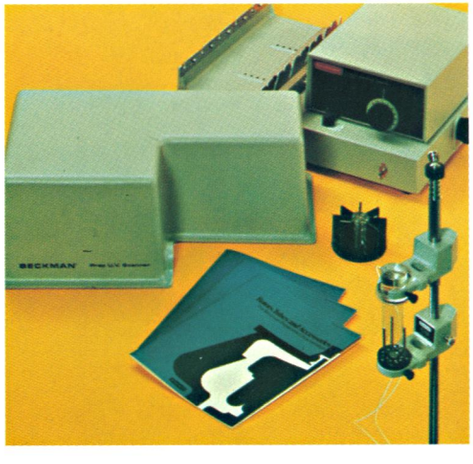


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# SCIENCE





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**COVER**

Reconstruction of the adult form of an identified abdominal motoneuron from the tobacco hornworm moth. The neuron performs different functions in the larva and the adult and, accordingly, shows a dramatic restructuring of its dendritic tree during metamorphosis. See page 477. [James W. Truman and Shirley E. Reiss, University of Washington, Seattle]

Height and Weight at Menarche and a Hypothesis of Critical Body Weights and Adolescent Events: *Rose E. Frisch and Roger Revelle*
Immigration Composition and Population Policy: *Charles B. Keely*
Cross-National Comparison of Population Density: *Alice Taylor Day and Lincoln H. Day*
Urban Growth and Decline: San Jose and St. Louis in the 1960's: *Peter A. Morrison*
Population and Pollution in the United States: *Ronald G. Ridker*
Birth Order, Family Size, and Intelligence: *Lillian Belmont and Francis A. Marolla*
Contraceptives and Dysplasia: Higher Rate for Pill Choosers: *Elizabeth Stern, Virginia A. Clark, Carl F. Coffelt, and Paul Shankman*
Birth Control after 1984: *Carl Djerassi*
Relevance of Demographic Transition Theory for Developing Countries: *Michael S. Teitelbaum*

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## LETTERS

### The Implications of Sociobiology

In his comments on our critique of E. O. Wilson's *Sociobiology* (*1*), Nicholas Wade (News and Comment, 19 Mar., p. 1151) correctly characterizes the basic issue as a political one. Indeed, it is the contention of our Sociobiology Study Group that Wilson's "new synthesis" represents an effort to cloak in modern terminology the age-old political doctrine that the main features of human social existence are biologically determined. As Wade notes, "*Sociobiology* teems with . . . provocative suggestions about human social behavior." It does so, moreover, on many topics of broad ethical, moral, and political import. The main purpose of our critique has been to point out precisely what those suggestions are and to show that Wilson's efforts to "biologicize" human sociality reflect a particular social and political perspective.

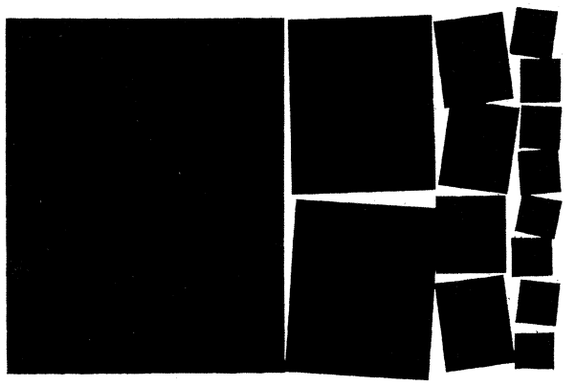
According to Wilson, our group has "utterly misrepresented the spirit and content" of his book. He contends that "the issue at hand . . . is vigilantism" and accuses us of condemning his work because its message does not conform to our own political convictions (*2*). Wade agrees with Wilson on both points. He says that we have "seriously" and "systematically distorted Wilson's statements to fit the position [we wish] to attack, namely that human social behavior is wholly or almost wholly determined by the genes," and he depicts us as a group of ideologues engaged in an unwarranted political attack against a work of objective scholarship. Like Wilson, Wade implies that we are conducting a personal vendetta against the author himself.

Readers of *Science* can only judge the truth of these accusations by reading Wilson's book (*1*) and our critique (*3*) for themselves. We strongly urge everyone to do so. We agree with Wade that we previously failed to recognize that Wilson was "hedging" in his statement about the existence of "conformer genes," and we apologize to him for implying that he asserted their existence as a matter of fact. But we can find no other instance in which we misquoted or otherwise misrepresented his position. We have no interest in cutting off debate. We contend that a careful reading of *Sociobiology* will suffice to rebut the charge of distortion and will confirm that the "new synthesis" contains numerous inconsistencies and transparent political messages. Although Wade's superficial and uncritical reading ignores it and Wilson's own statements disclaim it, we contend that there is politics aplenty in *Sociobiology* and that those of us who are its critics did not put it there.

In addition to rejecting Wade's charges we object to his journalistic treatment of the controversy as if it were merely a personal contretemps involving a few newsworthy scientists. By likening it to a "battle between titans" and by singling out one member of our group as Wilson's "critic-in-chief," Wade distorts and, in effect, trivializes the entire matter. The basic issue at hand is *not* one of vigilantism, personalities, or individual motives. We are engaged, rather, in a recurrent dispute over the social and political dimensions of scientific affairs.

Our central point is that sociobiology—like all science—proceeds in a social context; "pure objectivity" is as much a myth for sociobiologists as for science reporters. All attitudes toward sociobiology—ours as much as any—reflect certain political preconceptions which need to be made explicit. The weaker the constraint of fact, and the closer the subject to immediate human concern, the greater the influence of these preconceptions.

There can be no doubt that sociobiology deals with subjects of immediate human concern. We contend, further, that there are *no* constraining facts on several of the subjects with which Wilson's *Sociobiology* deals. One such subject concerns the genetic determination for supposedly universal behavioral differences between men and women. As a matter of fact, the biological basis of sex roles in society is a major issue in the book, and the way Wilson handles it offers an insight into his thought. Given the prevalence of sex discrimination in contemporary American society, we believe that there is an obvious political message in Wilson's assertions that "rampant *machismo*" has evolved in some insects (*1*, p. 320) and that "In [human] hunter-gatherer societies, men hunt and women stay home. This strong bias persists in most agricultural and industrial societies and *on that ground alone* [italics ours], appears to have a genetic origin" (*4*). Although he implicitly acknowledges the lack of compelling proof for his extrapolations from insects to humans and from past to present societies, Wilson goes on to "guess . . . that the genetic bias is intense enough to cause a substantial division of labor even in the most free and egalitarian of future societies" (*4*). Thus, to the political question of why sex discrimination persists at its obdurate extreme, Wilson answers, in effect, that it is *natural*:



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"many of the peculiar details of human sexual behavior and domestic life flow easily from [the] basic division of labor" which has evolved through natural selection (*1*, p. 568). The political message is clear: the way things *are* is the way they must necessarily be. And to those of us who would change the way things are, Wade quotes Wilson as warning against the effort to "steer" human society "past those stresses and conflicts that once gave the destructive [human] genotypes their Darwinian edge. . . . In this, *the ultimate genetic sense* [italics ours], social control [of human affairs] would rob man of his humanity."

Such assertions about the nature of human nature and society are contestable but they are not scientifically verifiable. For a scientist to promote them is an act that is certainly redolent of political implications. With equal impact, we wish to underscore the responsibility which scientists must bear for the political implications of their academic activities where prescriptions for social policy are consequent.

It deserves emphasis in this connection that natural selection presupposes that genes determine reproductive fitness and hence adaptive success in future generations. Thus, genetic determinism becomes the sociobiologist's ultimate answer to any question about human behavior. All behaviors and social structures which we observe are presumed to exist because they are or were adaptive. The logic is circular, the scenario appears to be predestined, and the result is a kind of parlor game in which prescriptive statements about human nature and human societies are couched in the language of descriptive science.

What we have argued, and continue to assert, is that sociobiological ideas do not arise in a social vacuum but rather reflect the dominant interests and attitudes of the class to which their authors belong. For centuries similar ideas, similarly unproven, have helped to preserve prevailing social conditions by lending an aura of manifest destiny to the particularities of a given time and place. What is natural must be destined, and what is destined cannot, indeed should not, be overcome.

We submit that, despite its bold theoretical poses, Wilson's *Sociobiology* embodies a form of social prophecy which coheres comfortably with the dynamics of modern market societies. It offers, under the guise of scientific objectivity, an invitation to cultivate what Wilson calls a "philosophical ease" (*4*) toward the unfolding of contemporary human af-

fairs. We find ourselves unable to maintain the ease required to accept discrimination, militarism, and social injustice as natural and inevitable reflections of some vast and insensate sociobiological scheme of things.


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**References**


1. E. O. Wilson, *Sociobiology: The New Synthesis* (Harvard Univ. Press, Cambridge, Mass., 1975).
2. E. O. Wilson, *BioScience* **26**, 183 (1976).
3. Sociobiology Study Group of Science for the People, *ibid.*, p. 182.
4. E. O. Wilson, *New York Times Magazine*, 12 October 1975, p. 38.


Criticism of E. O. Wilson by the Sociobiology Study Group should be a matter of serious concern to scientists in all disciplines. It is of course possible that some statements in Wilson's *Sociobiology* are in error. But to deduce from this possibility that Wilson's field of research should be abandoned is extremely dangerous for the scientific community as a whole.

The fundamental issues are intellectual, not political. Relations between genetic and environmental factors are incredibly complex in all primates, not to mention humans; some traits exhibit narrowly determined ranges of variability, whereas others are broadly variable from one individual or population to another (*1*). To exclude the study of genetic variables would thus be as absurd

30 April 1976, Volume 192, Number 4238 **SCIENCE**



# Energy Diplomacy

The Soviet Union is becoming powerful in energy matters while the United States continues its drift into dependence on others. Proved Soviet oil reserves are 80 billion barrels (11 billion metric tons) in contrast to 33 billion barrels for the United States. Soviet production is about 9.8 million barrels a day (b/d) and rising, that of the United States is 8.1 million b/d and dropping. The Soviet Union is a net exporter of oil; it reinforces its military control of Eastern European countries by sending them 1.4 million b/d. In contrast, the United States is importing about 7.2 million b/d of oil and its products.

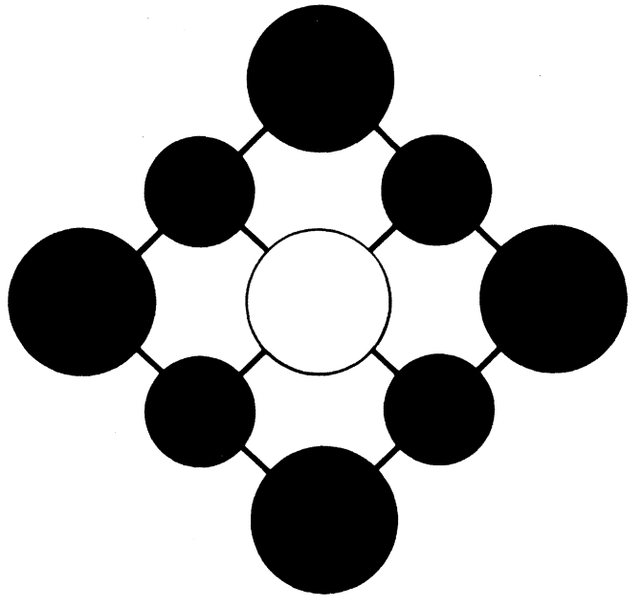
The proved reserves of natural gas in the Soviet Union (800 trillion cubic feet or 22.4 trillion cubic meters) are by far the largest in the world; those of the United States are 228 trillion cubic feet. During 1975, production in the United States (20.1 trillion cubic feet) exceeded that in the Soviet Union (10.2 trillion cubic feet). But U.S. reserves are declining rapidly. If present trends continue, which is likely, Soviet production will be exceeding that of the United States in about 4 years. Already the Soviet Union is an exporter of natural gas, and it has been negotiating with Japan and West Germany to supply part of their needs.

In late 1973 it was hoped that a combination of conservation and expanded domestic production of fuels would render the United States energy independent by 1980. This hope has been frustrated. For a short time during the embargo the public was conservation-minded, but this did not last and public consumption of energy has been increasing. A combination of industrial conservation measures and lower production levels cut overall consumption of energy by a few percent in 1974–1975. But in the first 3 months of 1976, electricity demand was up 5.9 percent from a year ago. The public, responding to a price rollback on domestic oil, has been burning more gasoline and buying the larger automobiles.

A major factor in the optimism of government officials during late 1973 was the expectation that higher prices would lead to greater production of oil. This was to be accomplished by exploiting new discoveries and by enhanced recovery of oil from existing fields. The higher prices did lead to more drilling activity, but in 1975 only 1.3 billion barrels of oil was found while a total of 6 billion barrels was being consumed. In 1973 enhanced recovery of oil from existing fields was a hopeful prospect. In existing fields, conventional techniques had produced roughly a third of the oil in place, leaving about 300 billion barrels. Thus an improvement of a few percent would make a big difference. More intense exploitation of earlier methods and use of some new ones has led to an increase of 270,000 b/d, but the Energy Research and Development Administration (ERDA) now estimates that only an additional 300,000 b/d will be forthcoming by 1985. Moreover, the cost of additional oil has been as much as $20 to $25 per barrel.

In early 1974 there was hope that substantial amounts of oil might be obtained from coal or shale. Now ERDA states that comparatively little synthetic oil will be available before 1985. As for using other major energy sources instead of oil, there has been little progress. Because of environmental constraints, consumption of coal has not expanded appreciably. Nuclear energy, which has replaced some oil in generating electricity, is under heavy attack. In consequence, there is no alternative but to expand dependence on foreign oil. At a recent press briefing, Exxon predicted that in 1985 the United States will be importing 11 million b/d. Most of it will come from the Middle East.

The United States has joined Western Europe and Japan in facing a long era of vulnerability to crippling damage from interruptions to energy supplies. The Soviet Union is not subject to such stoppages and indeed has much to gain by fomenting trouble. A new embargo is not the only hazard. The precedent of Angola suggests other scenarios for interruptions of oil from the Middle East.—PHILIP H. ABELSON



A New World of

# Materials:

## Renewable and Nonrenewable Resources

Edited by
Philip H. Abelson
and Allen L. Hammond

An important exploration of the new set of realities affecting the flow of raw materials—a probing of the increasing demand for them and the obstacles to their discovery and production.

A reliable flow of raw materials has been the fundamental factor in the health of the American economy and of the economies of all other industrial nations. While economic growth has begun once again in the United States and, more slowly, in Europe, it is predicated on a whole new reality of materials dramatically different from that of a decade ago. No longer can an abundance of basic commodities be taken for granted, and no longer can the supplying of any commodity be assumed continual. We have learned that the flow of existing materials is vulnerable to interruption by financial shifts, increased nationalization of foreign-owned properties, restriction of access to resources on public lands, and a host of other considerations born of the 1970's. In the development of substitute materials we must hurdle these obstacles and also adhere to new regulations for environmental protection.

In February 1976 *Science* devoted an entire issue to a critical in-depth look at these and related problems. The special issue contained 24 papers written by some of the country's foremost authorities. Thirteen more articles created by other, equally distinguished authors were added to the list, and the total is being published as a compendium to provide a meticulous look at *Materials: Renewable and Nonrenewable Resources.*

The compendium's authors probe the implications of national policy, energy constraints, environmental considerations on materials production and use, the perspectives in needs and supplies of resources, high technology materials, and renewable and reusable resources. They examine those materials issues most vital to industrial economics, the future of materials research, and the effect of the new realities on the quality of life.

The result is rare and refreshing—a detailed study which yields an identification of critical problems as well as the authors' consensus that, in principle, these problems are solvable. This overview must be studied by those involved in materials problems today, by those reaching for answers, and by all of us who will benefit from the solutions. Don't miss this vital collection of papers. A brief sampling of the compendium's contents reveals the importance of studying and dealing with these new realities.

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