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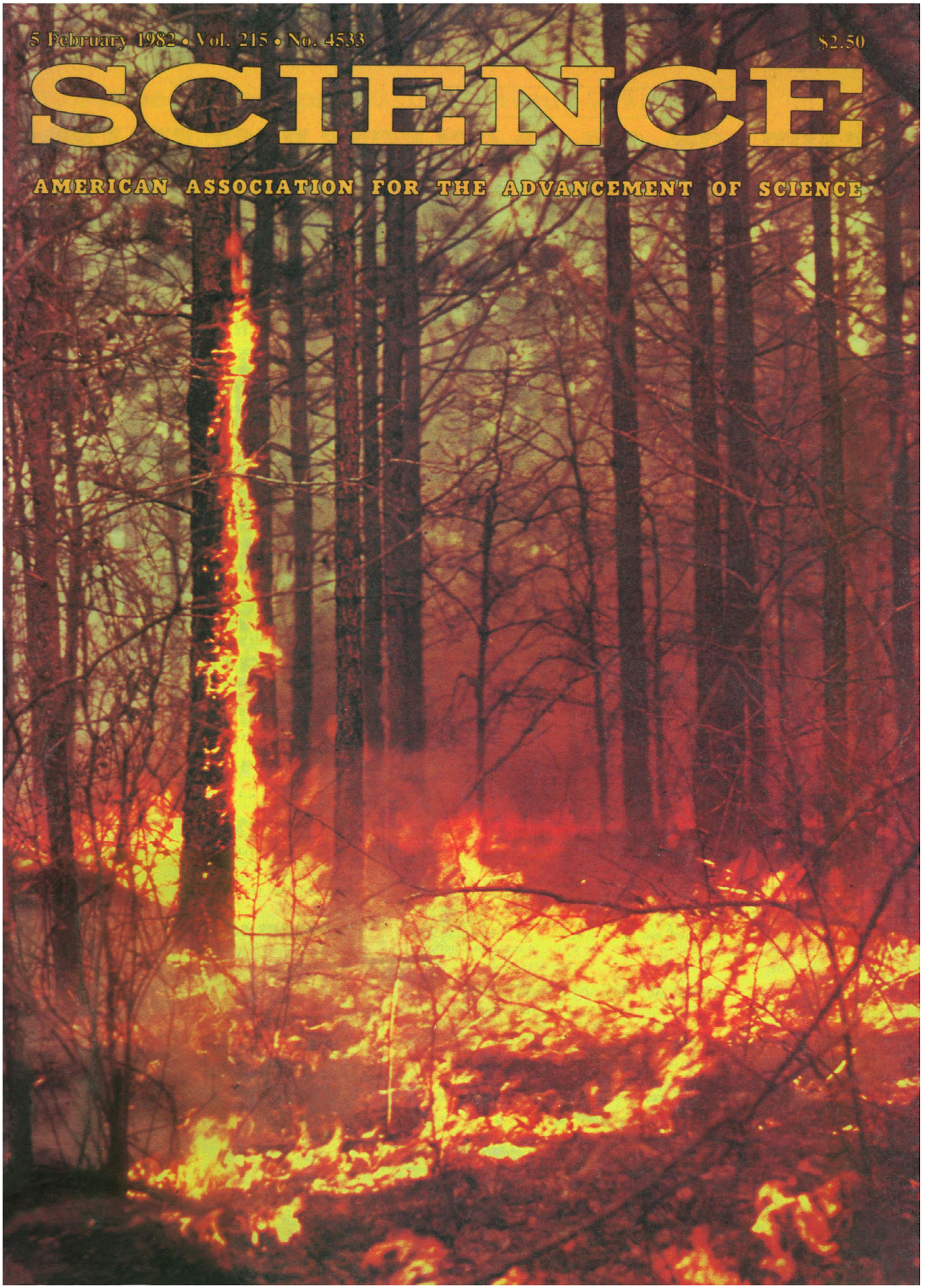

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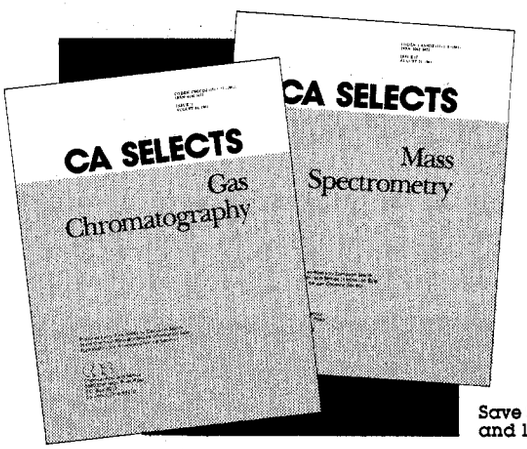

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ISSN 0036-8075

5 February 1982

Volume 215, No. 4533

SCIENCE

SCIENCE is published weekly on Friday, except the last week in December, by the American Association for the Advancement of Science, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. Second-class postage (publication No. 484460) paid at Washington, D.C., and at an additional entry. Now combined with **The Science Monthly**. Domestic individual membership and subscription (51 issues): $43. Domestic institutional subscription (51 issues): $80. Foreign postage extra: Canada $24, other (surface mail) $27, air-surface via Amsterdam $55. First class, airmail, school-year, and student rates on request. Single copies $2.50 ($3 by mail); back issues $3 ($3.50 by mail); classroom rates on request. **Change of address:** allow 6 weeks, giving old and new addresses and seven-digit account number. **Postmaster:** Send Form 3579 to *Science*, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005. *Science* is indexed in the *Reader's Guide to Periodical Literature* and in several specialized indexes.

COVER

Prescribed burning has become of major importance to the multiresource management of the southern pine forest. Fire is used periodically in the life of pine stands to manipulate understory vegetation and to reduce the risk of wildlife by controlling litter build-up. Although prescribed fires partially consume important components of the pine forest ecosystem, the fires have limited effects on soils, nutrient cycles, and hydrologic systems. See page 661. [Daniel H. Gelbert & Associates, Forestry Consultants, Durham, North Carolina]

THE SECOND ANNUAL CONGRESS FOR

DNA RESEARCH

15-17 FEBRUARY, 1982, LOS ANGELES, CALIFORNIA
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(1) University of California, San Francisco; (2) University of California, Irvine

The congress, has been organized jointly by SCHERAGO ASSOCIATES and the journal, DNA and GENETIC ENGINEERING NEWS. (Published by Mary Ann Liebert Publishers, Inc.) Subjects will include:

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GENE TRANSFER, NUCLEAR RNA
TRANSCRIPTION
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EXPRESSION OF FOREIGN GENES IN MICRO-ORGANISMS

SPEAKERS (Partial List)

John Baxter
University of California, San Francisco

Marvin Caruthers
University of Colorado

Pierre Chambon
Centre National de la Recherche Scientifique

Gerald Fink
Cornell University

David Goeddel
Genentech

Robert Goldberg
University of California, Los Angeles

Benjamin Hall
University of Washington

Leroy Hood
California Institute of Technology

Timothy Hall
University of Wisconsin

Keiichi Itakura
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Alex Rich
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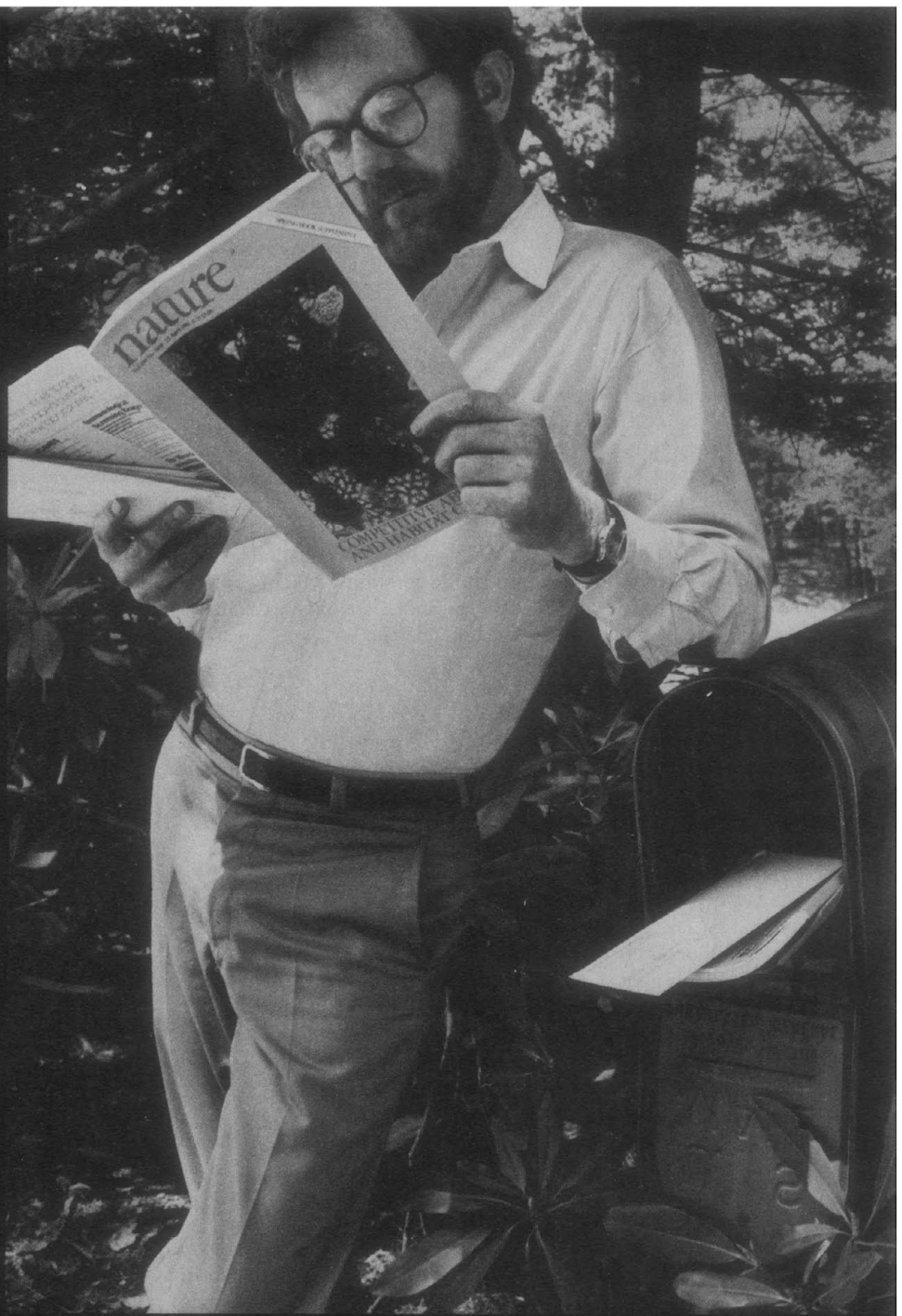

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wastes some 4000 megawatts of thermal energy, leads to annual operating expenses of more than $100 million. The Savannah River reactors are slated for upgrading over the next several years at an estimated more than $1 billion; however, even with this expenditure the reliability of these aging reactors in the decades beyond is questionable.

What this nation needs is a new production reactor utilizing modern technology and operating at high temperatures that could produce tritium and electricity. Instead of wasting the thermal energy, as is now done, the new reactor by producing and receiving credit for the electricity could yield positive cash flows of more than $200 million a year, meet all present and future safety standards, and ensure our nation the tritium it requires for defense and fusion needs in the future. Planning, budgeting, and design for such a reactor are long overdue.

HAROLD M. AGNEW*

General Atomic Company,
Post Office Box 81608,
San Diego, California 92138

*Former director, Los Alamos National Laboratory.

Fixed Amount Awards

Numerous letters and articles in *Science* (*1*, *2*) have addressed the controversy surrounding the Office of Management and Budget's Circular A-21. One can hope that the National Science Foundation (NSF) has taken a step toward alleviating academe's problem of coping with A-21's "demands for unrealistic accountability" (*3*) and its inability to "provide the optimal principles for federally sponsored research agreements with universities" (*1*). If the trend continues, perhaps the pages of *Science* will be replete with the fruits of its namesake rather than the equally important but less stimulating dialogue over the merits of this bureaucratic burden on academic research.

I am referring to the NSF's use of a "fixed amount award" for at least one of its programs—New Engineering Faculty Research Incentive Grants–1982. The NSF, in a parenthetical yet far reaching note to institutional research administrators, states in its program announcement that "grants awarded on a fixed amount basis will not be subject to Federal cost principles [for example] OMB Circular A-21" (*4*). Since a fixed amount award represents a predetermined amount for NSF support of proposed research without regard to the subsequent costs of the

project, no itemized budget is even requested (*4*, pp. 2–3).

Circular A-21 appears to expressly recognize the valid use of such fixed amount awards by exempting "awards under which the institution is not required to account to the Government for actual costs incurred" (*5*) from its cost principles. Lest disgruntled bureaucrats wonder where their rallying cry—accountability—has gone under a fixed amount award, let them look to the work product itself—the diligent inquiry and advancement of knowledge which, after all, is what research is all about.

The Sloan Commission on Government and Higher Education properly recognized that excessive oversight creates a costly burden of paperwork and that its effect on the research process itself is self-defeating (*6*). Their recommended solution, however, was not to remove the attached strings of A-21 from research grants as does a fixed amount award, but rather to develop a corps of federal auditors, sophisticated about scientific research and how research universities operate. The preferred option is accountability measured not by stacks of personnel activity reports open to scrutiny by auditors—sophisticated or not—but by the work product itself.

The fixed amount award is a move in this direction, and I applaud its use even on this small scale. Evidenced by ongoing moves to sever from block grants the strings of Circular A-87, the cost principles for state and local governments that are counterparts to those in Circular A-21, the time may be ripe for expanded use of this type of award to achieve the same results for colleges and universities.

WALTER F. MATYSTIK
Manhattan College,
Manhattan College Parkway,
Riverdale, New York 10471

References and Notes

1. "Accountability; Restoring the quality of the partnership": A report from the National Commission on Research, *Science* **207**, 1177 (1980).
2. D. R. Corson, *ibid.* **208**, 1211 (1980); A. J. Sinisgalli, *ibid.*, p. 1212; J. Walsh, *ibid.* **210**, 34 (1980); S. MacLane, *ibid.*, p. 158; J. Walsh, *ibid.*, p. 612; J. D. Tebbenhoff, *ibid.* **213**, 819 (1981); S. MacLane, *ibid.* **214**, 132 (1981).
3. P. H. Abelson, *ibid.* **208**, 353 (1980).
4. "Program announcement: New engineering faculty research incentive grants 1982," (NSF 81–73, National Science Foundation, Washington, D.C., 1981.)
5. *Fed. Reg.* **44**, 12368 (6 March 1979).
6. *A Program for Renewed Partnership—The Report of the Sloan Commission on Government and Higher Education* (Ballinger, Cambridge, Mass., 1980).

Erratum: Figure 1 in the report "Muscle fatigue and the role of transverse tubules" by C. P. Bianchi and S. Narayan (15 Jan., p. 296) was inadvertently transposed with figure 2 in the report "Sedimentation field flow fractionation of liposomes" by J. J. Kirkland *et al.* (p. 297). The figure legends are correct.

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5 February 1982, Volume 215, Number 4533 SCIENCE

State Involvement in Science and Technology

Much has been accomplished over the last 30 to 40 years by our prevailing structure of science and technology. Now, however, a crisis is emerging: U.S. output per man-hour has leveled off or declined in recent years. Results of basic research no longer percolate through our economy fast enough or effectively enough to increase productivity substantially. Education in the United States is less rigorous than that of several other nations. And we have not devised the organizational means to generate and use knowledge of how to manage land, water, and air resources properly and to minimize dangers associated with toxic, hazardous, and low-level radiation waste.

In dealing with the emerging crisis, we must foster throughout society the creative potential of science and technology by technical and organizational innovation, which together constitute technological innovation. I contend that the center of gravity for technological innovation must shift from the federal government to state governments.

Of the 184 research universities of this nation, 119 are public institutions, most of which are supported by state governments. Elementary and secondary educational systems are the responsibility of state and local governments, who (regardless of action by the federal government) must take the lead if significant improvements are to be achieved. State and local governments are the prime points of contact with the many aspects of economic activity that entail industry-government interaction. Finally, people are essential in technological innovation, and people can more easily relate to state and local governments than to distant federal agencies.

The experience of North Carolina and a few other states illustrates how a state government can forge these various interrelations. The North Carolina Board of Science and Technology is the unit that maps much of our strategy, building on the work of our universities and the influence of our Research Triangle Park. I chair this 15-member board; the remaining members are scientists from our public and private research institutions and officials from state and local government. Other groups advise me; one is a council of business leaders from across North Carolina. As a consequence, new industrial investment in North Carolina has averaged approximately $2 billion per year for the past 5 years. Our unemployment rate is about 2 percent below the national rate.

In North Carolina we are also investing in people, particularly young people. In our elementary and secondary schools, we have introduced competency testing, raised the level of teacher training and pay, reduced class size, and taken other measures to improve education. Significant improvements in national test scores are one indication that these changes are having an effect. In addition, we have established the North Carolina School of Science and Mathematics, a residential high school for students with very high aptitudes in these subjects. In its first year, with 150 students enrolled, this school had the second largest number of National Merit Scholarship semifinalists of any school in the nation.

My last example consists of our Microelectronics Center and our Biotechnology Center. The former is designed to enable six leading research institutions in North Carolina to have access to sophisticated microelectronics research equipment on a sustained basis. The latter is beginning on a relatively small scale, but represents a long-run commitment to this field. Other states, such as California, Minnesota, Michigan, and Florida, are taking significant action in relation to such fields of exploration.

Technological innovation must be construed as more than an end in itself. Its larger purpose is meeting the needs and desires of people. This is a function of values and beliefs and of political and economic processes. The emerging crisis I have mentioned is a reflection of such concerns. Government—particularly state government in partnership with academia, industry, and people—has a clear responsibility in resolving this crisis.—JAMES B. HUNT, JR., *Governor, State of North Carolina, Raleigh 27611*

Adapted from an address presented on 4 January 1982 at the AAAS Annual Meeting.