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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.

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### 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.

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#### 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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