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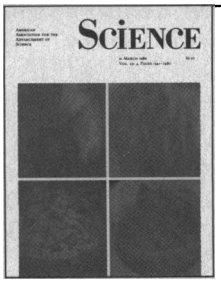

COVER Patterns of convection cells and wavy disturbances, as observed in laboratory experiments of global-scale planetary and stellar convection. A rotating hemispherical shell of fluid is heated on the inside and cooled on the outside, and an electrostatic radial "gravity" field is imposed. The resulting flows are viewed by Schlieren imaging, providing circular views extending from pole (top) to equator (bottom) and covering a quadrant in longitude. Experiments were carried out in the Spacelab 3 microgravity laboratory flown aboard the space shuttle Challenger in May 1985. See page 61. [J. E. Hart and J. Toomre, University of Colorado, Boulder, CO 80309]

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On Institutional Memory

For four postwar decades U.S. science has done quite well at the hands of government. Fundamental research has experienced a few thrills and chills along the way, but the course of federal funding has edged upward. Oddly, the question that was asked in the early years—how much support is enough—is still with us. The most striking statement in the recent Packard-Bromley panel report* is that the nation's needs for new knowledge will not be met without a much greater federal investment in university research—that is, a growth path that matches the still rising overall investment in national research and development, which implies, on the basis of current trends, a doubling of funds in 10 years.

Such an investment strategy, if it is not extruded from the thickets of Gramm-Rudman-Hollings and the politics of deficit reduction, is bound to be stalled. White House panels come and go, and their reports seldom drive budgetary decisions. Presidents, for their part, like to keep open their options, and hence the prognosis for a long-range growth policy for basic research is best described, in the absence of aggressive public support, as guarded.

We have a complicated situation on our hands as we look ahead. The result of decades of constructive investment in science is the presence of an awesome research capacity. This capacity requires unremitting and increasing financial nutrition to keep it healthy and productive, and its health and productivity are critical to the technology base on which the nation's economic and national security depend. What is more, the problem is not entirely one of finding new money for investigative science alone. It is equally a problem of halting and reversing the cumulative reinvestment shortfall in the tools, equipment, and facilities that science requires. And beyond all that, the technology base will deplete if precollege and advanced science and mathematics education continue to draw the short straw in national investment choices.

As current budget practices go, civil research and development is the steady loser to national security funding. Support for basic research has been the redeeming exception, but in the face of three-fourths of the research and development budget earmarked for defense requirements it is doubtful that the distribution of scientists and engineers in the years ahead will favor equilibrium in the disposition of scientific and technical assets. The quantity of federal funding is only part of the issue, the larger part bearing on the quality of the investment choices.

In all these dilemmas, institutional memory serves an important purpose. In Congress, science has had the luck through the years to have had the attentive ear of enough members and senior committee staff to hold high ground despite political turnover. On the Executive side, the built-in career memory that has characterized the Office of Management and Budget under successive presidencies has also provided immense, if underappreciated, support for basic research, and it is not good news to learn of the retirement after 35 years of Hugh Loweth. Institutional memory likewise resides, to science's benefit, in the Office of Technology Assessment, the Congressional Research Service, and the General Accounting Office, and it is worth noting that few of these assets existed, as we see them today, in the formative years of federal involvement in research and development. A great deal hangs on their grasp of the nation's heavy stake in research and education, and upon their reading of the messages emerging from the National Academy of Sciences, the National Science Foundation, and the White House panel.

The present Administration, which has an exceptional record in supporting basic research, whatever one may think of the overall shape of its research and development priorities, has a dwindling life of 2 years. What will follow is anyone's guess, and it would make a salient difference were the Packard-Bromley panel report to be the focus of a presidential initiative on science policy that would become embodied in government's institutional memory as we prepare for the future.—WILLIAM D. CAREY

*Report of the White House Science Council Panel on the Health of U.S. Colleges and Universities (Office of Science and Technology Policy, Washington, DC, February 1986).