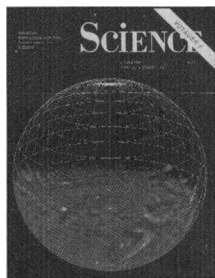


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COVER Miranda, Uranus' innermost major satellite. This view was assembled from nine images returned during Voyager 2's close pass in January 1986. The images were acquired from widely different viewing stations due to the closeness of pass and high velocity of the spacecraft. In this view of the 490-kilometer satellite, the equator and terminator are almost coincident because the sun shines nearly on the south pole. Miranda's trailing hemisphere is in the center of the view as the satellite moves directly away from us in its orbit. See page 39. [Members of Planetary Cartography Group of the U.S. Geological Survey, Flagstaff, AZ, assembled this computer mosaic and rotated it to this perspective]

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Changing Times

At a time of financial stress brought about by a declining agricultural economy, reduced world prices for oil and gas, reduced demand for coal, and increased imports from abroad, the taxable incomes from many farm and energy-producing states would seem inadequate to keep pace with pre-1985 expenditures for science and related activities. The states most dramatically affected are those in the deep South, the northern plains and Rocky Mountains, and a few in the northeastern and central portions of the United States. On top of the economic plight, many of these states have not been very competitive in acquiring research funds from federal sources. One study showed, for instance, that the top ten states received 66 percent of federal research funds, whereas the bottom ten received 1.5 percent.

Some may argue that only a few states should be funded to carry the entire burden of this nation's research effort. On the other hand, it seems that a more broadly based scientific enterprise might provide some of the answers needed to cope with troubled economic times. Such activity could help encourage new businesses or help old ones find novel products.

To some extent, steps to cope with this problem are already being taken by the National Science Foundation. In 1980 an experimental program to stimulate competitive research (EPSCoR) was established. At that time, Arkansas, Maine, Montana, South Carolina, and West Virginia were selected from seven competitors to receive funding at a level of \$500,000 to \$600,000 per year each for 5 years with comparable local matching funds.

These modest sums of federal money had large catalytic effects. The advice of U.S. senators and representatives was sought, and presidents of the state universities participated as did members of the university faculties. Influential people from industry and in the legislatures had roles on advisory committees active in each state. Additional local funds were pledged. Out of much consultation, many research proposals emerged. These were evaluated by a large number of expert reviewers situated in other states. In addition, outsiders made project site visits. The best proposals were identified and supported.

The result of having EPSCoR in Montana, South Carolina, Arkansas, and other states has been a notable increase in the success of independent proposals submitted to NSF, the National Institutes of Health, and other agencies. Just as important has been the maintenance of research committees that have played critical roles in helping with the development of state science and technology alliances. These alliances have funded university-industry-related research. Project peer review at a national and international level has resided with the state EPSCoR programs.

Realizing the benefits of EPSCoR, in 1985 Congress supported NSF in expanding the program to 11 more states and Puerto Rico. In spite of difficult economic times, the states, realizing the value of the EPSCoR program, have allocated matching commitments that exceed NSF dollars two- to sixfold. Few other federally sponsored research programs can say as much. In addition, in many states, the working relationship established between industry, government, and the university is a novel event—one that is needed and one that should be encouraged.

However, some additional things would help. The people in the poorer states need the assistance of scientists in other states to (i) help with peer review of projects, (ii) participate as research collaborators, and (iii) visit the states and establish rapport with scientists in them. As a nation we sometimes seem more willing to help foreign governments with their science than those comparable enterprises in our own third world states.

For the benefit of the nation, NSF should continue its involvement with EPSCoR, and Congress should encourage the development of comparable EPSCoR programs in agriculture, commerce, energy, environment, and defense. Federal agencies and organizations including the National Academy of Sciences need to be encouraged to have participants from a broader number of states on their panels, committees, and boards.

Times are definitely changing, and the way in which science is funded, administered, and utilized needs to be closely examined especially as it relates to many of the states and territories of this nation.—GARY A. STROBEL, R. G. Gray Professor and Director, MONTS, Montana State University, Bozeman, MT 59717