

effort: "As a nation we should establish a goal of being world class in all major scientific fields." Adoption of Gomory's goal is appropriate only for countries with moderately large GNPs, such as France. This goal is overly ambitious for countries with small GNPs. In contrast, adoption of this yardstick by the US would mean a substantial reduction in funding of basic research and an abdication of our current leadership role. Such changes are inappropriate.

In selecting goals for both basic and applied research, Gomory uses the flawed premise that the purpose of science is to enhance industrial competitiveness. This premise is implicit in his goal for basic research: He implies that we do not need to make the discoveries; we just need to be poised to use the discoveries of others. This premise is fundamental to his statement that the goal of Federally funded applied research should be "to contribute to the nation's industrial competitiveness through science and technology." Industrial competitiveness is essential to the economic welfare of the US, it is a high national priority, and it is a modern mantra. It is not—and has never been—the primary objective of scientific research. To value applied research based solely on its impact on industrial competitiveness is to define resulting industrial improvements in other countries as liabilities, not assets. Both individual companies and individual countries benefit from total technological growth, even without competitive advantage.

Pragmatism, not naiveté, suggests that the criterion for national science funding should be return on investment, not relative advantage. How much money should the US invest in basic and applied science? As with all potential investments, the first step is to evaluate return on investment. And as Gomory writes, "basic research . . . has been an astounding success, whether measured in terms of understanding natural phenomena or improving material wealth and living standards of the world." With confidence in return on investment, one invests as much as one can afford. More funded research will lead inevitably to more discoveries, increased productivity and a higher standard of living.

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I hope that politicians responsible for decisions in science and technology read what Ralph E. Gomory wrote. And I hope especially that the considerations Gomory outlines, which in most cases

are not valid only for the United States, find their way into the research ministries of France, Germany, Great Britain and so on. The new tendencies to go for applied research instead of pure research exhibited by politicians in those countries show a surprising amount of shortsightedness. It again smells like setting priorities before having fixed goals.

While Gomory is writing about goals for the United States, many of the same goals could be said to apply to Europe. I wonder, however, whether setting national goals is enough. Many of our largest problems (in the environment, health, resources, population growth and so on) will take a generation or more to be understood or solved; meanwhile they are becoming increasingly acute for all of us. In many cases, therefore, the goals should be set on a worldwide basis, if only to be effective and to avoid inefficient use of resources (money, but also people). The world certainly doesn't need, for example, all the space efforts by NASA, the European Space Agency, the Russians and other countries around the globe.

Politicians sometimes claim that worldwide efforts are a failure or are impossible to manage. Particle physics, to cite but one discipline, has proven them wrong for years: Physicists from all over the world are using installations duplicated nowhere on Earth, like the Tevatron (at Fermilab), LEP and LEAR (at CERN), and HERA (at DESY in Hamburg). The Russian physicist Lev Okun recently said at a conference in Hamburg: "The main danger in these days of fast and global change is that the construction of the tower may stop, as it did at Babel. I do not think that the many-language problem could be serious in the high-energy physics community. For many years, we have learned to understand each other, to help each other and to work together in spite of national and professional differences. I am not even sure that languages were the main problem with the tower of Babel; the main problem, I suspect, was the lack of funding." And, one might add, the lack of clearly defined goals.

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6/93

Political Science of Happer's Dismissal

Irwin Goodwin's report (June 1993, page 89) on the disputes between the present Administration and the former DOE director of energy research,

William Happer, was disingenuous, to say the least. In contrasting Happer's "scientific" approach in opposing the limiting of CO₂ emission until more research is done with Vice President Gore's "political" approach of limiting CO₂ emission now, Goodwin is increasing the confusion between scientific analysis and political decision. Politics is the art of making decisions in the face of uncertainty and conflicting goals.

We do not have sufficient knowledge to know for sure what the effect of increased CO₂ emission will be, and more research to increase that knowledge is necessary. Both Happer and Gore would surely agree with that statement. The disagreement is about whether or not to impose restrictions on CO₂ emissions now. Either decision would be political. Emissions restrictions will put some burden on industry, possibly lowering US competitiveness in some industries. Not restricting emissions will place us in danger of some serious future consequences, such as the melting of ice caps and flooding of coastal cities. The political question is to decide, in the face of uncertainty as to the probability and severity of consequences, which course to take. Here, Gore has sided with the environmental scientists who estimate the consequences of global warming to be severe and the probability to be high. Happer, on the other hand, apparently sides with the previous two Administrations, which generally placed the concerns of industry above the concerns of the environment.

Although Goodwin throughout the report implicitly favors Happer's "scientific" approach over Gore's "political" approach, he also points out, perhaps inadvertently, various instances when Happer's statements are anything but scientific. One example is Happer's favorable quoting of a remark that even in times when the Earth had more CO₂ (and therefore was presumably much warmer) it was "a reasonable place to live." He talks as if the melting of the ice caps and the inundation of all of the world's coastal cities is not something to worry about! Politics posing as science can again be found in Happer's stating, "It seems to be an act of treason to propose that there is a great deal of research that needs to be done on the origin, extent and effect of greenhouse gases," at the same time that he was opposing NASA's research effort. Of course one could argue that there are more cost-effective ways of studying greenhouse gases than that proposed by NASA, but surely NASA's proposals

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indicate an Administration interest in research in this area.

On today's news, before I decided to write this letter, there was an announcement that the hole in the ozone layer had opened a month earlier than usual, causing considerable concern among atmospheric scientists. So much for Happer's casual dismissal of the seriousness of the problem in his 26 April testimony before the House Appropriations subcommittee on energy and water.

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GOODWIN REPLIES: Will Happer's explanation of his position on the need for better understanding of the causes and effects of CO₂ emissions and his citation of research on the wide variations of CO₂ in the Earth's ocean-atmosphere system over the course of 570 million years speaks for itself. His dismissal for venturing into turbulent political waters was the principal subject of the news account, not whether the "scientific approach" to the continuing controversy over global climate change is more timely or fitting than the "political approach." The components that contribute to reaching scientific conclusions or political decisions are fairly well known and are frequently very different. Since Happer's removal from the Energy Department's research office and his return to Princeton University, the Clinton Administration, it should be noted, has taken a less ardent and active stand on climate change—to the disappointment and dismay of some scientists and environmentalists. I do not believe there is any connection between Happer's departure and subsequent policy.

Savannah River's K Reactor Was Restarted

Irwin Goodwin's Washington Reports discussion about the nation's tritium production (May 1993, page 53) states that all attempts to get the Savannah River site's K reactor restarted after it was shut down in June 1988 had failed.

That is not true. After a concerted program to upgrade the K, L and P reactors, which eventually focused on just the K reactor, the K reactor was indeed restarted and successfully completed a two-month test run in 1992.

Even with the excellent safety record of the nuclear industry compared with others, nuclear operations of various kinds struggle constantly for the public's understanding and confidence.

The task should not be made harder by unnecessary inaccuracies.

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GOODWIN REPLIES: In its heyday the K reactor was an engine that could. After the leaks occurred in its cooling system in January 1989, it was shut down for repairs and modernization. With the end of the cold war, the need for tritium virtually vanished. Still, the Energy and Defense departments decided to restart the K reactor after it was repaired, just to be sure that the US could produce tritium for nuclear warheads. So the reactor was ramped up, bit by bit, in 1992 and eventually reached something like 60% of its design capacity before it was turned off. During the reactor's test run in 1992, it did not produce any tritium, though.

Bias in Recruiting: A Cautionary Reminder

A recent PhD from our department received an unsolicited invitation to visit a branch of a well-known state university. In the same phone call this person was virtually offered an assistant professorship. The invitee's publication record consisted of one paper about to be submitted, making this invitation extraordinary in today's job market. Inquiry disclosed that this unadvertised position would be offered only to members of certain ethnic groups or one sex; the invitee (who declined both the invitation and the position) satisfies those criteria.

Departments that let such bigotry affect their job offers should realize that they are unlikely to get the best candidates. They are also violating the Civil Rights Act of 1964. Chairmen should have the integrity to tell their administrations that they will not perform searches with such constraints. Will we next see appointments made on the basis of a candidate's political views?

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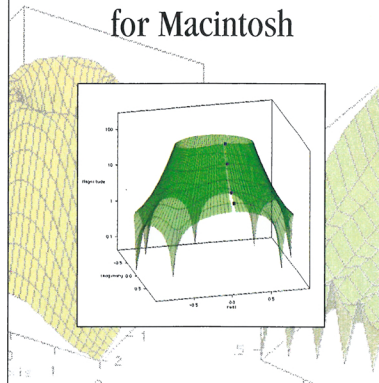
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Correction

April, page 52—In the budget table for the National Science Foundation, the three asterisks after "Materials research science and engineering centers" should have appeared after "National facilities and instrumentation." The list of facilities in the corresponding footnote should have included the Cornell High Energy Synchrotron Source. ■

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