

NIH Study-Section Scoring

The proposed changes for the U.S. National Institutes of Health (NIH) Center for Scientific Review (B. M. Alberts *et al.*, Policy Forum, *Science's Compass*, 30 July, p. 666) do not address a critical factor in NIH study-section scoring procedures—a built-in bias against new and unfamiliar ideas. The way scores are allocated is that two primary readers and two secondary readers get to set the score level at the beginning of a discussion of a given proposal. So for proposals on topics and strategies that are unfamiliar to the majority of the study section, members have a hard time countering the biases of “acknowledged experts” on the panel. This means that basically one or two section members can control an entire subfield.

A case in point is the study of biomolecular conformation changes using small-angle x-ray scattering. This field matured in the 1950s through the work of Glatter and Kratky in Europe, but it is now undergoing fundamental improvements because of the availability of synchrotron radiation x-ray beams and new algorithmic developments for interpreting the data. However, relatively few studies of biomolecular conformations using this approach have been funded by NIH. The effects of this practice may be seen by comparing the activity in this field in different geographical regions. The number of relevant publications worldwide in 1997 through mid-1999 (from the Science Citations Index) is around 170, of which 94 are from Europe, 35 from Japan, 8 from Russia, and 33 from the United States. Part of the explanation for the much greater output in Europe is the expert training handed down from the early days of the field. However, the relatively weak level of development of this field in the United States may also be attributed in part to the blocking of research proposals to NIH to exploit modern versions of this technology.

One way to help alleviate this kind of bias would be to solicit outside mail reviews from a broad spectrum of reviewers (as practiced by the National Science Foundation). This could also help NIH overcome some of its problems in reviewer recruitment, because using mail reviews in conjunction with a modified system of study sections would spread the reviewing burden more widely.

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Energy R&D Funding

Why would anyone believe that more government funding for energy (Congressman R. Holt, Editorial, 30 July, p. 662) is the responsible position? If any subject

cries out for a market solution, it is energy, because it cannot be isolated and it interacts with everything in society worldwide. Americans love to compete and love to make money in entrepreneurial endeavors. The government should provide the regulatory framework and incentives (not risk-free money). Some selected government-funded R&D is necessary, but let us not return to the days when everything was funded twice and three times over (as in the case of the “new generation of vehicles”). I worry that irrational funding decisions may do just the opposite of what is intended, namely, provide sound information on which to make progressive societal decisions.

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The Difference a Year Makes

Since the early 1970s, scholars, international organizations, and policy-makers have been exploring ways to lower tropical deforestation. Solutions have included greater use of non-timber forest goods, sustainable logging, clearer property rights, ecotourism, and higher crop yields. In the search for solutions, people have paid scant attention to the role of ordinary schooling.

Comparative research carried out since 1992 in five lowland Indian groups in Honduras and Bolivia suggests that one more year of schooling could reduce the area of old-growth forest cut by a rural household by 7 to 17%, owing to greater opportunities to work outside the farm and to higher farm yields that typically accompany better human capital. We ran median and ordinary least squares (OLS) regressions on data from 641 households. We used area of old-growth forest cut as a dependent variable and household size, knowledge of Spanish, yields, village-to-town distance, landholding, residence duration, and dummies for ethnic groups and for villages as explanatory variables. The median regression estimated by bootstrap data resampling with 200 iterations yielded a coefficient of -7% ($P = 0.09$), and the OLS regression with robust standard errors yielded a coefficient of -17% ($P = 0.01$) for each additional year of education.

More schooling for rural populations inhabiting or abutting the rain forest could be a simple and progressive way of lowering deforestation. A schooling subsidy for these populations is justified on economic grounds because each additional year of schooling would induce households to cut less old-growth forest and, in so doing, would provide the rest of the world with many types of use and non-use values for which rural people now receive no compensation. Whether

policy-makers and international development organizations take up the challenge remains to be seen.

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Reducing Natural Disasters

I read with interest the Review by the National Research Council's Board on Natural Disasters regarding the International Decade for Natural Disaster Reduction (*Science's Compass*, 18 June, p. 1943) and the editorial “Mitigating national disasters” by Frank Press and Robert M. Hamilton in the same issue (*Science's Compass*, p. 1927). I was pleased to see highlighted some of the successful federal programs that reduce natural disasters. I would like to describe some new directions and some of the Administration's recent program initiatives.

The Clinton Administration has dramatically shifted U.S. policy on natural disasters toward greater emphasis on pre-disaster mitigation and better understanding of the natural processes that lead to natural disasters. For example, scientists at the National Oceanic and Atmospheric Administration predicted the record El Niño of 1997–1998 months in advance, al-



Red River at Grand Forks, North Dakota, during the record flood of 1997.

lowing local communities to clean drainage ditches and repair roofs and gutters to prepare for the onslaught. These preparations prevented an estimated \$500 million or more in damages.

Other recent federal program initiatives also signal the Administration's commitment to maximizing our technological resources to address natural disasters. Vice President Gore's Global Disaster Information Network seeks to give disaster managers and affected citizens fast, reliable communication links to existing sources of disaster information to help them make better informed decisions in the event of a disaster. The Administration's Information Technology for the 21st century initiative (IT²) will, among other things, improve our skill in predicting and tracking weather phenomena over

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the next decade to provide greater advance warning for tornado strikes and more accurate estimates of hurricane landfall, saving lives and property.

Recognizing the need to involve the private sector as well as all levels of government, the Administration has developed a variety of partnerships. The 18 June Review discusses the Federal Emergency Management Agency's Project Impact. In addition, the Partnership for Advancing Technology in Housing, led by the Department of Housing and Urban Development, will make durable, disaster-resistant housing more readily available to people at all income levels. Public-Private Partnership 2000, co-sponsored by the National Science and Technology Committee, the Institute for Business and Home Safety (representing the insurance industry), and more than 20 other non-profit organizations, has held more than a dozen forums to seek opportunities for reducing our nation's—and our world's—vulnerability to natural disaster.

Working together, we are building a sustainable society that will be much more resilient to natural hazards. I appreciate the contribution of the timely Review in helping us tell this story.

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Effect on the Biosphere of Elevated Atmospheric CO₂

The report "Net primary production of a forest ecosystem with experimental CO₂ by enrichment" by E.H. DeLucia *et al.* (14 May, p. 1177) provides excellent and much-needed experimental work on the responses of the terrestrial biosphere to elevated atmospheric carbon dioxide (CO₂). However, we are concerned about the report's last statement (also appearing in the abstract), which extrapolates measurements of net primary production (NPP) from this one experiment to the world's forests as a whole, suggesting that they could absorb as much as 50% of the projected fossil fuel emissions of CO₂ in 2050. This projection gives a misleading, perhaps erroneous, picture of the role of the terrestrial biosphere in the global carbon cycle.

First, NPP is not the appropriate measurement to apply when considering the net uptake (or release) of CO₂ by the terrestrial biosphere on a biome or larger spatial scale

and over several decades. The most appropriate concept is net biome production (NBP) (1), which includes not only NPP, but also losses of carbon resulting from heterotrophic respiration, fires, insect-induced mortality, logging, and other natural and human-induced disturbances (2).

In contrast to global terrestrial NPP, which is about 60 picograms of carbon per year, global terrestrial NBP is about ± 1 or 2 picograms per year.

Second, there is considerable difficulty in extrapolating up in time and space from a single experiment based on a step-change in CO₂ concentration over a young, rapidly growing stand of trees, as noted by the authors of the report immediately before the final statement.

Third, applying the same methodology for extrapolation as used in this report, we conclude that the world's forests should now be taking up at least 3 picograms of carbon per year of fossil-fuel emissions. This is significantly higher than current estimates of terrestrial carbon sequestration [for example, (3)] and is inconsistent with atmospheric inverse calculations, as well as with estimates of oceanic carbon uptake.

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