

Calling on Scientists to Fight Budget Cuts

THE FUNDING LEVELS REQUESTED BY THE Bush Administration for 2006 (“Caught in the squeeze,” J. Mervis, *News Focus*, 11 Feb., p. 832) represent a decrease in science and technology funding across the board. This budget and its priorities do not bode well for American science and technology or for America’s scientists and science students. Underfunding science and technology research and education today is short-sighted. It puts our nation’s strong global standing in science and technology at risk now and in the future.

As ranking member of the U.S. House of Representative’s Committee on Science (which has jurisdiction over all nondefense science research and development including the National Science Foundation), I am familiar with the realities of our country’s current fiscal crisis and attempts to “remedy” that situation by cutting “lesser priorities.” I assure you that some Members of Congress, including myself, are fighting to push science and technology as a priority in this and future budgets.

However, Congress cannot achieve this alone; we must have your help. Adding your voices to ours is essential in presenting a unified front in support of additional science and technology funding. In a time of necessary fiscal restraint, advocates of science must be vocal in communicating science’s centrality to our nation’s future. It must be clear that science is not just an academic exercise.

The current downward trend in funding can be reversed. The federal budget is not irrevocably set and can be redrawn. Researchers, students, faculty, this affects you. Write, call, e-mail, and speak on the importance of what you do for this nation’s economy. Help us help you by being your own unrelenting advocates.

BART GORDON*

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 6 months or issues of general interest. They can be submitted through the Web (www.submit2science.org) or by regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.

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Establishing Indicators for Biodiversity

IN THEIR POLICY FORUM “THE CONVENTION on Biological Diversity’s 2010 target” (14 Jan., p. 212), A. Balmford *et al.* argue that “conservation scientists have a lot to learn... from economists” in regard to the establishment of indicators that are “rigorous, repeatable, widely accepted, and easily understood.” By way of example, they refer to gross domestic product (GDP) and write that the “global imperative to protect biodiversity and ecosystem services must become as politically significant as economic growth...”

GDP may be a repeatable and widely accepted measure, but it is not rigorous and it is easily misunderstood. GDP measures a country’s dollar market value of legal, final (nonintermediate) goods and services produced during the course of an accounting period, such as one year. That can be a problem. Consider two examples: First, people become ill on account of pollution and have to seek medical treatment; more medical services are produced and counted in GDP at their market value. GDP rises. Economies grow. But we are not better off for having been polluted in the first place. Second, the more wars we fight, the more funds governments expend in the arms market, but we cannot argue that states are better off for fighting wars. Conversely, if we become healthier and fight fewer wars, GDP falls and economies shrink.

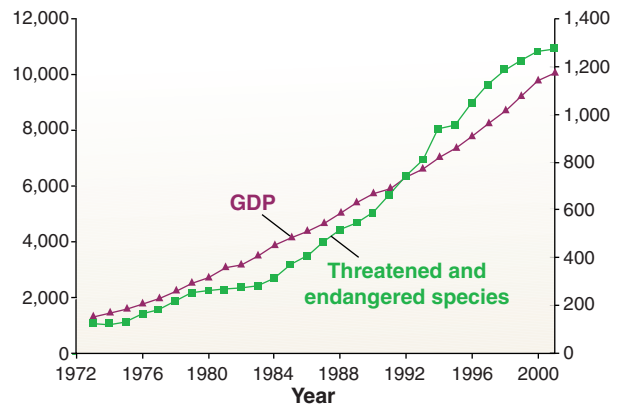
Economics can make tremendously valuable contributions to biology, but GDP and economic growth measures are not among them.

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IN THEIR POLICY FORUM “THE CONVENTION on Biological Diversity’s 2010 target” (14 Jan., p. 212), A. Balmford *et al.* describe the need for biodiversity indicators pursuant to the Convention on Biological Diversity. They identify gross domestic product (GDP), a measure of economic growth, as a precedent-setting indicator to be emulated by scientists. We propose that scientists already possess such an indicator, namely, inverse GDP.

As indicated by rising GDP, economic growth entails increasing population times per capita consumption (1). Technological progress broadens the human niche (2); economic growth is the process of filling the broadened niche (3). Economic growth



U.S. GDP correlates with the number of U.S. threatened and endangered species. GDP figures are in billions of dollars (www.bea.doc.gov/bea/dn1.htm). Threatened and endangered species are those listed by 31 December of the corresponding year (http://ecos.fws.gov/tess_public/).

entails the reallocation of natural resources from the “economy of nature” and its non-human species to the human economy (4).

The tight correlation ($R^2 = 0.99$; see figure) of U.S. GDP to the number of U.S. threatened and endangered species listed under the Endangered Species Act is unlikely to be a coincidence. The sectors comprising the economy are the same sectors endangering species (5).

Some may object, citing the “environmental Kuznets curve,” the hypothesis that the environment deteriorates during early phases of economic growth, then recovers after a threshold of growth is achieved (6). However, environmental Kuznets curves are thought to apply to only a limited set of pollutants (7), not to environmental issues stemming from macroeconomic activity (8). Biodiversity is threatened by economic sectors in the aggregate (5), and certainly a higher GDP cannot resurrect an extinct species.

GDP accounting is an indicator of the size of an economy, not necessarily of human welfare (9), and has been overlooked as an indicator of biodiversity loss.

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Response

AS BRAUER NOTES, IT IS WIDELY ACKNOWLEDGED that GDP is a flawed and distorted index. However, our Policy Forum was not a panegyric for GDP, but a “call to arms” to develop appropriate indices of biological diversity that are both scientifically and statistically sound and receive as much attention in the media and the minds of the public as GDP or the Dow Jones Index. This in turn leads us to dismiss the use of GDP as an index of biodiversity loss, as proposed by Czech *et al.* Although it is discouraging that GDP has a strong correlation with rates of biodiversity loss, we do not think that this qualifies it as an index for monitoring the state of environmental degradation. On the contrary, the same flaws that undermine its utility as an index of a nation’s economic well-being will only be compounded when it is used as an index of environmental stress.

Inverse GDP used as an index of environmental damage instantly creates the impression that environmental protection and economic progress act in direct opposition to each other. We believe that this is not necessarily the case; the Millennium Development Goals and the Convention on Biological Diversity 2010 (CBD2010) goals directly imply that we need to find ways to develop

the global economy while also protecting the environment and the welfare of those whose health and economic well-being are most dependent on the ecosystem services supplied by the natural environment. Although slowing economic growth may be desirable in wealthy countries (as Czech *et al.* argue), we believe that in poorer parts of the world this would be not only impractical but morally unacceptable.

Plainly, the principal criticism of GDP stems from the fact that it amalgamates a variety of processes into a single figure. This will also be a problem with any single index we propose to monitor biodiversity; a possible way to reduce this criticism would be to develop a set of indicators attuned to different aspects of ecosystem health. Comparing the



An Amazonian fisherman displaying a catfish for sale. Inverse GDP should not be used as an index of biodiversity because in poorer parts of the world economic development consistent with preservation of biodiversity must occur.

relationship between such indices with GDP and other indices of economic progress, at a range of geographic scales, will lead to the development and testing of environmental indices that provide important insight into the health of the planet. The regular reporting of their changing value can play a crucial role in influencing public policy.

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Memo to NASA: Finish What You Start

NASA’S UPCOMING DECISIONS ON THE FATE of the Hubble Space Telescope and other valuable scientific satellites and probes (“Confusion at the space agency,” D. Kennedy, Editorial, 11 Mar., p. 1533; “NASA plans to turn off several satellites,” A. Lawler, News of the Week, 11 Mar., p. 1541) illustrate a fatal flaw in NASA’s reasoning and planning. The loss of data and knowledge from those spacecraft has been and will be caused by over 30 years of NASA’s dedication to starting projects and not finishing them. NASA is basically a propulsion agency: great on launching spacecraft, poor on following up on their advantages. Usually, there is not enough money to analyze all the data that are collected, the spacecraft may not be allowed to complete their missions, and using working spacecraft is given lower priority than launching new ones. As one who was in on the beginning and the continuation of the Landsat program, I feel I can give voice to my concerns.

If I could give one piece of advice to the new Administrator of NASA, it would be: “If you’re going to start a job, finish it!”

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The End of a Chilean Institute

THE CHILEAN GOVERNMENT AND THE WORLD Bank launched the Millennium Initiative in 1999, to promote the development of “world-class” scientific centers in Chile. As a result, three Millennium Institutes have been created since 2000 for 10-year terms, subject to periodic evaluations.

The Chilean government has recently decided against the renewal of the Millennium Institute of Cellular Biology and Biotechnology (CBB). This decision is particularly surprising, because the CBB has been widely recognized internationally as one of the most successful and productive centers of excellence in Chile and as a successful example of scientific initiatives in developing countries. The Institute has published over 200 scientific papers in journals indexed by ISI, generated 25 Ph.D. graduates, and carried out an outstanding program on science education targeting the high school system in Chile.

Some of us, as members of the Institute’s Advisory Panel, have given courses, performed collaborations, or attended scientific meetings at the Institute. We have been impressed by the excellent level of science at the CBB.

It seems a paradox that the Chilean government has terminated support to the CBB, even though the Chilean Congress has already approved the funds for the Institute to continue. The interruption of CBB activities would be a distressing sign to the international scientific community and would cast doubt on the stability of long-term scientific cooperation with Chile, with negative consequences and impact for a country that has made a significant effort to promote science and international scientific cooperation.

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TECHNICAL COMMENT ABSTRACTS

Comment on "Energetics of Hydrogen Bond Network Rearrangements in Liquid Water"

A. Nilsson, Ph. Wernet, D. Nordlund, U. Bergmann, M. Cavalleri, M. Odelius, H. Ogasawara, L.-Å. Näslund, T. K. Hirsch, L. Ojamäe, P. Glatzel, L. G. M. Pettersson

Smith *et al.* (Reports, 29 October 2004, p. 851) reported a temperature-dependent x-ray absorption study on liquid water. We argue that both the measurement and the data analysis have serious shortcomings. The spectra are affected by experimental saturation effects, and the analysis suffers from incorrect assumptions for x-ray absorption spectroscopy. Full text at www.sciencemag.org/cgi/content/full/308/5723/793a

Response to Comment on "Energetics of Hydrogen Bond Network Rearrangements in Liquid Water"

J. D. Smith, C. D. Cappa, B. M. Messer, R. C. Cohen, R. J. Saykally

We demonstrate that the spectra reported in our study are free from artifacts induced by saturation effects. Furthermore, our analysis of the energetics of hydrogen-bond rearrangement is in perfect agreement with temperature-dependent populations previously reported by Wernet *et al.*

Full text at www.sciencemag.org/cgi/content/full/308/5723/793b

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