Editorial & Letters

EDITORIAL

The Future of U.S. Science Policy

Although the United States' science and technology enterprise has achieved enormous success, it is essentially operating on autopilot. The policies that Vannevar Bush outlined in his 1945 report *Science—The Endless Frontier*, still, to a large extent, guide the research enterprise. The context in which science and technology presently operate, however, has changed remarkably since publication of *The Endless Frontier*. At the end of World War II, public support for funding of science was seen as critical in ensuring our nation's defense; the end of the Cold War has brought with it a vacuum in terms of a national imperative to justify research funding. Furthermore, the continuing increase in the cost of federal entitlements has caused decreases in federal research and development spending. The federal government cannot fund every worthwhile scientific project; thus, a policy for determining priorities is essential.

The changes are not limited to funding. Today, for example, the link between basic and applied research seems neither as clear nor as unidirectional as was once thought. Some large-scale scientific projects require more international participation. U.S. students are turning their backs on Ph.D. programs, seemingly viewing them as the training grounds for professions only some of them can enter. Our country's citizens are alarmingly scientifically illiterate in an era when the economy is increasingly driven by technology-based industries. In addition, as was pointed out in a recent editorial (*Science* 23 May, p. 1175), much of the scientific community remains unversed in political realities. These new times require us to reformulate our national science policy. I have been given that charge by House Speaker Newt Gingrich and House Science Committee Chairman James Sensenbrenner, who have also asked me to undertake a review of science and math education. Both will be bipartisan projects conducted within the auspices of the Science Committee, with recommendations stimulating a "national debate in Congress on science policy," according to Chairman Sensenbrenner.

It is important that such a policy be concise so it does not die of its own weight, as some previous attempts have. It must be comprehensive enough to encompass government, universities, and industry, and their relationships to science, technology, and engineering, and to each other. Finally, it must be coherent in that the parts must fit together; it must be a usable guide for Congress. To succeed, it is crucial that the policy be approved by the House, the Senate, and, ideally, the White House.

George Brown, the ranking minority member of the House Science Committee, summed up the present situation by saying, "We don't have a science policy; we have a budget policy." It is time to wipe the slate clean and decide on a future-based vision of where science can, and should, take the nation. Gingrich, in a recent speech to a group of scientists, urged us not to take the approach of working around the margins of our existing system when he said, "Give me a mission which will mobilize a nation ... then make it my problem to go out and figure out how to find the money for it."

Thus, I ask each of you, "What are the most important intellectual challenges rising over the scientific horizon in the next half century? What will be the biggest problems facing our nation and our planet in the future, and how can science and technology help overcome or avoid them? What should our scientific and technological enterprise strive to be 10, 20, or 50 years from now? And what changes do we need to make in our present system in order to get there?" I do not ask these questions rhetorically. In October I heard from a number of leaders in science about where we need to go from here. Last month I met with a group of scientists in the early stages of their careers to obtain their perspective. And this spring, the Science Committee intends to hold hearings addressing these questions. I seek your input, too. You can contribute—as individuals, scientific societies,* or institutions—via the policy study's Web site at www.house.gov/science/science_policy_study.htm, which will be periodically updated with our progress and with specific requests for your contributions. Science has changed since 1945, and so has the world. It is time to address these changes and chart our course correspondingly.

Vernon J. Ehlers

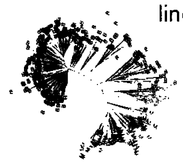
*AAAS will contribute to Representative Ehlers' Web site through its AAAS Conversation on Science and Society. The site is located at www.sciencemag.org/feature/data/aaasforum.shl.

The author is a Republican congressman from Michigan and vice chairman of the House Science Committee.

LETTERS

Roots and branches

A DNA fingerprinting study of einkorn wheat prompts a discussion about wheat genetics and the geography of its first domestication. [Left, tree showing genetic distances between some lineages of wheat; from M. Heun *et al.*, *Science* **278**, 1312 (1997)].



Pharmacological, clinical, and long-term observational research on aging is discussed by investigators. And the "immediate release" of crystallographic protein data is proposed.

Wheat Domestication

In their report "Site of einkorn wheat domestication identified by DNA fingerprinting" (14 Nov., p. 1312), Manfred Heun *et al.* make the interesting association between the genetic makeup of wild einkorn in the Karacadağ mountains in Turkey and the presence of nearby archaeological sites associated with early farming. They infer that the domestication, around 10,000 years ago, of einkorn and perhaps other founder crops was localized in this region. They also summarize the uncalibrated radiocarbon dates associated with the relevant archaeological sites. These range between 7600 and 6200 B.C., with domesticated einkorn first recorded at 7000 B.C.. Earlier farming sites are located about 800 kilometers to the south. At Jericho, Netiv Hagdud, and Gilgal (in the Jordan Basin), and Aswad (near Damascus), domesticated einkorn, emmer, and barley appear between 8000 and 7700 B.C. (*1*). In short, the Turkish sites are, according to published data, several centuries too recent to be contenders for the earliest farms.

Two observations are relevant. First, archaeological evidence for early domestication repeatedly does not map precisely onto the relevant genetic centers. In Central America, the early maize cobs from the Tehuacan occur several hundred kilometers east of the stands of wild maize genetically closest to cultivated maize. The earliest known rice-growing settlements, along the Yangtse River, lie well to the north of the core region of wild-rice diversity (*1*). Second, for various reasons, these geographical mismatches are not unexpected.

The hypothesis of a simple relationship between modern centers of genetic diversity