BY RUSS HOYLE

JITTERS ABOUT U.S. RESEARCH COMPETITIVENESS

A curious thing has happened in the wake of the Soviet Union's collapse last year. It is not exactly a peace dividend. Call it more of an apprehension about inevitable cuts in Pentagon spending. Call it a sharp, sudden sensation that the Japanese are breathing down our necks. Or a creeping anxiety that the U.S. does not have a coherent national industrial strategy. Call it what you will, a case of the jitters has settled over Washington about our competitiveness in an arena the U.S. has long dominated: high-technology research and development (R&D). The Bush administration's patchwork answer to the problem is the National Technology Initiative (NTI), which was unveiled earlier this year at the Massachusetts Institute of Technology (MIT, Cambridge). Among the brightest spots is a strong commitment to the U.S. biotechnology sector and, more specifically, to development of new environmental technologies.

Reason for concern

There is good reason for all the concern. Two recent government studies have concluded that, for the first time in 20 years, Japan has surpassed the U.S. in spending on industrial research. That news comes at a time when the nation's federal research laboratories, long a rich source of innovation for commercial products, are bracing for sharp cutbacks in military research spending. In addition, the Department of Energy's (DOE, Washington, DC) sprawling nuclear weapons network, crippled by revelations of environmental depredations and financial corruption, has been slowed to a crawl by nuclear arms cutbacks. The DOE network has become the target of a $200 billion environmental clean-up campaign, equal in magnitude only to the government's ill-starred Superfund program.

Energy secretary James Watkins is leading the charge to reassert U.S. leadership in high technology, largely by encouraging government-industry research partnerships. Taking his cue from successful government-university research ventures, Watkins is urging the private sector—in recent years the font of national R&D spending—to pump more research dollars into the federal lab system in exchange for use of federal scientists and research facilities. The idea, the centerpiece of NTI, exploits legislation enacted in 1986 that first enabled the private sector to tap the federal lab system through cooperative research and development agreements (CRADAs).

Unfortunately, Washington, which will put $3.8 billion into biotech research in fiscal 1992 (out of a total research budget of $70 billion) has done little but jawbone about a basic fact that has dampened R&D spending across a spectrum of high-tech industries: tax laws that discourage high-risk, long-term private investment.

Benefitting small firms

Even so, the emphasis on developing environmental technologies may bode well for small, innovative environmental biotech firms. Weighed down by awesome environmental burdens at DOE and elsewhere, Washington seems genuinely receptive to—even desperate for—new ideas. Companies without access to well-equipped facilities with sufficient capitalization might do well to consider linking up with federal labs for basic research—to take advantage of both the scientific talent available and the $1.5 billion annual federal environmental research budget. George McKinney, the managing director and president of Environmental Quality (Waltham, MA) and a participant at the MIT conference, emphasized the potential of new environmental technologies to create "productive" alternatives to "non-productive" spending on pollution control and remediation. He added that such an approach should be viewed as "a cost-effective, integral part of any quality management program" and might be ideally suited for government-private sector cooperation.

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Some joint research arrangements already have shown results. Recomp (Bellingham, WA) worked with DOE's Pacific Northwest Laboratory (Richland, WA) to develop a glassified ash technology for high-level radioactive waste. Researchers at Los Alamos National Laboratory in New Mexico are working on a sonar system for detecting salmonella in eggs based on a device used to detect chemical and biological agents in artillery shells. McKinney cites a number of promising—and challenging—future directions for cooperative environmental research. Among them: development of an ozone bleaching process for paper manufacturing to cut chlorine wastes; and development of alternative solvents for the electronics industry to replace hazardous chemicals such as chloroflourocarbons.

Provocative but problematic

The most provocative directions for research are often saddled with long scientific lead times or obvious political problems. One of the most intriguing is chemical process redesign, the use of bioprocessing to construct chemical compounds that do not produce environmentally hazardous byproducts. Benzene, for example, is a byproduct of many petroleum products and a known carcinogen. Could more efficient, environmentally sound products be constructed chemically to avoid such hazardous byproducts? MIT computer models reportedly have described in some detail the characteristics of 40 such redefined products.

Pie in the sky? Perhaps. How about microbial coal desulfurization? A technology based on a naturally occurring sulfur-eating bug, *Rhodococcus rhodochrous* is capable of sharply reducing sulfur oxide emissions that contribute to air pollution and acid rain—and, potentially, to the cost of installing expensive scrubbers to comply with the Clean Air Act. The basic technology is so promising that an innovative start-up, Environmental BioScience (The Woodlands, TX), has borrowed *R. rhodochrous* to reduce the sulfur content of oil at the refinery down to .05 percent. But there's a small problem with coal. *R. rhodochrous* works best with coal slurry. Railroads and other interests have blocked the building of pipelines that would transport the alternative fuel from coal fields to power stations.

Now there's a real challenge for Washington.