Federal Agencies Gear Up for Nano Initiative

The National Nanotechnology Initiative (NNI), announced earlier this year by the Clinton administration, appears destined to be approved by Congress as part of the federal government's fiscal year 2001 budget. No "specific" opposition has emerged to the $495 million nanotechnology research funding package proposed by the administration, according to staff members of the House and Senate Appropriations Committees.

Furthermore, with the U.S. economy continuing to produce record tax revenues, Congress seems unlikely to block the initiative for budgetary reasons—although some trimming is possible. "We're still putting the figures together," said Jeanne Wilson, majority staffer of the House Appropriations Energy and Water Development Subcommittee. "So, until we know what our overall budget target will be, we can't be certain that the full request will be approved."

The possibility of less than full funding aside, the agencies and departments whose FY 2001 budgets include requests for the nanotechnology initiative—the National Science Foundation (NSF); National Institutes of Health (NIH); National Aeronautics and Space Administration (NASA); and the Departments of Defense (DoD), Energy (DOE), and Commerce (DOC)—are preparing to put their programs in action this fall, fortified by the knowledge that most, if not all, of the $225 million in increased spending proposed for the initiative will be forthcoming.

Although each agency or department's nanotechnology research strategy is unique, most have developed a similar approach to the task—in no small part the result of the efforts of the National Science and Technology Council's (NSTC) interagency working group on nanoscience (IWGN), which has been surveying the research community and coordinating the activities of the agencies involved. According to Mike Roco, senior advisor for nanotechnology at NSF and chair of the NSTC working group, the new initiative "will allow the research to proceed in a better, collectively organized, and visionary way on a national scale, instead of the more insular activities that have been going on."

In addition, Roco said, the research would be able to move into new areas that until now were precluded by lack of funding. In NSF's case, for example, Roco expects a share of the $120 million in new funding in FY 2001—the largest share of the initiative—to go to grants in such fields as materials, engineering, chemistry, and physics. And he expects NSF's mathematical sciences division as well as its social and behavioral sciences and engineering directorates to become involved in nanoscale research. "We do not look to replace research areas," he said, "but to do research in a new way—more generic and deductively."

Within the next few months, pending congressional approval of NNI, NSF also will announce its intention to establish new nanoscale science and engineering centers at selected universities nationwide, according to Roco. "This will give something we haven't had before—a university infrastructure dedicated to exploratory research at the frontiers of nanotechnology."

The smallest piece of the nanotechnology initiative—a proposed $4 million—will go to NIH in FY 2001. Nevertheless, the introduction of nano-related research within the biomedical-research community is a significant step, according to Jeff Schloss, the agency's representative on IWGN. "It might look like we're not enthusiastic [about nanotechnology]," Schloss said, "but only because initially all we're attempting to do is increase awareness about the technology."

Schloss said that most biologists—himself included—have not been generally aware of nanoscale research. Therefore, NIH first needs to educate its research community about the possible benefits of the field. Part of this task began last month at a symposium held at NIH headquarters in Bethesda, Md., to discuss nanoscale research issues.

Another reason for NIH's small initial funding request for nanotechnology research, according to Schloss, is that "there's a lot more fundamental [research] that needs to be done before this technology begins to have an impact in the biomedical field." He listed several promising areas, such as carbon nanotubes attached to atomic force microscopes, and nanoscale sensors for use in screening body fluids.

Schloss said that most of the new nanotechnology research is expected to be conducted by scientists who do not normally apply for NIH-funded grants, such as chemists and physicists. "The process will be application-driven," he said. "There will be new opportunities for NIH to work with people we haven't worked with before."

At the National Institute of Standards and Technology (NIST) in DOC, the top priority for the new funding—a requested $10 million—will be to improve the agency's ability to conduct measurements on the nanoscale level. "Up to now, the scientific community has been working with equipment at the limits of its capabilities, with a consequent reduction in accuracy at the nanoscale," according to Robert Shull, leader of NIST's magnetic materials division. "We need to develop new equipment and more appropriate measuring and computational techniques, in addition to measuring critical data."

An example cited by Shull is the relatively recent discovery in magnetic nanomaterials of minute variations in magnetic-field strength over time. "We need a new metrology to cover this phenomenon," he said. Likewise, according to Shull, NIST needs better ways to analyze, in nanoscale terms, the chemical composition and atomic structure of materials, the dynamics of magnetic domains, and the unique properties of materials at boundaries and interfaces. "We're at the beginning of a new stage in measurement science," he said.

DoD is probably the agency least affected by the nanotechnology initiative. The requested $40 million in new research funding for FY 2001 will be plugged into the department's long-standing nanoscale research efforts, which have been proceeding both under the general 6.1, or basic research, category, as well as within the Defense Advanced Research Projects Agency (DARPA). Current research efforts include biomolecular materials, molecular-scale electronics, water and air purification, and self-assembling mesomachines, according to Jan Walker, an external relations specialist for DARPA.

At DOE, nanoscience goes back nearly 20 years to when the department was experimenting in such areas as improving the efficiencies of catalytic converters and developing nanoscale carbon structures. Iran Thomas, deputy director of the department's Office of Basic Energy Sciences, said that the administration's initiative, however, marks an appropriate beginning to a new era. He said that the Clinton administration has been able to propose this new large-scale initiative because of the groundwork in research laid over that period.

"We have found new components that allow us to make rapid progress, and we are beginning to use them to accomplish that goal," Thomas said. Some of those components include advances in scanning tunneling microscopy, the Advanced Photon Source, and the development of nuclear magnetic resonance probes.

DOE is asking for $36 million in new nanoscale research funding for FY 2001. With it, according to Thomas, "we will provide broad guidelines, but the actual work will come from people at the universities and laboratories who are thinking about exciting things."

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