Clinton Technology Policy Defines Route to Economic Growth

On February 22 the Clinton Administration released its technology initiative, "Technology for America's Economic Growth, A New Direction to Build Economic Strength." While taking a more active role in supporting industrial research and moving research to commercialization, it also reaffirms support for basic research and builds on initiatives begun by the Bush Administration. All five initiatives—biotechnology, high performance computing and communications, global change, advanced materials and processing, and mathematics and science education—put forth by the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) during the previous administration are supported in the new plan. Indeed, the plan calls for strengthening FCCSET, which coordinates cooperation among federal agencies. In addition, advanced manufacturing—an area targeted for a 1994 initiative by the Bush Administration—has gained a significant role in the Clinton package.

The broad goals of the policy are: long-term economic growth that creates jobs and protects the environment; a government that is more productive and more responsive to the needs of its citizens; and world leadership in basic science, mathematics, and engineering.

Specific initiatives are put forth in the report to invest in a national information infrastructure, to accelerate investment in advanced manufacturing technologies, to re-establish the technological leadership and competitiveness of the U.S. automobile industry, to improve technology for education and training, to make the research and experimentation tax credit permanent, and to invest in energy-efficient federal buildings.

Long-term growth is encouraged through a strategy of government/industry cooperation, complementing the shift from military to civilian and dual-use R&D. The Administration plans to increase the civilian share of the R&D budget to 50% by 1998, compared to today's approximately 40/60 split favoring military R&D. According to the Clinton plan, federal laboratories managed by DOE, NASA, and DOD would aim to devote at least 10–20 percent of their budgets to R&D partnerships with industry. The Advanced Technology Program (ATP) would be expanded. ATP, a program managed by the National Institute of Standards and Technology within the Department of Commerce, shares the costs of industry-led projects. Also, in a symbolic move, the word "Defense" would be dropped from the Defense Advanced Research Projects Agency (DARPA) to become ARPA.

To fulfill the goal of maintaining world leadership in basic science, mathematics, and engineering, the Clinton Administration plans to ensure strong support for basic science and stable funding for projects that require continuity. But, the Administration says, such continuity requires clear priority setting.

The Administration offers "adequate and sustained funding for university research" and will ensure that federal labs "continue their key role in basic research" while also encouraging more cooperative research between the labs and industry and universities. The federal labs provide key facilities in fields such as high-energy physics, biomedical science, nuclear physics, materials science, and aeronautics, the Administration says in the report, and new missions for the federal labs will be designed to make full use of the facilities and special talents they harbor. The Administration will continue to work with foreign partners on space science and exploration, but given competing demands for scarce national resources, these programs will require design and management that ensure maximum return on investment.

The Administration plans to improve transportation infrastructure, including improving mass transit, investing in maglev and high-speed rail, developing nondestructive methods for evaluating the condition of existing structures, supporting renewal engineering programs which target materials and construction methods for rehabilitation and repair, and increasing research on civil aviation technology, materials for more durable infrastructure facilities, and "smart highways" that provide in-route planning and traffic monitoring.

The plan calls for an information infrastructure which would consist of "information highways." This endeavor would be assisted by the implementation of the High-Performance Computing and Communications Program to create more powerful supercomputers, faster computer networks, and more sophisticated software. Through the National Telecommunications and Information Administration (NTIA) of the Department of Commerce, funding will be provided for networking pilot projects to states, school districts, libraries, and other nonprofit establishments so that they can purchase computers and networking connections needed for distance learning and for hooking into computer networks like Internet.

Cooperation on manufacturing fronts would be encouraged through a national network of manufacturing extension centers, regional technology alliances, consortia, and increased funding for advanced manufacturing R&D. Regional technology alliances would be designed to promote commercialization and application of critical technologies, including "green" technologies that reduce pollution and manufacturing waste. SEMATECH, an industry consortium created to develop semiconductor manufacturing technology, will stand as a model for other industry consortia, particularly for the development of automobiles, construction technologies, intelligent control and sensor technologies, rapid prototyping, and environmentally conscious manufacturing.

To facilitate private sector development of a new generation of automobiles that are competitive and environmentally acceptable, the Administration's report proposes establishing a "clean car" task force, linking efforts of relevant agencies with those of U.S. auto manufacturers. A major concern is converting known technology (for example, advanced batteries, advanced gas storage and delivery systems, new fuels, and new propulsion systems to replace gasoline and the internal combustion engine) into practical vehicles. An advisory group established by the task force would use the authority already present in the Clean Air Act revision of 1991 and the National Energy Act of 1992 to encourage introduction of prototype vehicles consistent with the objectives of this program, to coordinate state regulatory programs designed to require low or zero emission vehicles, and to propose federal regulations needed to supplement state efforts.

To improve education and training, the Clinton Administration supports development and introduction of computer and communications equipment and software that can increase the productivity of learning in formal school settings, in business training facilities, and in homes. Access to Internet and development of a high-speed National Research and Educational Network (NREN) would be expanded to connect university campuses, community colleges, and K-12 schools to a high-speed communications network. Programs developed under the FCCSET Committee on Education and Human Resources will be enhanced. Proposals will be encouraged for industry consortia or regional alliances designed to develop new teaching systems. Manufacturing engineering education would be promoted by providing matching funds for graduate or undergraduate programs in manufacturing engineering. The Administration supports restructuring primary and secondary schooling, using youth apprenticeships

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and other programs to facilitate the transition from school to work for people who do not expect to go to college, and making training accessible and affordable for workers who must upgrade their skills or who were displaced by declining defense budgets or increased international trade.

To make government more efficient and more responsive, the Administration would make better use of information technology, operate energy-efficient buildings, and reform procurement policy to ensure early markets for innovative technologies.

Federal Government Releases Guides to Enhance National Math and Science Education

The federal government, in early January, published two guides, *Pathways to Excellence: A Federal Strategy for Science, Mathematics, Engineering, and Technology Education* and *Guidebook to Excellence: A Directory of Federal Facilities and Other Resources for Mathematics and Science Education Improvement*. These guides are intended to formalize a commitment to improve math and science education and to facilitate the interaction of federal facilities involved in science, math, and engineering with teachers, students, and others in the private sector.

The *Guidebook to Excellence* is a practical state-by-state directory that lists contacts and phone numbers at federal facilities nationwide. The federal agency facilities listed were empowered through Executive Order 12821, signed by former President Bush on November 16 of last year. The executive order enables federal agencies to bring teachers, students, and parents into federal facilities; encourages federal scientists, engineers, and others with technical expertise to work with teachers in classrooms; and broadens the ability of federal agencies to transfer surplus equipment, including computers, to elementary and secondary schools. Individuals and groups in the private sector can use this guide to avail themselves of federal laboratories, scientists, and equipment.

Pathways to Excellence, prepared by the Committee on Education and Human Resources (CEHR) of the Federal Coordinating Council for Science, Engineering, and Technology, details the five-year strategy of the National Education Goals of America 2000, which strongly advocate education as a means for social and economic improvement. This plan was jointly developed by representatives from 16 federal agencies over a period of nearly three years, and targets all levels of education.

The strategic objectives of the plan are to:

- improve science and mathematics performance;
- strengthen the elementary and secondary teacher work force;
- develop an adequate pipeline for the science and technology work force, including greater participation of individuals underrepresented in science, mathematics, engineering, and technology education, e.g., women, minorities, and people with disabilities; and
- improve public science literacy.

The base program is to maintain and capitalize on current world-class programs such as graduate education, and to promote opportunities for groups underrepresented in mathematics and science. The plan then proposes three "tiers" of program applications, in descending order of priority. At the most fundamental level, Tier I includes systemic reform of the K–12 education system, especially in the lower grades, and an evaluation of all federal science and math education programs. Tier II would promote the education of groups underrepresented within sciences and technology, identify and encourage the use of role-model science and education products, and broaden the use of effective educational methods. Tier III represents the improvement of public understanding of science, and of cooperation between two-year colleges and other education sectors.

To achieve its overall strategy, CEHR has defined intermediate goals, several of which are:

- From 1993 through 1998, to reach 600,000 teachers—emphasizing those at the elementary level—with intensive disciplinary and pedagogical training through federal agency teacher-enhancement programs.
- By 1995, to contribute via CEHR agencies to revitalized science, mathematics, engineering, and technology education at colleges and universities, benefiting at least one-third of the students enrolled in lower-division studies.
- By 1998, to provide, in all states, through the Department of Education, support that

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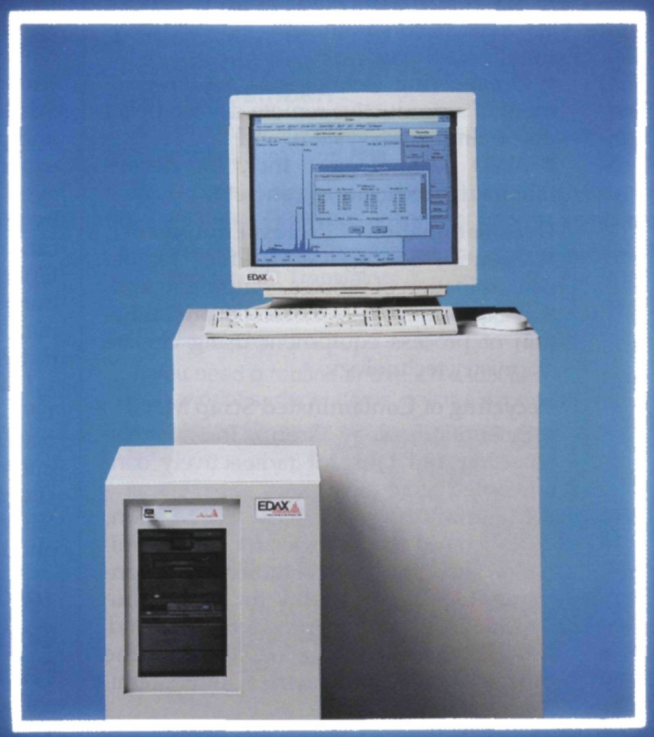

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will enable the development or revision of mathematics and science curriculum frameworks, reflecting world-class standards.

To receive a copy of *Guidebook to Excellence*, contact the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, Tennessee 37831; telephone (615) 576-8401. For a copy of *Pathways to Excellence*, contact: Federal Coordinating Council for Science, Engineering, and Technology, Committee on Education and Human Resources, c/o National Aeronautics and Space Administration, Education Division, Office of Human Resources and Education, 300 E Street, S.W., Washington, DC 20546.

DOE Notes

DOE Selects Clean-up Projects for Recycling and Disposing of Nuclear Materials

The Department of Energy (DOE) has selected 19 research, development, and demonstration projects in support of its efforts to clean up the nation's nuclear weapons complex. The projects will address the recycling, reuse, and disposal of materials resulting from the decontamination and decommissioning (D&D) of facilities in the complex.

The DOE program provides for decontaminating and, in some cases, decommissioning weapons facilities by the year 2019. Concrete and strategic metals by-products resulting from D&D could be reused within DOE or recycled by the commercial sector. Where this is not practical, as with contaminated asbestos, the projects will develop and demonstrate technologies to convert the materials to disposable waste forms.

The 19 projects were selected from 69 proposals submitted to DOE's Morgantown Energy Technology Center (METC) in West Virginia and will be managed by METC on behalf of the Office of Environmental Management and Waste Management's Office of Technology Development. The work on the selected projects will be performed in phases to ensure that the most promising technologies are continued and developed to full maturity. The initial development phase of the 19 selected projects has an estimated value of $10.5 million.

The selected companies and projects, by category, are:

Disposal of Asbestos Insulation

- KAI Technologies, Inc., for the recycling, reuse, and disposal of materials from DOE's decontamination and decommissioning activities.

Decontamination/Recycling of Concrete

- Isotron Corp., for electrokinetic decontamination of concrete;
- OBG Technical Services, Inc., for soda blasting evaluations;
- AVCO/Textron Defense Systems, for concrete decontamination by electrohydraulic scabbling;
- Oceaneering Technologies, for development of a productive remote dry-ice-pellet decontamination system; and
- AWD Technologies, Inc., for decontamination/recycling of concrete.

Decontamination of Process Equipment

- Scientific Ecology Group, Inc., for decontamination of process equipment; and
- Babcock and Wilcox, for decontamination of process equipment using chelate chemistry technology.

Recycling of Contaminated Scrap Metal

- Scientific Ecology Group, Inc., for the recycling and reuse of radioactively contaminated scrap metal;
- Manufacturing Sciences Corporation, for advanced technologies for decontamination and conversion of radioactively contaminated scrap metal to high-value intermediate and final product forms; and
- Molten Metals Technology, Inc., for the process of catalytic extraction contaminated scrap metal.

Characterization

- Science and Engineering Associates, Inc., for characterization of radioactive contamination inside pipes;
- Bio-Imaging Research, Inc., for waste inspection tomography;
- General Electric Corporate Research and Development, for rapid surface sampling and an archival record system;
- Physical Sciences, Inc., for a portable sensor for hazardous waste;
- Coleman Research Corporation, for a three-dimensional integrated characterization and archiving system; and
- Westinghouse Science and Technology Center, for a treatability study for concrete surface characterization using prompt gamma neutron activation analysis.

Worker Productivity and Protection

- Oceaneering Space Systems, for an advanced worker protection system; and
- Membrane Technology and Research, Inc., for permselective/sorptive protective clothing.

Opportunities Offered for Advanced Research in India

The Indo-U.S. Subcommission on Education and Culture is offering up to eight long-term (6–10 months) and up to nine short-term (2–3 months) awards for 1994-95 research in India. These grants will be available in all academic disciplines, except clinical medicine. Applicants must be U.S. citizens and hold a PhD or have comparable professional qualifications.

The fellowship program seeks to open new channels of communication between academic and professional groups in the United States and India and to encourage a wider range of research activity than now exists between the two countries. Scholars and professionals with limited or no prior experience in India are especially encouraged to apply. The program is sponsored by the Indo-U.S. Subcommission on Education and Culture and is funded by the United States Information Agency, the National Science Foundation, the Smithsonian Institution, and the Government of India.

The application deadline is **August 1, 1993.** Application forms and further information are available from the Council for International Exchange of Scholars, 3007 Tilden Street, N.W., Suite 5M, Box INDO-NEWS, Washington, DC 20008-3009; telephone: (202) 686-4017.

1994-1995 Fulbright Competition Opens for U.S. Faculty and Professionals

The Fulbright Scholar Program for 1994-95 includes some 1,000 grants for research, combined research and lecturing, or university lecturing in nearly 135 countries. Opportunities range from two months to a full academic year; many assignments are adjustable to the needs of the grantee. Nearly one-third of Fulbright grants are targeted for research, and many lecturing awards offer research opportunities; multi-country research is also possible in many regions.

Virtually all disciplines and subfields participate. Specific openings exist in almost every area of the humanities, social sciences, physical sciences, the arts, and applied fields such as business, journalism, and law. Many offerings throughout the program allow scholars to propose their own lecturing or research projects.

The basic eligibility requirements for a Fulbright award are U.S. citizenship and PhD or comparable professional qualifications. For lecturing awards, university or college teaching experience is expected. Language skills are needed for some countries, but most lecturing assignments are in English.

Applications are encouraged from professionals outside academia and from independent scholars. Fulbright seeks good teachers as well as active researchers.

The deadline is **August 1,1993** for research or lecturing grants to all world areas. Other deadlines are in place for special programs.

For further information and applications, call or write the Council for International Exchange of Scholars, 3007 Tilden Street, N.W., Suite 5M, Box NEWS, Washington, DC 20008-3009; telephone: (202) 686-7877. □

Coming in June...

Guest Editors J.W. Mayer, Arizona State University; Jian Li, Intel Corporation; and Robert Blewer, Sandia National Laboratory, will focus on the subject of Copper Metallization. Articles on this topic will include:

Chemical Vapor Deposition of Copper for Multilevel Metallization, by Alain E. Kaloyeros, SUNY-Albany, and Michael A. Fury, IBM;

Copper Etching: New Chemical Approaches, by Mark J. Hampden-Smith and Toivo T. Kodas, University of New Mexico;

Inlaid Copper Multilevel Interconnections Using Planarization by Chemical-Mechanical Polishing, by S.P. Murarka, J.Steigerwald, and R.J. Gutmann, Rensselaer Polytechnic Institute;

Electroless Copper for VLSI, by James S.H. Cho, Ho-Kyu Kang, and S. Simon Wong, Stanford University; and Yosi Shacham-Diamand, Cornell University; and

Refractory Metal Nitride Encapsulation in Copper Wiring, by Jian Li, Intel Corporation, and J.W. Mayer, Arizona State University.

Ad closing for the June MRS Bulletin is May 1, 1993. To place your ad, call Mary E. Kaufold at (412) 367-3036 today!

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