Report from NIST Details Benefits of Advanced Technology Program

The National Institute of Standards and Technology released a report stating that the expected economic benefits from the Advanced Technology Program (ATP) outweigh program costs. ATP co-funds with industry high-risk research projects to develop enabling technologies. The contract report, *Advanced Technology Program Performance of Completed Projects, Status Report Number 1* (NIST SP 950-1), by economist William F. Long of Business Performance Research Associates Inc., provides a detailed examination of the outcomes of the earliest ATP projects. The report shows that for 24 of the 38 completed projects, a new product or service is on the market, or a new process is being used to improve the quality or reduce the cost of an existing product or service; and of the 27 small, single-applicant companies, nearly 60% have more than doubled in size since their ATP award began.

The study documents research accomplishments, subsequent work by the companies to commercialize the results, and near-term outlooks for the technologies, and also lists the reasons for failure of 12 terminated projects. The technologies were distributed over seven broad areas—materials; energy and environment; biotechnology; information, computers and communication; chemicals and chemical processing; discrete manufacturing; and electronics—with the majority in electronics.

According to the report, the new technologies fostered by ATP include a merger of tissue-engineering and textile-weaving to help regenerate lost or damaged tissue in the body and an application of high-temperature superconductors to improve cellular phone service. Other new technologies developed under the projects ran the gamut from a desktop bioreactor capable of growing large amounts of human stem cells isolated from bone marrow for cell replacement therapy—a device now in clinical trials—to a computer programming tool to simplify the task of writing software for parallel-processing computers, which is now in commercial use, and a new navigation system for mobile robots that is being used to guide delivery robots in hospitals.

Among other successful examples provided in the report is a project pursued by a startup company that developed technology for processing very large semiconductor wafers, bringing into market processing equipment for the next generation of 300-mm semiconductor wafers. Another example is a small firm that developed a laser light source, which is described in the report as the most powerful tunable source of laser light over much of the ultraviolet spectrum, and which has been incorporated in three new products for laser surgery and other applications.

Technical success has not always led to commercial success, according to Long. In a few cases, financial reverses or corporate takeovers have left technically successful projects in abeyance. Projects with medical applications generally have yet to be widely applied because they must go through a long process of clinical trials, according to the report.

Copies of the report may be obtained from the ATP Economic Assessment Office, 301-975-2064, or e-mail to atp@nist.gov. The report is available at website www.atp.nist.gov/atp/pubs.htm.

NRC Recommends Science, Mathematics, Engineering, and Technology as Required Courses in Undergraduate Level

To be better prepared for an increasingly technological society, all undergraduate college students in the United States—regardless of their major areas of study—should be required to take courses in science, mathematics, engineering, or technology, according to a report by a committee of the National Research Council. In addition, two- and four-year colleges and universities should revise their admission requirements to ensure that they are consistent with national and state science and mathematics education standards.

Committee chair Marye Anne Fox, chancellor, North Carolina State University—Raleigh, said, "A majority of Americans are not prepared for the ever-expanding role that science and technology are playing in our daily lives. Undergraduate students—our future leaders, policymakers, and teachers—will need to make important decisions based on their understanding of basic scientific concepts. Universities must provide more opportunities for all students to get a solid foundation in science, mathematics, engineering, and technology."

According to the report, *Transforming Undergraduate Education in Science, Mathematics, Engineering, and Technology*, students enter college with varying levels of understanding and experience in science and mathematics, and most undergraduate students do not study the subjects for more than one year, if it all. Many of the courses they take focus on one discipline, such as biology or chemistry, and often do not give students an understanding of how disciplines are interconnected and their importance and relevance to everyday life or society.

The committee also reported that many students receive credits for scoring highly on advanced placement tests in science and mathematics and may not be required to take courses in these subjects at some colleges or universities. Although these students do well in placement tests, they may not be sufficiently prepared in these subjects, according to the committee.

The committee recommends that college and university officials, administrators, and faculty across departments work together to develop courses and provide students with opportunities to explore these subjects as early in their studies as possible. The committee said that the courses should be structured to include at least one laboratory experience and allow as many undergraduate students as possible to participate in research projects. In addition, universities should continually review admissions requirements to ensure that they measure levels of knowledge and competency specified by national and state K–12 science and mathematics standards.

The committee also recommends strengthening training and professional development of current and new K–12 teachers of science and mathematics. The committee recommends that faculty in science, mathematics, engineering, and education departments work together more closely to develop teacher preparation programs that offer scientific discovery both inside and outside the classroom. In addition, universities could form partnerships with local school districts to provide needed resources to continue professional development for teachers.

Copies of the report are available from the National Academy Press, 2101 Constitution Ave., NW, Washington, DC 20055; 202-334-3313 or 1-800-624-6242. The cost of the report is $24.00 (prepaid) plus shipping charges of $4.50 for the first copy and $0.95 for each additional copy. □

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