

Industrial R&D Boom Continues

Industry will significantly increase its spending for R&D in 2000, but federal expenditures will remain essentially flat, according to an annual forecast prepared by Battelle (Columbus, OH). U.S. R&D expenditures are predicted to total \$266 billion, up from the \$247 billion that the National Science Foundation (NSF) estimates went into R&D in 1999. Battelle foresaw a total R&D spending of \$236 billion in its 1999 forecast (see *The Industrial Physicist*, 4/99, p. 15).

U.S. companies will put \$187 billion into R&D this year, up 10.6% from the \$169 billion they spent last year. Federal R&D expenditures are

estimated at \$66.4 billion, an increase of only 0.07% from last year's \$65.9 billion that won't keep pace with inflation. Non-profit organizations, including universities, will put \$12.6 billion into R&D, an increase of more than 6% over the 1999 figure.

The increases continue a trend of several years that began when industry recognized that it was shortchanging itself by slashing research budgets, says Jules J. Duga, a physicist turned policy analyst and principal author of the forecast. The demand for short-term payoff from all investments remains a strong force in industry, but companies also recognize the obvious need to support programs that will lead to future market success.

"The fast pace of technology change is such that if companies do not change their products and develop new markets, they are in bad shape," Duga says. "They have to develop new technology or utilize technology that is already available and do so

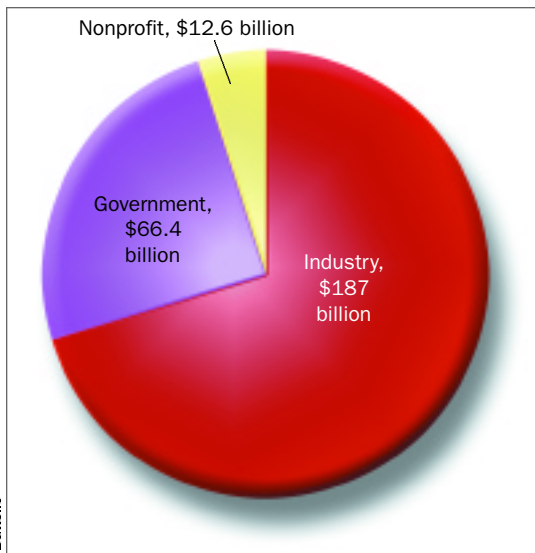
aggressively." And, he adds, "Research itself is becoming more expensive because the questions are getting harder. We have solved all the easy ones."

The size of the increase in industrial R&D funding stems from factors that have historically influenced technological growth—

improved sales, higher earnings, and expanding markets. "The rapid increase in stock prices may be seen more as a result of R&D investment and commitment, not a driving force," Duga says. He expects significant R&D increases in electronic components, pharmaceuticals, office computers and

next few years, two situations could have adverse effects on industrial spending. One is significant upheaval in foreign economic or political stability, as happened in Asia in recent years. The other is an insufficient number of research personnel. "The number of scientists and engineers going into industrial research is going to have to increase to effectively absorb the increased spending," Duga says.

In a separate survey, the Industrial Research Institute (IRI) found that little change was expected this year in industrial R&D expenditure patterns. IRI's more than 260 member companies carry out about 80% of industrial research in the U. S. manufacturing sector. The 90 companies that responded to the IRI survey expected average R&D spending to equal 3.2% of sales, up from 3.1% in 1999, and R&D budgets to increase 4.4%, compared with last year's anticipated increase of 4.2%. Twenty-one percent of the companies expected their R&D spending to increase by more than 5%, compared with 22% last year, and 21% expected to decrease R&D spending this year, down from 25% in 1999. [Q](#)



Projected R&D investment for 2000

accounting machines, and communications equipment, and smaller increases in mature industries such as basic metals, petroleum, and chemicals.

Duga foresees three trends continuing. Companies will emphasize partnerships and collaborations with other companies, federal laboratories, and research organizations abroad. Industrial-academic collaborations will also proceed, with renewed efforts to address how to meet the competing and sometimes conflicting goals of the two institutions (see *The Industrial Physicist*, 2/00, pp. 32-33). The federal R&D budget will remain a matter of contention on Capitol Hill. Congress will be under pressure to reduce the national debt, cut taxes, and ensure the strength of Social Security. As a result, it is unlikely to significantly increase federal R&D appropriations, Duga says.

Although the upward trend in R&D spending is expected to continue over the

Clinton boosts technology

Nanotechnology and information technology (IT) emerged as winners in President Clinton's budget request for fiscal year 2001. The president proposed a \$497 million National Nanotechnology Initiative (NNI), which would include a \$227 million (84%) increase in federal spending for R&D in the field. His request for \$2.268 billion in funding for IT R&D represents an increase of \$605 million (36.4%) above the current federal budget.

Forty-one percent of the increased funding intended for nanotechnology and IT research, or \$343 million, would go to the National Science Foundation (NSF). In his budget request, the president proposed an NSF budget of \$4.6 billion, which is an increase of \$675 million. If the request is approved by Congress, which is anything but certain, the increase would be the

largest in NSF's history.

"America leads the world in information technology, an industry that now accounts for a third of our economic growth," the president said in a speech at the California Institute of Technology, where he announced the proposed increases.

The White House called the NNI "a top priority." It would provide \$195 million for fundamental research and \$110 million for "grand challenges"—such things as developing stronger and lighter-weight materials and significantly reducing the size of computer-chip components. The remaining funds would pay for developing "centers and networks of opportunity" to encourage research networking and the shared use of academic research facilities; studies of the ethical, legal, and social implications of nanotechnology; and workforce training and education.

"Roughly 70% of the new funding proposed under the NNI will go to university-based research, which will help meet the growing demand for workers with nanoscale-science and engineering skills," the White House said.

Nanotechnology funding would be split among six agencies and departments: NSF, \$217 million; Department of Defense, \$110 million; Department of Energy, \$96 million; National Institutes of Health, \$36 million; National Aeronautics and Space Administration, \$20 million; and Department of Commerce, \$18 million.

The IT areas given priority in the proposed budget include ensuring that mobile and wireless systems become integral parts of the Internet; applying advances in quantum computation and molecular and nanoelectronics to develop future generations of computers; and building broadband optical networks. Other goals are the development of intelligent machines and networks of robots; improving the storage, management, and preservation of data; and ensuring the security and privacy of information.

Funds for the IT program will be divided among seven U.S. departments and agencies, the bulk going to NSF (\$740 million) and the Department of Energy (\$667 million). 