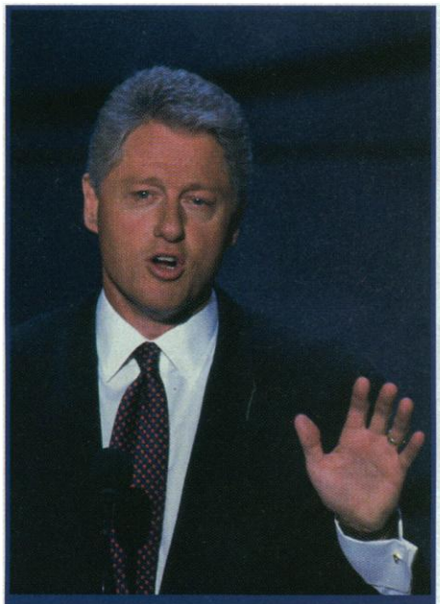
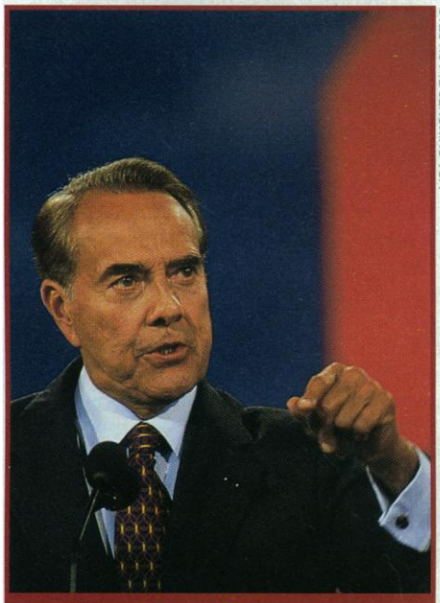
The Candidates Speak

At the invitation of *Science*, President Bill Clinton and Senator Bob Dole have responded to a series of questions regarding science policy



DENNIS BRACK/BLACK STAR

BILL CLINTON



LISA QUINONES/BLACK STAR

BOB DOLE

Bill Clinton is President of the United States and the Democratic candidate for President. Bob Dole is a former senator from Kansas and the Republican candidate for President.

Question 1

What will be your top three science and technology (S&T) priorities or initiatives during your Administration?

CLINTON: The Clinton Administration understands the significance of S&T to the prosperity and security of our nation. One priority is to ensure that our extraordinary S&T enterprise is put to use in the service of achieving key national goals, including a strong and vibrant economy. Achieving this goal will require our continued commitment to effective R&D partnerships with academia, industry, and international collaborators. Our efforts to move the results of science and new technology from the lab to the market more efficiently will continue. Our support of the development of military-civil dual needs technology will be maintained.

Another priority is maintaining the vitality of our S&T enterprise by supporting strong, equitable, and expansive education programs. Our progress as a nation has been linked to our formidable S&T capacity. We must maintain this strength by making sure we train the scientists, engineers, mathematicians, and citizens of the 21st century. From grammar school to university, American students must have the training opportunities that will prepare them for the technical jobs and research needs of the next century.

A critical priority is the continued exploration of the world around us. We are committed to fundamental research for knowledge's sake. We must learn more about ourselves, our neighboring creatures, and the planet we share. It has been through this commitment to knowledge that we have found new cures for diseases, new machines to improve productivity, and new ways to use resources more efficiently and protect the environment. These discoveries have improved the quality and the richness of our daily lives and provided a more secure future for our children. We must continue to be explorers. Our questing nature has recently brought us fascinating information about our neighbors Jupiter and Mars and about new forms of life in the ocean depths. This Administration will continue its strong commitment to fundamental research—our pathway to discovery.

DOLE: Basic research, science education, and transfer of federally funded research to American industry. Other priorities are subordinate to these three.

Without question, the basic S&T research base of this country is without peer in the world, and the Dole Administration will strongly support the scientific community and work to strengthen it. Rarely is government so cost-effective. This nation's sponsorship of basic science has led to breakthroughs that have enhanced the quality of life for our citizens.

We must continue supporting the strong and vital scientific research and education communities and ensure the funding stability that scientists and engineers require in order to pursue their R&D objectives.

Also, the Dole Administration will work closely with the basic research communities in our universities, government, and the private sector to ensure the continuity of funding so vital to the sustainability of our research enterprise.

We will take steps to accelerate the flow of basic research from our universities to American industry. And we will help resolve the gap between government funding of the initial research and the subsequent development being supported by the private sector by changes to our tax code, regulation, and other government intrusions into the industrial community that have contributed to industry backing away from investments in and support of basic research, technology development, and production of advanced and innovative technologies.

I intend to convene the leaders of the scientific research community at a national meeting to learn from them how the Dole Administration can provide motivation, incentives, and any other advantage that will cause industry to support strong research laboratories and more cooperation with our research universities, so together we can provide important technology to our citizens and successfully meet foreign competition. I see the relations between federal and state government, research universities, and industry as the key to the future of our research enterprise.

RICK FRIEDMAN/BLACK STAR

Question 2

Your plan to reduce the deficit would cut funding for S&T over the coming years in inflationary terms. Why doesn't it need to grow? Should medical research funding be protected from cuts?

CLINTON: The Administration is committed to a balanced budget by 2002. However, we will continue to fund the Administration's priorities, which include S&T and education, to the highest levels possible. We recognize that, sustained support of S&T is just as critical to the continuing economic health of the nation as is deficit reduction. That's why the Administration has fought in each of its budgets to increase spending on civilian R&D while simultaneously cutting the annual deficit by more than half.

The Administration commitment to S&T has been demonstrated time after time, including the President's fiscal year 1997 (FY97) request to Congress. This budget increases federal civilian S&T funding by more than $1 billion over 1996, and pegs total federal R&D spending at roughly $73 billion. These increases for FY97 come in the face of a highly constrained nondefense discretionary budget. The budget proposes $14 billion for fundamental research, an increase of $278 million (2 percent) over 1996. The President's FY97 budget also invests in technologies to create new jobs and new industries. There are increases for computing and communications research (up 3 percent), breakthrough technologies for clean and efficient cars (up 5 percent), and new building and construction technologies (up 20 percent). Also included in the portfolio of programs that directly support economic growth are full funding of transportation technologies to make our roads and highways safer and less crowded, including a $337-million program of new technology partnerships aimed at the 75 most congested urban areas in the United States. The President's FY97 budget also increases funding for environmental research including (i) an 8 percent increase for research aimed at understanding and predicting global climate change and its consequences, (ii) $72 million for the Environmental Technology Initiative—a partnership between industry and government, and (iii) increases of $88 million for solar and renewable energy and $133 million for energy efficiency.

These examples are indicative of the Administration's intention to support S&T investments even as the deficit is eliminated. Although some of these proposals may not emerge intact from the congressional funding process, these are the kinds of choices that will be even more important in the years ahead. And the choices are likely to become increasingly difficult. The research programs have been protected at some agencies such as the National Science Foundation (NSF), reflecting the strong commitment to university-based research, and the National Institutes of Health, reflecting the strong commitment to biomedical research. The Clinton Administration will continue to speak to the future by sustaining the priority of research and education investments.

DOLE: I am committed to ensuring that federal support for our basic research and associated education programs does grow.

Deficit reduction and a balanced budget are part of my commitment to providing expanded opportunity for all citizens through a better, vibrant economy. Although federal science spending is an investment, it is not immune from contributing to deficit reduction, particularly in areas of technology development not tied to national security.

Although I would protect, and expand, funding for basic research, I am concerned about funding for technology development beyond basic research, where the funding agency appears to act more as a venture capitalist, trying to pick winners in the technology race, rather than letting American industry play its natural role. I would redirect this funding to basic research while encouraging American industry to cooperate with our research universities through tax and other incentives.

Support for biomedical research, which underlies needed advances in health care for our citizens, will continue to receive strong, growing support in my Administration. I

CHUCK KNEYSE/BLACK STAR

owe my own life to progress in medical research because my World War II injuries were successfully treated with a drug that was still experimental at the time. And my wife, Elizabeth, has headed the Red Cross, which is part of our medical community.

Question 3

Are we training too many scientists? How and to what degree should the government support graduate education?

CLINTON: Human capital is the key scientific and engineering resource for an increasingly knowledge-based, information- and technology-driven, globally competitive economy. Thus, the Clinton Administration has emphasized education and training, from grade school to grad school, as a key investment priority. This commitment is being realized through numerous initiatives including, for example, the support of systemic reform in K–12 math and science education and improved federal aid to families for greater access to higher education. Broadly expanded public knowledge in S&T will be essential for the 21st-century workplace.

Federal support for graduate education in science and engineering should be viewed in this broad context. Indeed, our continuing commitment to colleges and universities as the focus of our national basic research enterprise is based on the link between research and education. The great majority of federal graduate student support is in the form of research assistantships drawn from peer-reviewed competitive funding at the research frontier. We anticipate that about one-third of the doctoral recipients in science and engineering will continue in academic careers. The majority will go on to stimulate innovation in industry and research laboratories. The fraction of the 29-year-old American population with a science or engineering doctorate, about 0.4 percent, has not changed appreciably in two decades. The system has served, and is serving, the nation very well. Thus, although some optimization will continue (such as working with universities and industry to leverage increased research and education partnerships, or perhaps expanding the number of traineeships), no major shift in federal support is anticipated in the near term.

DOLE: No, we are not training too many scientists. Scientific education is valuable to people no matter what career path they ultimately choose. The number of people educated in science is not decided by the government. In a free country with a free market economy, people make their own choices about whether they want to go into science.

Although recent studies question whether our graduate science curriculum should be oriented more toward training people for academic research careers when a growing majority are going into industrial careers, it is the research universities working with industry who should determine what changes are needed in our current system.

Government should continue to support graduate education through fellowships and research grants. The level of support for various scientific and engineering disciplines is an appropriate topic for the agenda of the national science policy meeting I called for in my answer to question number one.

Question 4

How and to what degree should the government foster public understanding of science? What would your administration do to increase scientific literacy?

CLINTON: Science and technology will increasingly shape our future. Rapid technological advances and our decisions on how to use these advances will be affecting us broadly—from our national systems of transportation and health to our personal communications and financial activities. As we move into the 21st century, it is essential that our citizenry be literate in S&T.

It is chiefly through our education system that we will achieve this goal. We will maintain our strong programs for improving science, mathematics, and engineering studies from kindergarten to graduate school. This

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Administration is committed to moving America's classrooms into the next century with the teachers and the technology that are needed. We have already begun to connect our classrooms to the information superhighway with computers and software. We will continue and expand this effort. We will continue to bring the latest technologies into the classroom and ensure that business is a player in the training of its future work forces. We seek to broaden the reach of education through distance learning and build on such programs as the Star Schools, whose distance-learning projects have helped to improve instruction in mathematics, science, foreign languages, literacy skills, and vocational education. Through lifelong learning efforts, we will expand the knowledge base of this country and ensure that there is not a fixed end point to an education. The Clinton Administration plans to head our nation into the next century with a work force that is ready and a citizenry that is informed. Familiarity with S&T will join the "three R's" as a basic survival skill of the next century.

RICK FRIEDMAN/BLACK STAR

DOLE: We must strengthen science education, from kindergarten through graduate school. This does not mean the federal government should take over the direction of local schools' science programs. The primary responsibility for scientific literacy is in the local schools. Often the federal government has made things worse. For instance, in the Clinton Administration's Goals 2000 Program, national history standards were developed that had no mention of Edison and the Wright brothers. How can we get our children excited about becoming scientists and engineers if they are taught a history where scientists and engineers are unimportant?

What the federal government can do is continue its support of science programs on television and encourage industry's cooperation. Many of today's young scientists got their introduction to science with programs like "Ask Mr. Wizard." The NSF has supported summer institutes for public school teachers and high-school students and programs to allow undergraduate students to work on university research projects. These programs all encourage our best students to consider careers in science and engineering. They provide opportunities to women and minorities, who have been underrepresented in science and engineering. They will be continued and expanded.

The federal government should also support development of curriculum material to be delivered to schools using new technologies such as the Internet. This can provide educational opportunities to students wherever their schools are located—particularly in rural areas and the inner city, where school budgets can't support large science programs. And we should devise programs that encourage businesses to donate computer equipment, provide teacher support, and help the schools maintain the computers.

The government, through NSF and other science-related agencies, has a responsibility to explain and foster the understanding of S&T. Increased scientific literacy is part and parcel of increasing literacy at all levels.

Question 5

How and to what extent should the U.S. government seed R&D partnerships with industry? Do you believe that industry will invest adequately in R&D? If not, what kind of incentives for industrial investment will be needed?

CLINTON: Our Administration came to office with a firm knowledge that technology is the engine of economic growth and job creation. About half of our economic growth over the past several decades derives from investments in research and technology. We have improved the business climate for investment in technology with practical plans for balancing the budget, streamlining regulation, expanding markets for U.S. products abroad, and protecting U.S. businesses from unfair foreign trading practices. The Administration proposed and secured passage of targeted capital gains tax cuts in 1993 and has fought successfully for extension of the research and experimental tax credit.

Even in the best business climate, however, there will always be R&D that benefits the nation as a whole but cannot pay adequate returns to private investors. The federal government has a long tradition of supporting research in partnership with industry to develop products for agriculture, aviation, health care, the Internet, and other critical areas.

Intense competition in world markets; uncertainties growing out of deregulation of telecommunications, electricity, and many other major markets; and changes in the market for defense technology have, if anything, increased the need for well-managed federal investments in both basic and applied technology programs. The nonpartisan Council on Competitiveness and many

other business organizations have underscored the need to maintain federally applied research programs. Our interest in making the most effective use of federal funds has led us to rely heavily on partnerships with businesses who can both share the burden of research costs and convert innovations into investments that create growth and jobs. Calls to abandon federal research programs at this critical time are clearly dangerous and reckless.

DOLE: The primary means of government-industry cooperation should be the transfer of technology to industry from federally funded programs. I have been a champion of this technology transfer throughout my years in Congress. I sponsored the Bayh-Dole Act of 1980, which set up the technology transfer programs for our research universities, that have proved so successful in areas such as genetics research.

Industry will invest in R&D if given the right incentives, such as the R&D tax credit and the reduction of capital gains taxes. Regulations also need to be reformed, especially those of the Food and Drug Administration, which would bring effective new drugs to patients more promptly. Removal of unnecessary regulatory hurdles will also encourage American biotech firms to invest more in research when they see a clear path for producing and marketing their products.

Question 6

The government's R&D efforts are distributed among many agencies. To what extent is a reorganization needed?

CLINTON: Federally supported R&D efforts are distributed among many agencies and conducted by universities, government laboratories, and industry. The pluralistic support of science is strongly endorsed by the Administration. The diversity of missions and of associated research support mechanisms provides the best return on our R&D investment in pursuit of broad national goals such as health, national security, prosperity, and environmental stewardship.

Clearly, this distributed portfolio requires coordination. This is being provided through the National Science and Technology Council (NSTC), which has facilitated an unprecedented amount of communication and collaboration among the agencies and has also advanced multi-agency consensus on several research agendas driven by overarching national goals. The NSTC, established by the President in November 1993, is still relatively young and will evolve further.

Over the past 2 years, there has been considerable discussion in Congress about eliminating programs or agencies, such as the Departments of Energy (DOE) and Commerce (DOC). These agencies have important national missions and major S&T components. For example, DOE has prime responsibility for research in subatomic physics, for developing the science and enabling technologies aimed at environmentally responsible energy sources, for maintaining the safety and reliability of the nuclear weapons stockpile through a science-based program, and for environmental remediation. The DOC has prime responsibility for standards through its National Institute of Standards and Technology laboratories; for patent and trademark regulation; for stimulating commercial technology innovation; for the national census; and, through the National Oceanic and Atmospheric Administration, for oceanographic and atmospheric research, for the National Weather Service, and for coastal protection and marine sanctuaries. All of these government functions must be preserved. Consequently, our focus is on streamlining agency operations and concomitantly reducing the size of government, rather than shuffling pieces around the government. Indeed, in the past 3 years, the size of government has been reduced back to the level of that in the Kennedy Administration, while S&T programs have been preserved.

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DOLE: I am committed to reorganizing the functions of two large government departments that support science: Energy and Commerce. Too often, research money goes to support the overhead of government agencies rather than to the researchers. The necessity for finding additional savings everywhere in government to help reduce the deficit mandates a complete review of how to make the government's science support infrastructure more coherent, to avoid reducing funding for basic research itself.

Question 7

Is the country getting sufficient return on its investment in research at the hundreds of NASA, DOE, and Department of Defense (DOD) laboratories? Should some be privatized or closed?

CLINTON: The laboratories of NASA, DOE, and DOD have been enormously productive in contributing to their agency objectives. The end of the Cold War and the imperative to make government more efficient have focused increased attention on improving the efficiency of these agencies' laboratory structure. A Presidential Decision Directive has put forward a set of principles and objectives to make the national laboratory system more efficient by streamlining and improving its management while retaining its scientific and technical effectiveness. These objectives are essential to maintaining a strong national defense, economic security, and U.S. world leadership in S&T. Substantial downsizing has already taken place. For example, DOD has already reduced its research, development, test, and evaluation personnel by over 11 percent from its FY92 level and is scheduled to reduce it an additional 17 percent by 2001. Department of Defense laboratory personnel levels have dropped by 7 percent since FY93. Consolidations have already taken place and more are expected. Privatization

is one option that may be appropriate in some cases.

The most important challenge is to retain and even enhance scientific competence and innovation capability at these research centers during this downsizing. The Administration is committed to preserving the vital core R&D competencies these agencies must have to accomplish their missions and to serve their academic and industrial customers.

DOLE: It is important to examine all aspects of government spending as we eliminate the deficit. I am committed to the reorganization of Energy's and Commerce's functions. Some of the government laboratories were established for particular purposes that are no longer a government priority. If these labs are to be assigned a new mission, we need to be sure that they are the ones to perform it most efficiently. In addition, consolidation of management and programs within our laboratory system should undergo further review.

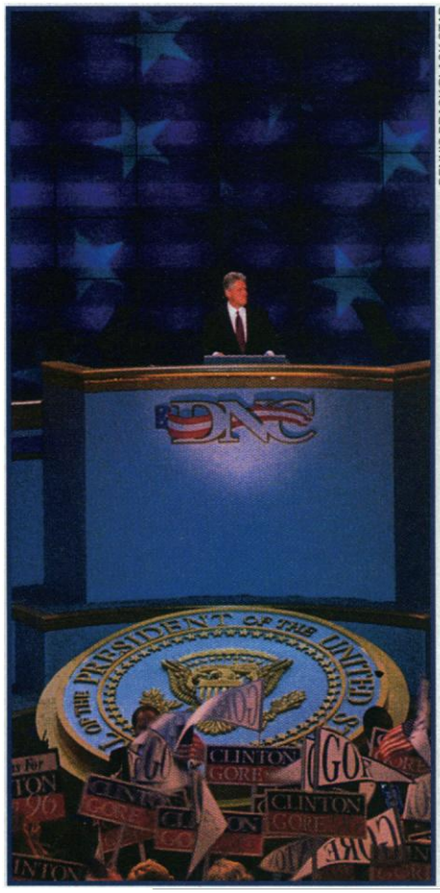
Question 8

Should we spend more to explore the solar system or should the space program focus more on monitoring the Earth?

CLINTON: Our investments in space research and technology should not be viewed in an "either/or" context. The President's policy is to support a strong, stable, and balanced space program across a number of areas, including space science, Earth observations, and human space flight. In each of these areas, we have sought to apply new management philosophies, converge agency requirements where feasible, and introduce new program approaches to get the most for our investment.

The President's new space policy underscores these commitments by directing NASA to undertake a program to support a robotic presence on the surface of Mars by the year 2000. It also directs NASA to initiate a long-term program to obtain in situ measurements and sample returns from celestial bodies in the solar system. At the same time, it directs NASA to undertake a program of long-term observation, research, and analysis of the Earth Observing System by 1998.

The question is not whether we do one type of science or another; it is how we set priorities, streamline, and schedule activities so as to be both cost-efficient and timely in developing the technology and delivering the science. Indeed, the President has announced a space summit for late this year that will take a fresh look at optimizing a robust set of space explorations within realistic budgetary constraints.



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DOLE: Both aspects of the space program are producing important scientific data and should be continued as part of a balanced research program. In the future, as commercial space ventures go into operation, the private sector may take over more of the Earth monitoring.

Question 9

What changes, if any, should be made in U.S. energy policy? How and to what extent should the government encourage use of nonfossil-fuel energy sources and reduce greenhouse gas emissions?

CLINTON: By the middle of the 21st century, world population is expected to exceed 10 billion. The demands for increased standards of living will drive large increases in energy consumption, in turn putting great stress on the global environment. Research investments in renewable energy and energy-efficient technologies are essential to our long-term economic competitiveness, security, and environmental quality.

The Administration favors continuation of selected tax incentives that spur greater private development and utilization of alternative energy and conservation technologies. However, federal sponsorship of basic research and enabling technology development is also essential, particularly in those areas where the returns on investment are distributed and far into the future or where capital requirements and risk are very large. The Administration will continue to back research on environmentally sound solar, wind, biomass, and fusion energy sources, as well as on diverse ways to improve the efficiency of energy production and use. For example, the Administration recently announced projects designed to demonstrate complete energy-from-biomass processes, from crop growth to electricity generation with the latest turbine technology. The Partnership for a New Generation of Vehicles is a flagship public-private partnership advancing research toward a major breakthrough in automobile energy efficiency (80 miles per gallon). International collaboration on fusion will be supported.

The diversity of energy needs, from the support of rural economics to efficient transportation to meeting large-scale electricity demands, clearly motivates a broad portfolio of energy research as exemplified above. The Administration will continue to seek a return to bipartisan support of this research portfolio at a level commensurate with its critical importance to America's long-term economic, environmental, and security interests.

DOLE: The difficulty confronting the nation today is that we don't have a coherent energy policy. Instead, we have fragments such as the Clinton Administration's proposed Btu tax—which Republicans defeated—and a 4.3-cent gas tax—which I worked to repeal as a senator.

We must encourage investment in energy resources, technology, and infrastructure. My proposed tax cut, especially reducing capital gains by 50 percent, will do more to encourage marketplace-driven investment in our energy future than all of the government energy subsidies.

It seems that the only time we think about our energy future is when gas lines are long or when Saddam Hussein rears his ugly head. Crisis management is always shortsighted and expensive and results in government programs that are Band-Aid solutions with long lives.

As I stated before, I am committed to reorganizing DOE. We need greater reliance on market forces to define our energy choices, not a Washington bureaucracy.

The scientific jury is still out on the full impacts of human interactions on our global environment. Until more research is completed, it is not appropriate to commit to internationally binding mandates or other government intervention.