

PRESIDENT WILLIAM J. CLINTON
REMARKS ON SCIENCE AND TECHNOLOGY INVESTMENTS
CALIFORNIA INSTITUTE OF TECHNOLOGY
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Acknowledge: introducer Gordon Moore; Caltech President David Baltimore and the whole Caltech and JPL community; Sec. Richardson [*who has done a great job of making sure our National Laboratories are true engines of innovation in fields from computational science to environmental technology*]; NSF Dir. Rita Colwell; Neal Lane. I would also like to thank someone who is not here today – the Vice President, who has played an enormous role for many years in keeping America the world’s leader in science and technology, and who’s been campaigning all over the country with a Palm VII on his hip. In fact, he loves science and technology so much, he’s not even angry that Caltech beat out his alma mater for the top spot in the *U.S. News* rankings this year.

You know, I hate to admit it, but lately I’ve been spending a lot of time getting in touch with my “inner nerd.” I think it started with a wonderful lecture at the White House with Vint Cerf, one of the founders of the Internet, and Eric Lander, who has helped develop many of the tools of modern genome research. It accelerated over the holidays, when I started buying gifts over the Internet and figured out what all the fuss was about. I mean no one told me that with just a click of a mouse you can get an authentic Arkansas chopped pork sandwich delivered right to your door.

Three weeks ago, TIME Magazine crowned as the “Person of the Century” Albert Einstein – who, of course, spent a great deal of time here at Caltech in the early 1930s. The fact that he won this honor – rising above such enormously influential figures as Franklin Roosevelt and Mohandas Gandhi – is a powerful testament to the quantum leaps in knowledge Einstein achieved for all humanity. It is also a clear recognition that the 20th century will be most remembered, in the words of TIME’s managing editor, “for its earthshaking advances in science and technology.”

But, of course, the reason why so many of you are here is because there are so many more great scientific questions just waiting to be answered. How does the three-pound mass of tissue up here [*the brain*] produce the phenomenon of consciousness? How do we translate insights from neuroscience into more productive learning environments for our children? Why do we age? When you look at pictures of me from my first year in office, it’s clear that we do age – but is aging pre-programmed, or is it just wear and tear? Are we alone in the universe? What causes gamma-ray bursts? What makes up the “missing mass” of the universe? And the biggest question of all: How is it possible that you can add \$3 billion in market capitalization just by adding “dot com” at the end of a name?

I am confident that you will help us find the answers to the serious questions I’ve just posed. For it was this brilliant Caltech community that first located genes on chromosomes and unlocked the secrets of chemical bonds and quarks. You were the propulsive force behind jet flight and built America’s first satellite. You made it possible for us to manufacture microchips of ever increasing complexity and gave us our first guided tour on the surface of Mars. And with your new

Gravitational Wave Observatory, you will open an entirely new window on the mysteries of the universe, observing the “propagating ripples” in space that Einstein predicted 84 years ago.

Today, I want to thank you for all that you are doing to advance the march of human knowledge. I have also come here to announce all the ways we intend to accelerate that march – by greatly increasing our national funding for science and technology.

The budget I will submit to Congress next month will include a \$2.8 billion increase in our 21st Century Research Fund. This will support a \$1 billion increase in biomedical research at the National Institutes of Health ... double the largest dollar increase for the National Science Foundation in its 50 year history ... and will provide major funding increases in areas such as information technology, space exploration, and the development of cleaner sources of energy.

This budget makes research at our nation’s universities a top priority – with an increase in funding of more than \$1 billion. University-based research provides the kind of fundamental insights that are the most important building blocks of any new technology or treatment. It also helps produce the next generation of scientists, engineers, and entrepreneurs. We’re going to give university-based research a major lift.

My budget supports increases not only in biomedical research, but also in all scientific and engineering disciplines. As you know, advances in one field are often dependent on breakthroughs in other disciplines. For example, advances in computer science are helping us to develop drugs more rapidly, and to move from sequencing the human genome to better understanding the function of individual genes.

My budget supports a major new National Nanotechnology Initiative, worth \$500 million. Caltech is no stranger to the idea of nanotechnology – the ability to manipulate matter at the atomic and molecular level. Over 40 years ago, Caltech’s own Richard Feynman [FINE-man] asked, “What would happen if we could arrange the atoms one by one the way we want them?” [*One answer is that we can make cool images of the Western Hemisphere in gold atoms, as you can see in greatly magnified form behind me. With our national investment in nanotechnology, we believe we can find more enduring uses.*]

Imagine the possibilities: materials with ten times the strength of steel and only a small fraction of the weight ... shrinking all the information housed at the Library of Congress into a device the size of a sugar cube ... detecting cancerous tumors when they are only a few cells in size. Some of our research goals may take 20 or more years to achieve, but that is precisely why there is an important role for the federal government.

As I announced yesterday, my budget also includes an historic initiative to make higher education more affordable. We’re proposing to make college tuition tax-deductible, for the first time ever. We also want to significantly increase the value of Pell Grants and help minority students earn degrees in fields like science and engineering in which they are greatly underrepresented. Thanks to scholarships and other aid, I became the first person in my family to go to college. I don’t want a single student in America to be denied the chance I was given.

In addition to announcing these new ways we are going to catalyze discovery and make college more affordable, I have one other major mission here today. I want to take a step back, to acknowledge that we have not done a good enough job of helping all Americans understand why the enormous investments we are making in science and technology are so important. For far too many of our citizens, science is something done by men and women in white lab coats, behind closed doors – something that leads, somehow, to things like Dolly the sheep and satellite TV. It is our responsibility to help open the world of science to our citizens – to help them understand the great questions that science is seeking to answer, to help them see how those answers will directly affect their lives.

So the first thing I want to underscore, in the clearest possible way, is that science and technology have become the engine of our economic growth. Consider the impact of information technology. Because of our early investments in developing the Internet, America now leads the world in information technology – an industry that accounts for one third of our economic growth and that generates jobs that pay almost 80 percent more than the private sector average wage. In the words of Alan Greenspan, “It is information technology that defines this special period.... Information innovation lies at the root of productivity and economic growth.”

To ensure that America continues to lead in the Information Age, my budget proposes a 36% increase in information technology research. With this infusion of funds, researchers will be able to tackle a wide range of important challenges: How do we find precisely the piece of information we are looking for in a vast ocean of raw data? How do we design computers that are usable by everyone, including people with disabilities? Can the Internet grow to accommodate not only millions of computers but billions of other devices? I read the other day that manufacturers will soon introduce a refrigerator that can scan the bar codes of empty packages and expired goods and then order new groceries for you over the Internet. [*Now – if those engineers could just figure out a way to get rid of that moldy salsa that’s been hiding in the fridge for a year and a half, without your having to touch it.*]

Second, I want all Americans to see that investments in science and technology are allowing us to lead longer, healthier lives. In the last century alone, the life expectancy for the average American has increased from 47 to 77 – thanks to discoveries such as penicillin and the development of vaccines for many childhood diseases.

Today, we are on the cusp of even greater advances. Later this year, researchers expect to finish the first complete sequence of the human genome – all 3 billion letters and 80,000 genes that make up our DNA code. Since so many diseases have a genetic component, the completion of this project will lead to a revolution in our ability to detect, treat, and prevent many diseases. For example, patients with some forms of leukemia and breast cancer may soon receive sophisticated new drugs that elegantly and precisely target cancer cells, with little or no risk to healthy cells. Our new trove of genomic data may even allow us to identify and cure most genetic diseases before a child is even born.

Research at the intersection between biomedical research and engineering will also lead to amazing breakthroughs. Scientists are already working on an artificial retina to treat certain kinds of blindness, and methods of directly stimulating the spinal cord to allow people who are paralyzed

to walk. Someday, we may be able to grow organs from a single adult cell – ending forever the agonizing wait for a heart, kidney, or liver transplant.

Third, advances in science and technology are helping us to preserve our environment in ways that produce more widespread, more stable, more sustainable economic growth. Here in California, we helped build a moderate-income housing community with glass in the windows that keeps out four or five times as much heat and cold as ordinary windows do. With these and other technologies, we thought we'd be able to save homeowners 40% off their energy bills. It turns out, they're saving 65%.

The Detroit Auto show is showcasing cars we've helped the automakers develop which get 70 to 80 miles a gallon. Next on the horizon are even more efficient cars powered by fuel cells that emit pure water and nothing else. Before you know it, we will crack the chemical barriers to truly efficient production of biomass fuels, which generate eight or nine times more energy than we invest in producing them. That would be the equivalent of traveling hundreds of miles on a gallon of gas. My budget will help spur all of these energy-saving technologies and alternative fuel sources to cut down on greenhouse gas emissions here and around the world. We will finally break the hold of the long-outdated idea that a nation can only grow rich and stay rich if it despoils the environment.

But for all of the extraordinary promise of science and technology, we must never forget the weighty responsibilities that promise imposes on us. The same genetic revolution that can offer new hope for millions of Americans could also be used to deny people health insurance or clone a human being. Information technology, which helps educate our children and provide telemedicine for rural communities, can also be used to create disturbingly detailed profiles of every move our citizens make online.

The federal government has a large role to play in meeting these challenges. That's why, for example, we've put forward strict rules and penalties to limit the use and release of medical records. That's why we worked with Congress to ban the cloning of human beings, while preserving our ability to use the morally and medically acceptable applications of cloning technology. And that's why we are working with the Internet industry to ensure that consumers will have control over how their personal information is used.

But frankly, it's up to all of us to make sure that we use the new powers that science and technology gives us in a responsible way. Just because we can do something doesn't mean that we should do it. It is incumbent upon us, both scientists and public servants, to ensure that science always serves humanity, never the other way around. For as Albert Einstein said on this very campus nearly 70 years ago: "Never forget this in the midst of your diagrams and equations.... Concern for man himself and his fate must always form the chief interest of all technical endeavors."

Today, as the first light falls on the new millennium, we see illuminated before us an era of unparalleled promise – fueled by curiosity, powered by technology, driven by science. Our restless quest to understand the unknown, a quest that has defined us as Americans since the first explorers set foot on this continent, will quicken. More than any other time in human history, the 21st century

will be the century of discovery and science. Thank you for all that you have done to bring us to this moment. Thank you for helping to guide and propel us all into the future.

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