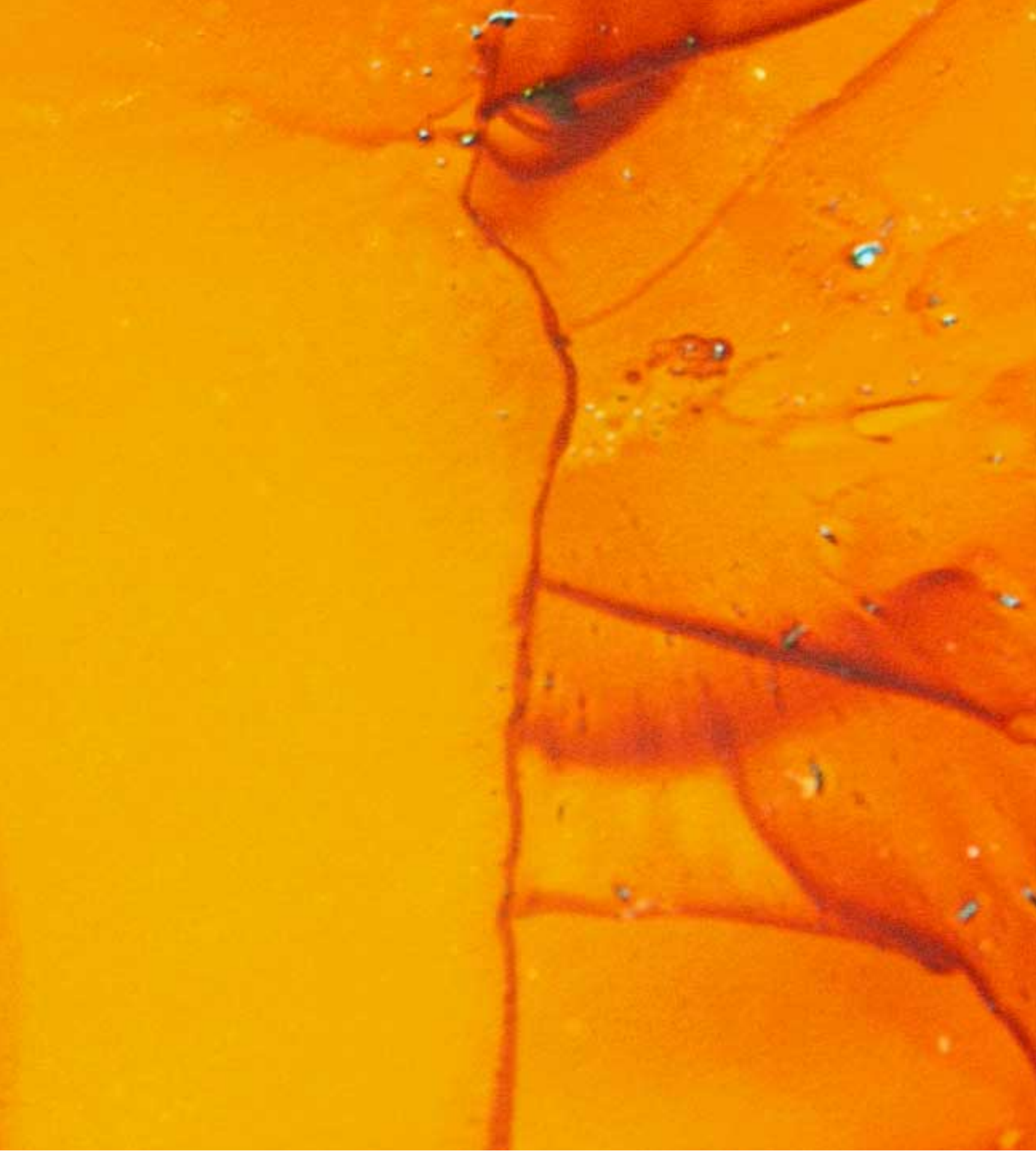


The National Science Foundation at 50

Where Discoveries Begin

At the National Science Foundation, we invest in America's future. Our support of creative people, innovative ideas, and cutting-edge technologies has led to thousands of discoveries vital to our nation's health and prosperity.

When she assumed her post in August 1998, Dr. Rita Colwell became the Foundation's first female director. She is a nationally respected scientist and educator. Before she became NSF director, Dr. Colwell was president of the University of Maryland Biotechnology Institute and professor of microbiology at the University of Maryland where she produced the award-winning film, *Invisible Seas.* While at the University of Maryland, Dr. Colwell also served as director of the Sea Grant College and as vice president for academic affairs.

Unique among federal research agencies, the National Science Foundation's mission is to advance learning and discovery in all disciplines of science and engineering and to foster connections among them. Our job is to keep science and engineering visionaries focused on the furthest frontier, to recognize and nurture emerging fields, to prepare the next generation of scientific talent, and to ensure that all Americans gain an understanding of what science and technology have to offer.

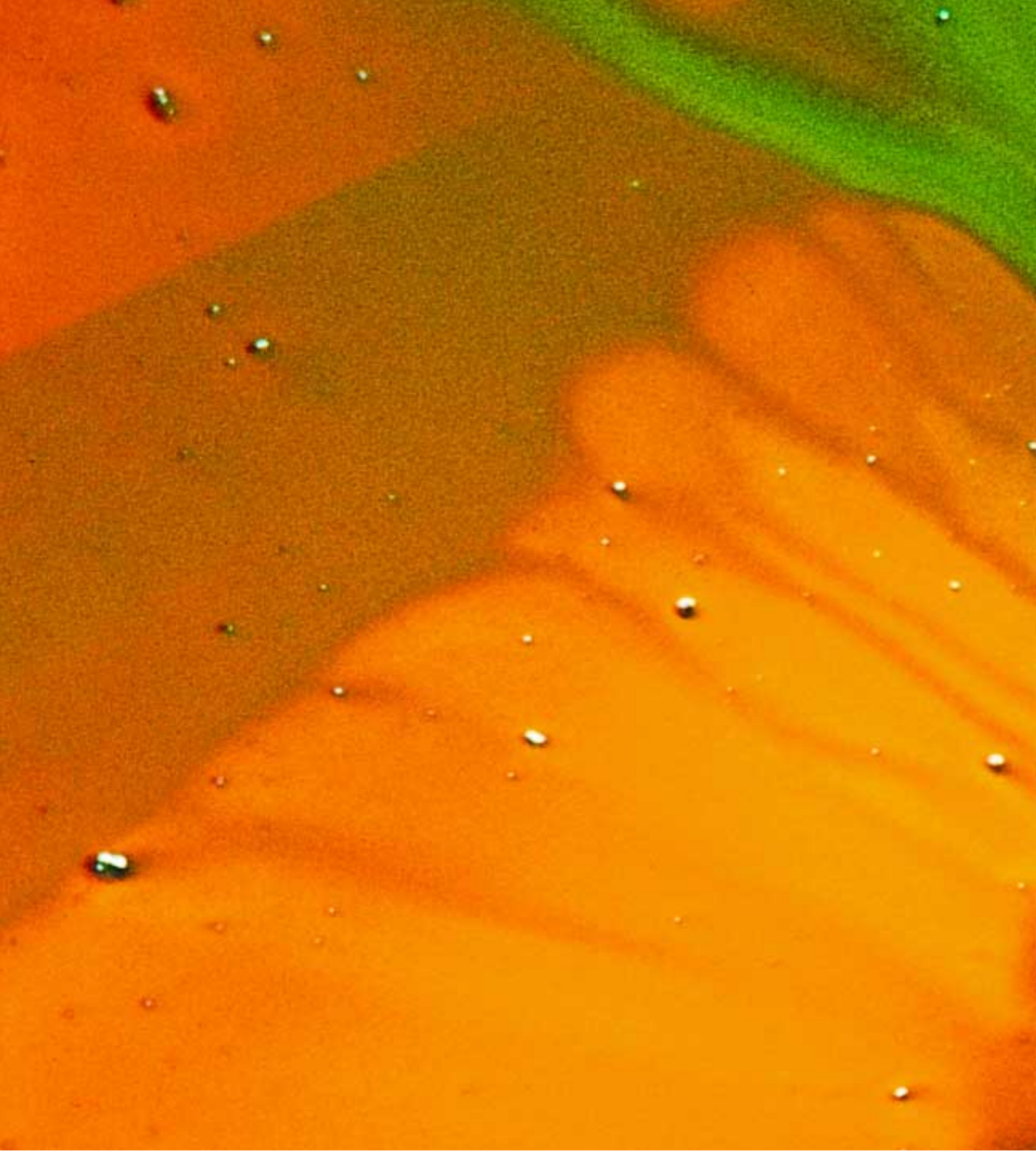
Retired hockey star Wayne Gretzky used to say, "I skate to where the puck is going, not to where it's been." At NSF, we try to fund where the fields are going, not where they've been. In marking our fiftieth anniversary, we are celebrating this kind of vision and foresight.

For example, as chronicled in this book, NSF began funding efforts in the mid-1980s to expand what was largely a Department of Defense networked computer system into the civilian realm. NSFNET linked NSF-supported supercomputer centers at five universities and was open to all academic users. Response was so great that NSF was soon able to turn much of the burgeoning network over to the private sector. Meanwhile, a student working at one of the NSF supercomputer centers developed the first major Web browser, Mosaic. Other NSF-funded research led to the first widely used Internet routers, the gateways and switches that guide information around the globe. Besides enabling the freer flow and more sophisticated manipulation of information, the Internet has triggered a surge of new business activity, which some say will amount to $1.3 trillion in e-commerce activity by 2003.

All in all, NSF's role in the birth of the Internet is a perfect example of how the right public investment can lead to huge societal pay-offs. Other stories you'll read here highlight NSF's instrumental role in such important innovations as Magnetic Resonance Imaging, or MRI, one of the most comprehensive medical diagnostic tools; the identification of the "ozone hole" over the Antarctic and chlorofluorocarbons as the probable cause; advances in the underlying mathematics of computer-aided design (CAD) and computer-aided manufacturing (CAM), two techniques that power much of U.S. industry's global competitiveness; and many other discoveries.

The point to remember is that these and other advances came only after long years of publicly funded basic research that NSF had identified as among the most promising avenues for exploration. Businesses, understandably, tend to make research investments that pay off in the short term. Other federal agencies have as their mission the oceans, energy, defense, or health, and they fund research that directly relates to those missions. In contrast, NSF's mandate is broad, deep, and long: to invest in educational programs and fundamental, multidisciplinary research of strategic, long-term interest to the nation.

Science—The Endless Frontier, a 1945 report by Vannevar Bush, a respected engineer and President Franklin Roosevelt's science advisor, made the case for why the federal government should actively promote the progress of research and science-related education. On May 10, 1950, President Harry Truman signed the bill creating the National Science Foundation. Now, fifty years later, we are reaping the rewards of this prescient



commitment. As a whole, we are a healthier, better educated, and more accomplished nation. Advances in knowledge have accounted for half of the net new growth in the U.S. economy since the end of World War II. This is a mighty return on investments made by NSF, other government agencies, and their partners in the science and engineering community. NSF's share of that investment totals nearly $4 billion in fiscal year 2000.

We have reason to celebrate NSF's historical accomplishments, but looking back is an unusual posture for the Foundation. We are more accustomed to anticipating new frontiers so that we can enable researchers, students, and educators to get where they need to be. As we look ahead today, one of the highest priorities for NSF and its partners is information technology research. There is no area of life that has not been dramatically altered by the advent of computers. In my own work, tracking the environmental conditions that give rise to cholera outbreaks, I've gone from very early studies using an IBM 650 (a model now on display at the Smithsonian Institution) to recent, highly complex analyses of data collected from global satellites and remote sensing systems. NSF's multidisciplinary connections, its historically strong relationships with the nation's research universities, and its commitment to the public good make the agency a natural leader with regard to information technologies. That is why NSF has been asked to lead the federal government's initiative to develop faster, more powerful computers and networks.

Another priority for NSF in the next few years will be to nurture the development of an emerging area known as "biocomplexity." The NSF-led biocomplexity initiative will lead to a better understanding of the interaction among biological, physical, and social systems. As this book illustrates, many of the most exciting discoveries occur at the intersections of multiple disciplines, where chemists help biologists see how blood vessels can be repaired with polymers and social scientists learn from mathematicians how to study the seeming chaos of human interactions. NSF is committed to joining what were once discrete disciplines into a more powerful understanding of the whole of nature.

The education of our nation's youth also remains a major concern. In an economy ever more driven by knowledge and ideas, it's paramount that we discover better ways to prepare a culturally diverse and globally competitive workforce of scientists, engineers, and other citizens. NSF has always encouraged innovation in the teaching of science, mathematics, and engineering at all grade levels and among the general public. We will continue to build the kind of synergistic partnerships among researchers, educators, policymakers, parents, and students that lay the groundwork for true reform. As NSF Deputy Director Joseph Bordogna has said, "It's not enough just to discover new knowledge; we need to train people in the use of that new knowledge if the American workforce is to prevail in the twenty-first century."

As we look to the century ahead, it is apparent that science and technology will continue to be the propelling and sustaining forces of our nation's well-being. Our quality of life will in large measure depend on the vigor of our economy, the health of our planet, and the opportunities for enlightenment. Wherever the next research challenge lies, you will find the National Science Foundation.

—Rita R. Colwell
Director

Dr. Colwell has studied the causes and cycles of the infectious cholera bacterium for more than 30 years. While working in Bangladesh recently, she demonstrated how to use sari cloth as an excellent, affordable water filter to screen out plankton associated with cholera transmission.