

# Science Forward

## Unlocking Opportunity Through Innovation



By Arvind Krishna, Chairman and Chief Executive Officer

Scientific collaboration literally changed the course of history. From putting a man on the Moon to the creation of the Internet, partnership-based approaches to science and innovation yield massive, society-changing results. Most recently, at the onset of the pandemic, IBM and the White House Office of Science and Technology Policy rapidly mobilized to create the [COVID-19 High-Performance Computing Consortium](#), bringing together the world's most powerful computing resources to advance our understanding of COVID and better combat the virus.

Even as we continue to recover from COVID-19, our society faces massive challenges. Whether it's extreme weather, a new health crisis, food insecurity or the growing impact of climate change, scientific advancements are needed to prepare for the next crisis. And we cannot lose sight of the promise scientific innovation holds to create jobs, grow the economy, and build back a healthier and more prosperous country for all Americans.

We've reached a point where **we must re-invigorate our national approach to science and innovation** because, as of today, we are not focused enough on advancing science to meet our biggest challenges. In the last 30 years the U.S. investment in research has never represented [more than 1%](#) of GDP, and investment in federal Research and Development constitutes a smaller percentage of our GDP than it did in 1964. That puts the U.S. behind thirteen other nations when it comes to public investment in science and technology. The business sector, which conducts [most](#) of the nation's R&D, is largely self-funding projects.

At the same time this country is also facing a severe shortage of diverse scientists in emerging fields. We must dramatically increase the number of women, Black, Hispanic and Latino workers in STEM fields for the U.S. to remain globally competitive, as noted by the National Science Board's Vision 2030 report. While a significant amount of money from the private sector funds advancing STEM education, there is no coordinated effort that addresses urgent areas of need, shares resources, and brings the combined weight of the government and industry together to ensure increased diversity in STEM.

Only by making science a sustained national priority will we be prepared to tackle the next crisis, whatever it may be, and accelerate discovery that spurs prosperity. IBM has outlined the following **Science Forward agenda with four steps we must take immediately to fuel America's economy, retain U.S. leadership in advanced technology, improve national security, and make discoveries that will save lives.**



America must continue to play a leading role in driving cutting-edge technologies, and now is the time to take the bold actions that will advance innovation and economic competitiveness and safeguard our national security. IBM will work with leaders in Congress and the Administration to advance a Science Forward agenda to drive the progress our country needs.

Arvind Krishna, Chairman and Chief Executive Officer

### Pass the Endless Frontier Act

IBM strongly supports the Endless Frontier Act because we believe good R&D policy is good fiscal policy. Provisions in this bipartisan legislation would bolster U.S. investment in scientific research and discovery by expanding government sponsored research to the development of real-world technologies, ensuring these investments yield the greatest societal and economic benefit.

Just like the United States chose to invest in science in the post-WWII era, the Endless Frontier Act offers a once-in-a-generation opportunity to refocus our institutions on innovation. A key aspect of this legislation would expand the reach and impact of the National Science Foundation by significantly increasing investments on emerging technologies such as AI, cybersecurity, high performance computing, robotics, automation, and advanced manufacturing.

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The Endless Frontier Act also would spur economic growth and job creation by forming regional technology hubs in local communities that have been traditionally underserved by the tech industry. This will result in new opportunities for these communities, serving as a catalyst for job creation and a more diverse STEM workforce.

The Endless Frontier Act would also increase collaboration by helping companies partner with research facilities to move technology from labs to market and ensure research centers have needed resources, equipment, and infrastructure.

### Create a Stronger Semiconductor Innovation Pipeline

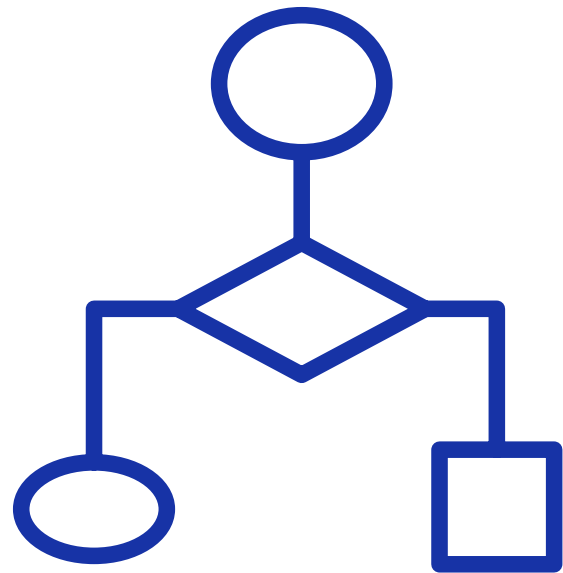
The way we travel, communicate, and conduct business increasingly depends on semiconductors. Semiconductors are essential building blocks in cutting-edge technologies ranging from our mobile devices to the IBM-built Summit supercomputer that helped accelerate research on COVID-19 treatments, and IBM Z, which is capable of processing one trillion transactions per day. Semiconductors are the underlying technology for the microchips in basic, everyday machines that we rely on for our daily lives. The next generation of semiconductors are crucial to advancing AI, 5G-6G, autonomous systems, space exploration, and quantum computing. The semiconductor industry also directly employs about 250,000 people and supports more than a million additional jobs in the U.S.

Yet, right now, we are facing a global chip shortage. Unless we boost domestic chip manufacturing, we threaten economic growth and long-term national security. At the same time, retaining leadership in cutting edge chip technology and continuing to advance U.S. competitiveness in critical industries of the future requires investment that is broader than production and prioritizes advanced R&D, design and prototyping, and packaging.

Fully implementing the National Semiconductor Technology Center (NSTC), which Congress mandated in 2020, where industry and academic partners work hand-in-hand to advance a technology development roadmap, would help meet the manufacturing demands of today and anticipate the needs

of tomorrow. Placing the NSTC in Albany, New York would draw on a deep ecosystem of partner companies, academic institutions and a trained workforce that can continually move new designs to many different foundries, ensuring collaboration on advanced semiconductor R&D that meets the full spectrum of U.S. economic and national security needs. The NSTC would also promote semiconductor supply chain security by drawing on members' shared knowledge and understanding of whether materials are being sourced appropriately and would ensure that the procurement process is closely monitored and managed to the highest standards.

Global collaboration and coordination will be critical to expand business opportunities beyond the U.S. as domestic companies must also continue to engage and collaborate with foreign entities to meet the volume requirements needed to incentivize foreign companies to invest in American foundry and innovation capacity. While partnerships with trusted allies are part of a global economy, these solutions will help correct the current over reliance on offshore sources that has developed over time.



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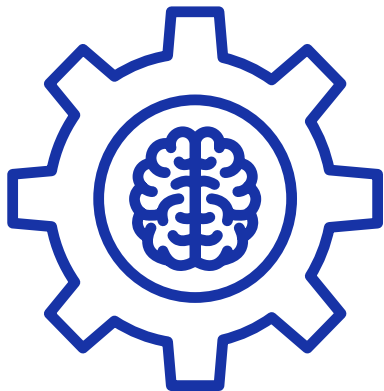
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### Ongoing Support of Quantum Technology and Quantum Research

Quantum computing has the potential to solve our most complex challenges that even the world's most powerful supercomputers cannot. Fully realizing quantum potential will require substantial investment in improving quantum science and device quality and at large scale, building quantum computers for broad experimentation by industry, academia, and government, developing new quantum algorithms, and accelerating the pace of advancement towards achieving fully error-corrected quantum computers, the holy grail of the industry.

Quantum is core to the future of computing, and we need a strategy for building a robust quantum infrastructure and leveraging quantum's role as a catalyst for economic growth. To facilitate new discoveries that benefit our economy, national security, the global scientific community and more, we must expand access to quantum computing technology to a more diverse set of researchers across the country.

IBM calls on the U.S. government to play a role in convening leaders in quantum to create a unique exchange of ideas and resources. Congress should provide researchers, educators, and students with access to the world's most advanced quantum computing systems at our National Labs to encourage greater participation in quantum information sciences, thereby facilitating a larger and more diverse range of research into these evolving technologies.



### Create the Science Readiness Reserve to Tackle Future Crises

We should apply lessons learned from the COVID-19 pandemic to start preparing now for the next global emergency. In its annual report, FEMA identified a myriad of looming threats to our national livelihood, ranging from another pandemic, to the effects of climate change, to solar flares. We must make sure we have mechanisms in place now — not only computing systems themselves, but also the human expertise, software, and relevant data — to deploy a comprehensive and timely response in the next crisis.

We can use what we've learned from the COVID-19 pandemic to create the Science Readiness Reserves — a corps of volunteer scientists that can swiftly be mobilized to apply critical technologies in times of crisis. The Science Readiness Reserve would evolve from the High Performance Computing Consortium, a public-private endeavor that IBM helped form rapidly to combat COVID-19. Establishing a permanent structure ensures our nation is prepared to mobilize swiftly in times of crisis, assembling human and technological resources to combat our country's next threat.

IBM continues to urge interested parties in Congress to study how to turn the concept of a Science Readiness Reserve into a reality, having called for the launch of a task force to study this concept. IBM also supports establishing a National Strategic Computing Reserve (NSCR), which would offer computing power and expertise in the next crisis. We urge the President's Council of Advisors on Science and Technology to consider establishing a working group that explores the creation of a Science Forward agenda, specifically including the creation of a NSCR.

### Moving Forward

America must continue to play a leading role in driving cutting-edge technologies, and now is the time to take the bold actions that will advance innovation and economic competitiveness and safeguard our national security. IBM looks forward to working with leaders in Congress and the Administration to advance a Science Forward agenda to drive the progress our country needs.