



Potomac Institute for Policy Studies

*Science for Policy, Policy for Science*

# **Biotechnology and the Bioeconomy in the Global Competitive Environment**

## *A Roundtable Summary*

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*Global Competition Project (GCP) White Paper Series*

### *About the Potomac Institute for Policy Studies*

The Potomac Institute for Policy Studies is an independent, non-partisan, 501(c)(3), non-profit science and technology policy research institute. The Institute identifies and leads discussion on key science and technology issues facing our society. From these discussions and forums, we develop meaningful policy recommendations and ensure their implementation at the intersection of business and government.

### *About the Global Competition Project*

The Potomac Institute for Policy Studies regularly engages with a spectrum of experts to elevate insights on the primary challenges and opportunities associated with technology policy and national security. The Institute's Global Competition Project (GCP), focused on societal level competition, develops foundational references for national security professionals, policymakers, industry leaders, and others while driving awareness in how the U.S. might address the most consequential aspects of the globally competitive environment. The Project has delivered on that goal through its research, publications, panels, and continuous dialogue, all through the lens of the Institute's mission intersecting science and technology, business, and government.

### *About the Authors*

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## INTRODUCTION

Over the last decade, new technologies like artificial intelligence and advanced sensors have drastically changed and accelerated the field of biotechnology. At the same time, a renewed national interest in space exploration is driving advances in space medicine, which carry positive spillover effects for terrestrial medicine and other biotechnology capabilities. The bioeconomy—both biotechnology and biomanufacturing—is an important strategic asset to the future of American prosperity.

On August 20<sup>th</sup>, 2024, the Potomac Institute for Policy Studies convened a panel of experts to explore intersections of biotechnology, biomanufacturing, and national security consequential to America’s competitive posture. The panel discussed potential opportunities, risks, policy implications, and recommendations for the United States to prevent, deter, and mitigate challenges as well as maintain and increase its competitive advantage on the global stage.

The panel included:

- **Dr. Jennifer Fogarty** is the Director of Applied Health and Performance at Sophic Synergistics. She previously served as Chief Scientist for NASA’s Human Research Program and as Chief Scientific Officer for the Translational Research Institute for Space Medicine at Baylor College of Medicine.
- **Dr. Dennis Mayo** is a Senior Policy Advisor to the National Security Commission on Emerging Biotechnology. Dr. Mayo previously served as a Senior Scientist at the Government Accountability Office and as a scientist at the Naval Surface Warfare Center in Indian Head, Maryland.
- **Dr. Chelsi Beauregard** is an Assistant Professor of Biology at Southern New Hampshire University. Prior to her current role, Dr. Beauregard researched immunology and emerging viruses at the Uniformed Services University of Health Sciences.

## BACKGROUND

Competitiveness in biotechnology and biomanufacturing has become a clear priority for Congress<sup>1</sup> and the Executive Branch.<sup>2</sup> Technological advancements in these areas impact our national security

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<sup>1</sup> National Security Commission on Emerging Biotechnology. (2024). *Charting the Future of Biotechnology.*, from <https://www.biotech.senate.gov/>; The Select Committee on the Chinese Communist Party. (2024, April 1). *Gallagher, Krishnamoorthi Expose Hidden BGI Subsidiary, Innomics, Operating in the US, Call on Pentagon to List Chinese Biotech Firms as “Chinese Military Companies.”* <http://selectcommitteeontheccp.house.gov/media/press-releases/gallagher-krishnamoorthi-expose-hidden-bgi-subsidiary-innomics-operating-us>.

<sup>2</sup> The White House. (2022, September 12). *Executive Order on Advancing Biotechnology and Biomanufacturing Innovation for a Sustainable, Safe, and Secure American Bioeconomy.* The White House. <https://www.whitehouse.gov/briefing-room/presidential-actions/2022/09/12/executive-order-on-advancing-biotechnology-and-biomanufacturing-innovation-for-a-sustainable-safe-and-secure-american-bioeconomy/>; The White House Office of Science and Technology Policy. (2023). *Bold Goals for U.S. Biotechnology and Biomanufacturing: Harnessing Research and Development to Further Societal Goals.* <https://www.whitehouse.gov/wp->



and economy across health and medicine, food, manufacturing, materials, energy, and other sectors, all critical to US competitive posture on the global stage.

A prime example is the proliferation of biometric technologies—smart watches, phones, rings, and other devices—and the accompanying data analysis capabilities. While the combination of novel data collection and complex analytics carries implications for advancements in medical care, it also portends a threat to personal privacy and security. Persistent biological data collection can enable medical providers to make better informed decisions for individualized healthcare. However, the collection and use of individuals' biological information by adversaries and competitors poses novel national security implications, especially in the health and medical sectors. Intelligence gathered from biotechnologies therefore drives an array of implications for individuals and for national security, prosperity, and competitiveness.

## KEY ROUNDTABLE THEMES

To remain competitive in biotechnology, the United States must focus on advancing education and workforce development, economic incentives for businesses, and understanding and addressing related national security implications. A key challenge will be implementing policies that help reduce barriers to innovation but are congruent with our societal norms, ethically and otherwise. The panelists explored several themes within these topics.

**There is a spectrum of national level consequences, from a national and personal security standpoint, for losing competitive ground in biotechnology.**

A few examples include:

- Data breaches have become commonplace, and the capacity to secure data is lacking. Data security, especially for biometric and genetic data, is becoming increasingly important as technological advancements increase the potential uses – and threats – associated with such data. Breaches also have far-reaching consequences for public trust and support of novel technologies.
- National competitiveness requires a greater level of “bio-literacy.” An increasing number of people and positions will be responsible for making informed decisions related to biotechnology, in sectors ranging from business to regulations to personal consumer choice. Education policy in the United States is primarily formed at the state level, which introduces additional challenges in ensuring consistent educational standards and practices across the country. Micro-credentialing (such as week-long courses or short workshops) is one possible avenue to increase bio-literacy in the workforce.
- Falling behind risks the rise of medical tourism, i.e., traveling to another country for medical care. Medical procedures may be less regulated in foreign countries, which poses a threat to both medical and personal data security and the health and safety of Americans.

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content/uploads/2023/03/Bold-Goals-for-U.S.-Biotechnology-and-Biomanufacturing-Harnessing-Research-and-Development-To-Further-Societal-Goals-FINAL.pdf; United States Department of Defense. (2023, March 22). *DoD Releases Biomanufacturing Strategy*. <https://www.defense.gov/News/Releases/Release/Article/3337235/dod-releases-biomanufacturing-strategy/>.



- Food security and over-reliance on a small number of crops remains a concern. Agricultural pathogens and other threats require a complex approach to research and mitigate security threats.

**The US leads in biomanufacturing and biotechnology research and product development. However, the US is lacking talented professionals in biomanufacturing and medical technology.** Emerging companies are unable to fulfill personnel openings for technical positions. This is particularly true for positions requiring day-to-day hands-on work in laboratories and manufacturing centers. There is a need for a new generation of workers who are trained in biology as well as other disciplines such as biochemistry, data science, computer science, engineering, and business.<sup>3</sup>

- Higher-level positions within such companies are often filled via national searches; however, lower-level positions would ideally be filled by individuals who live close by. Designation of national “Biotechnology Hubs” may help solve this issue by building local communities and a culture that sees biotechnology jobs as valuable, exciting, and a chance to build a career rather than just temporary employment.

**US regulatory agencies unintentionally create barriers for biotechnology companies.** The US regulatory pipeline significantly lags the pace of technological innovation; they struggle to adapt to innovative technologies and workforce requirements. The primary tension that emerges is between encouraging innovation and maintaining rigorous standards, particularly in areas related to medical technology.

- Federal immigration and visa policies also constrain the recruitment and retention of US-educated students and workforce. International students who attend US universities are often unable to remain in or return to the US after completing their degrees, meaning that their knowledge and skills will likely benefit other nations. Further, the broad application of International Traffic in Arms Regulations (ITAR) impacts the ability to collaborate with non-US citizens.

**The national re-focus on exploratory space travel and the Space Economy is driving the development of new technologies that can potentially revolutionize terrestrial biotechnology.** Many of the same innovations that can enable long-duration spaceflight<sup>4</sup> can also transform healthcare on the ground.

- Manufacturing experimentation in the microgravity environment of space allows for techniques that are not possible on Earth.

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<sup>3</sup> Jensen, U. S. (2024, July 18). *USU Receives \$1M NSF Grant for BioTech Workforce Development*. Utah State Today. <https://www.usu.edu/today/story/usu-receives-1m-nsf-grant-for-biotech-workforce-development>.

<sup>4</sup> National Aeronautics and Space Administration. (2024, July 10). *Station Science 101: Biology and Biotechnology*. <https://www.nasa.gov/international-space-station/space-station-research-and-technology/space-station-science-101/space-station-science-101-biology-and-biotechnology/>.



- Biomanufacturing of reusable and biodegradable materials is particularly advantageous for spaceflight, where waste disposal is far more difficult and expensive than on Earth. The Space Economy's need for reusable materials therefore provides an incentive to develop such materials, which can then be applied to terrestrial sustainability efforts.

## CONCLUSION

US competitiveness in biotechnology remains a challenge. The bioeconomy, which includes both biotechnology and biomanufacturing, intersects with a range of sectors such as health and medicine, food, manufacturing, materials, energy, and others. Accordingly, the national security implications of US competitive posture are wide-ranging, from data security to the physical health and security of Americans. Policy efforts to maintain an international edge in biotechnology and the bioeconomy must focus on incentivizing innovation across sectors, educating and developing the workforce, and reducing the ability of adversarial competitors to exploit US technological advancements.

