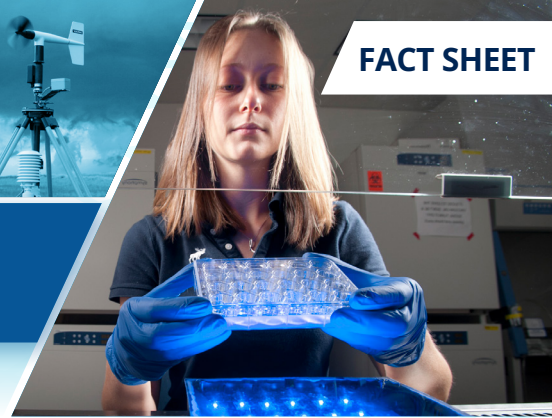




Expanding the Frontiers of Biotechnology



NSF investments in biotechnology underpin nearly every major advance in the modern bioeconomy, strengthening **U.S. competitiveness, economic growth and national resilience**. By supporting **fundamental research, workforce development, infrastructure and translation**, NSF accelerates biotechnology innovations that advance health, agriculture, manufacturing, energy and supply chain security.



SCIENTIFIC DISCOVERY AND INNOVATION

- NSF-funded research enabled **CRISPR**, the revolutionary DNA editing tool and the 2020 Nobel Prize in chemistry.
- Ongoing NSF-supported projects explore:
 - » DNA for information storage.
 - » RNA-based therapies to fight cancer and crop diseases.
 - » Microbial engineering for biomining to secure critical metals for U.S. energy needs.
 - » Computer simulations to predict bone healing for better outcomes.
- **NSF-supported Engineering Research Centers, Centers for Chemical Innovation, Materials Research Science and Engineering Centers, and Science and Technology Centers**, as well as other domain-focused centers and institutes, tackle large, complex problems, create new fields of study, and develop transformative technologies. Examples include:
 - » Engineering Research Centers are creating new technologies for cell and organ cryopreservation as well as new manufacturing routes to resilient supply chains.
 - » Science and Technology Centers that are developing new technologies to improve crop resilience and reduce fertilizer and pesticide utilization.
 - » Centers in all domains are advancing the foundational research needed to engineer cell-based therapies, create novel biomaterials, and foster new innovations that will create the next generation of biotechnologies.
- **Predictive Intelligence for Pandemic Prevention Centers:** Apply artificial intelligence and machine learning to forecast outbreaks and mitigate impacts.

BIOTECH'S FUTURE IS NOW

Life, simulated: In 2026, researchers achieved a first—fully simulating a cell dividing into two, capturing life's inner workings in unprecedented detail. [Learn more](#)

AI accelerates discovery: Machine learning is helping scientists decode complex RNA structures faster, advancing drug delivery and disease research. [Read more](#)

Cloud BioFoundries: Remotely accessible, automated labs are enabling faster, user-driven protein design and experimentation. [Explore more](#)

From structure to function: New advances in 3D genome mapping are revealing how DNA organization drives cell behavior. [Learn more](#)





WORKFORCE DEVELOPMENT

HudsonAlpha Institute (AL): Yearlong biotech training for 7th-12th graders includes hands-on research, mentorship and career exploration.

Utah State University and partners: Hands-on biomanufacturing training for students at 50+ community colleges in the intermountain West.

InnovATE BIO (Austin CC): Connects high schools, colleges and universities to grow the biotech education community.

Beginnings: Dakota Biotechnology Rural Workforce Development Program (Mount Marty College): New Experiential Learning for Emerging and Novel Technologies (ExLENT) program combines online training with internships for students and recent graduates through a network of 21 biotech companies and seven institutions of higher education.



TRANSLATIONAL RESEARCH AND NATIONAL ADVANTAGE

Future Manufacturing Program: Drives next-generation manufacturing breakthroughs across multiple sectors such as biomanufacturing by advancing automation, digital twins, and distributed manufacturing, while developing new biological methods to produce critical supply chain components.

NSF Small Business and Small Business Innovation Research/Small Business Technology Transfer programs: Support biotech startups and small businesses developing vaccines, disease-resistant crops, rare material recycling and bio-inspired instruments.

NSF Regenerative Medicine Engine in North Carolina: Led by Wake Forest University School of Medicine, this Regional Innovation Engine aims to cultivate breakthroughs in health care by providing the resources and ecosystem necessary to accelerate the transition of use-inspired regenerative medicine technologies into commercial products.

INFRASTRUCTURE AND TECHNOLOGY LEADERSHIP

- **NSF Industry-University Cooperative Research Centers** promote industry-aligned biotech research and workforce development.
- **New BioFoundries** allow rapid design, build, test and improvement of biological tools and products, and provide access to tools to academia and industry.
- **Programmable Cloud Labs** broaden access to modern biotech tools and accelerate engineered biological systems research.
- **Protein Data Bank** enables AI tools for protein structure determination and engineering, contributing to the 2024 Nobel Prize in chemistry.

FEDERAL PARTNERSHIPS SUPPORTING BIOTECHNOLOGY

- **NSF + BioMADE:** Integrate basic research with scale-up for real-world bio-industrial applications.
- **NSF + International Space Station National Lab:** Study tissue engineering and mechanobiology in microgravity.
- **NSF + National Institute of Standards and Technology:** Provide internships and faculty fellowships in AI-ready bioeconomy standards, workflows and tools.

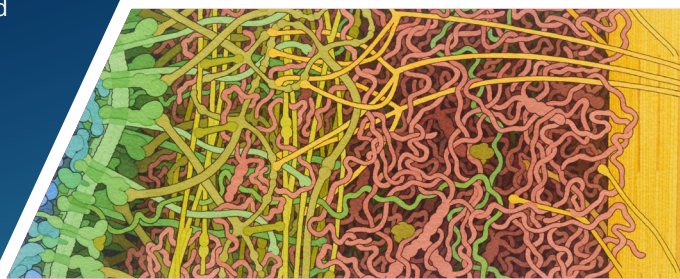


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