

Overview of the Bioeconomy

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NAS Safeguarding the Bioeconomy

How do we **define** the bioeconomy?

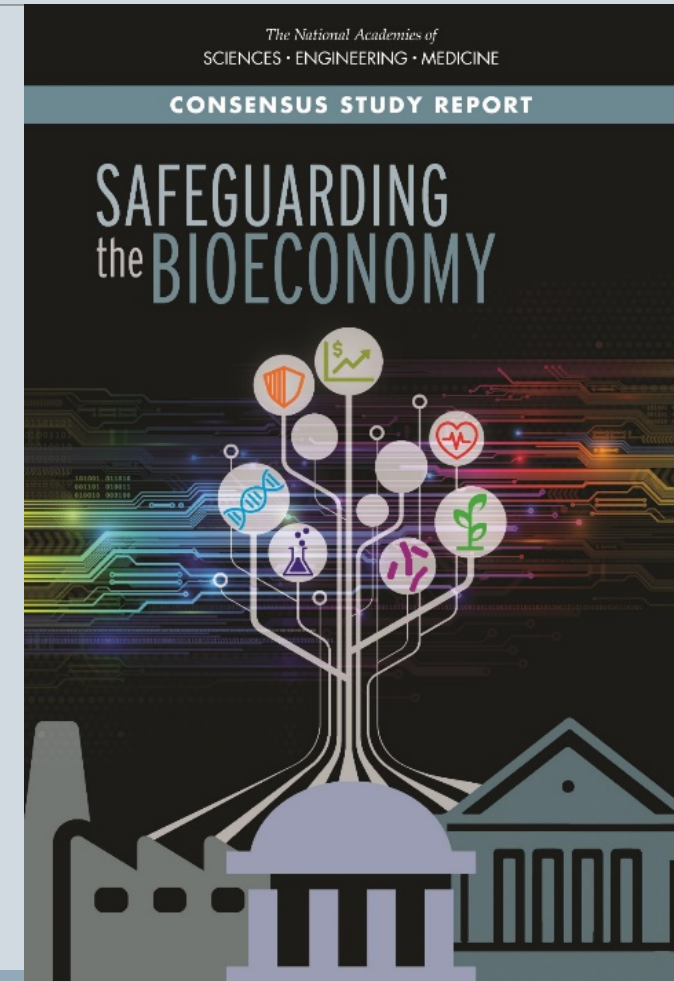
How can we **measure** the U.S. bioeconomy?

How can we measure U.S. bioeconomic **leadership** and where the US currently leads?

In what ways can we **forecast** the bioeconomy?

What **security risks** are associated with the U.S. bioeconomy?

What are the specific **cybersecurity/data** concerns?

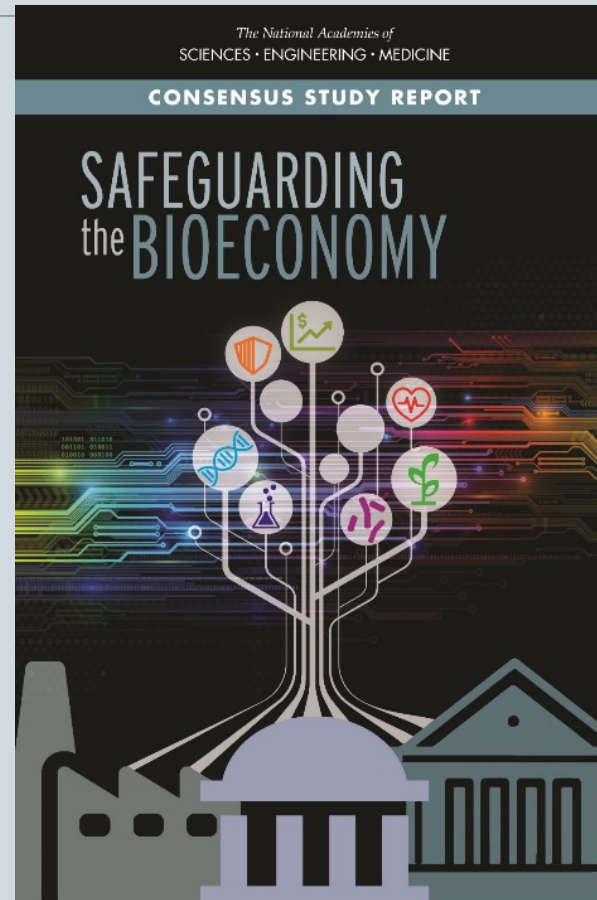


Overarching Themes

- Transdisciplinary integration drives the bioeconomy
- Importance of coordination and collaboration
 - Across disciplines, sectors, agencies, and countries
- Balancing security considerations with openness
- Need to measure, track, and analyze the bioeconomy

Identifying the Risks Related to the U.S. Bioeconomy: 2 sides

- Failure to Promote the Bioeconomy;
 - Failure to Protect the Bioeconomy;
- Numerous policy & governance approaches can be taken for each of these.



Failure to PROMOTE the Bioeconomy

- Insufficient U.S. government R&D investment
- Asymmetric research constraints
- Inadequate workforce
- Lack of public trust or conflict with public values

Example: Biological Specimens and their data can drive the US Bioeconomy

- The ability to engineer organisms for biotechnology innovations relies on genomic and associated metadata for biological organisms.
- Depending on the types of innovation, specimens and their data sets can be considered as type of “critical infrastructure” for the US bioeconomy and the sectors it comprises.

Some Examples

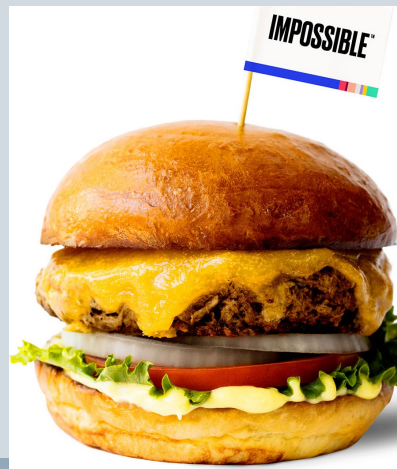
Bioconcrete from microorganisms



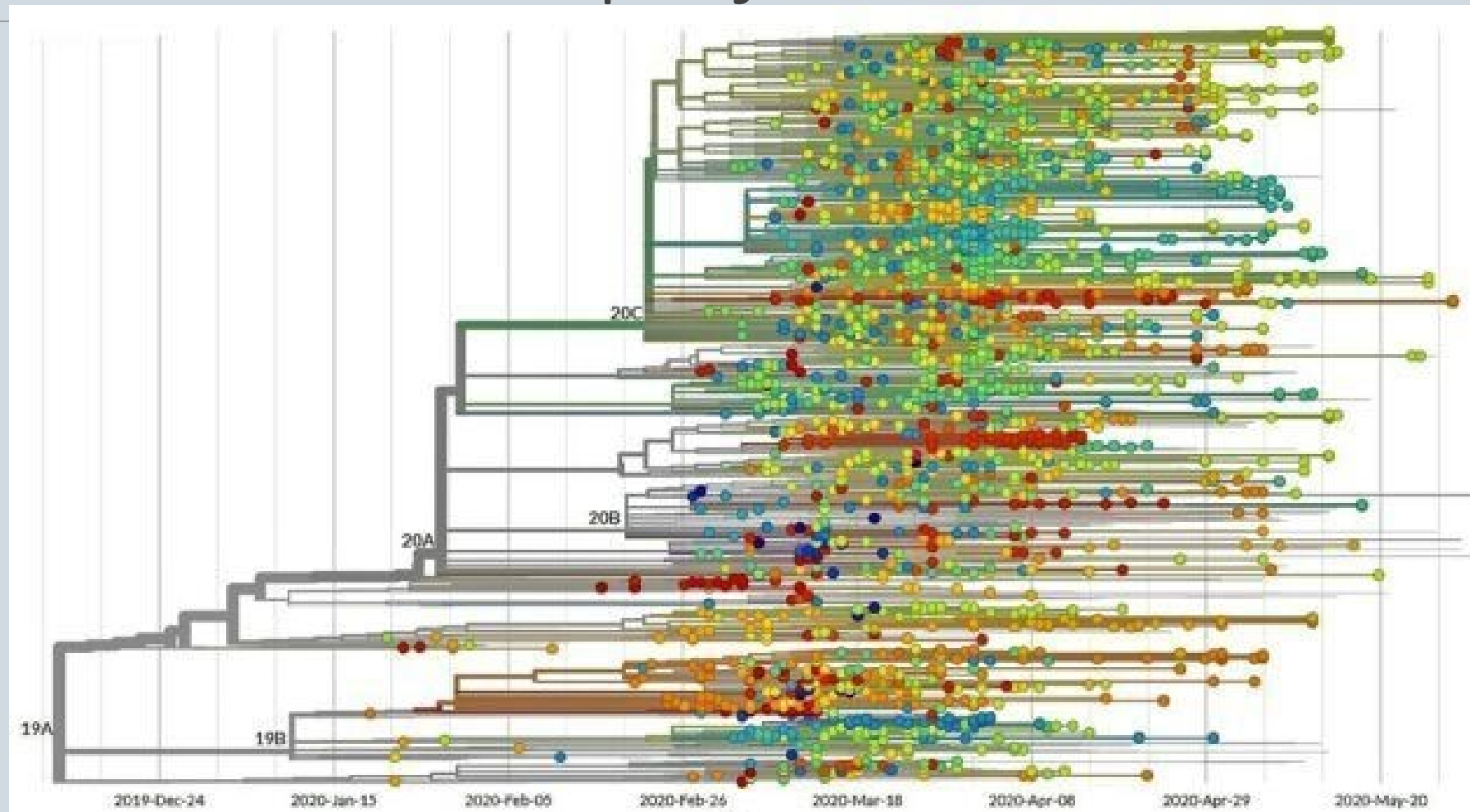
Soil microbes for nitrogen fixation

Spider silk,

'mylo' leather from fungi



GISAID COVID19 project



Failure to PROTECT the Bioeconomy

- Constrained access to international data*
- Use of datasets to the detriment of individual privacy or national security*
- **Cyber risks** associated with the bioeconomy* (digital biosecurity)
- Economic attack – **theft and infiltration***
- State involvement in business activities*

- **Trade barriers**
- The bioeconomy as a component of critical infrastructure
- Traditional biosecurity and biosafety risks

*has a recommendation in the report

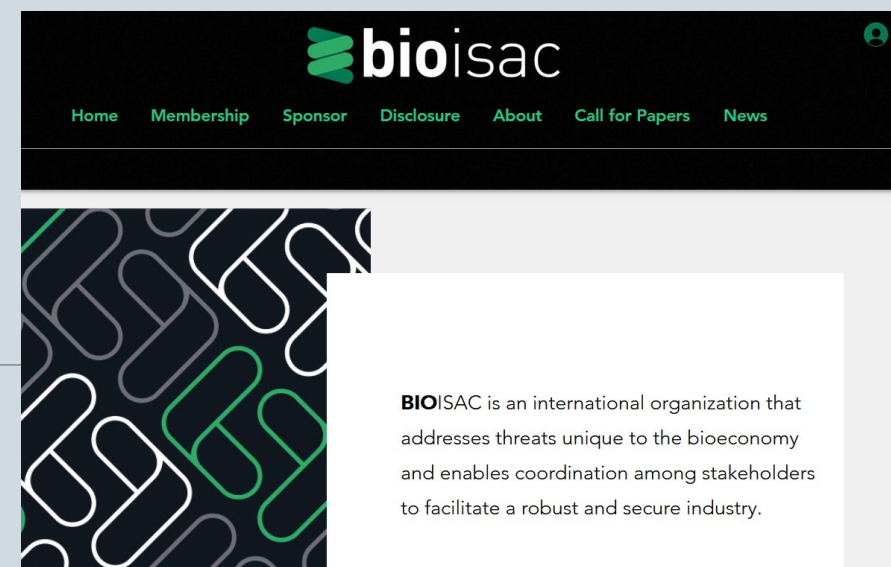
Recommendations Related to Data & Cyber Risks

Inadequate cybersecurity practices and protections expose the bioeconomy to significant new risks.

Recommendation 6: All bioeconomy stakeholders should adopt [best practices](#) for securing information systems from digital intrusion, exfiltration, or manipulation.

Recommendation 7: To protect the value and utility of databases of biological information, U.S. science funding agencies should [invest in the modernization, curation, and integrity](#) of such databases.

Recommendation 8*: Bioeconomy stakeholders should pursue membership in one or more relevant [information sharing](#) and analysis centers (ISACs) or information sharing and analysis organizations (ISAOs), or consider creating a new sector-based information-sharing organization for members of the bioeconomy.



Need for Coordinating Mechanism and Strategy

Given the lack of obvious lead government agency for the bioeconomy, a mechanism through which the science, economic, and security agencies could bridge the gaps in communication and coordination is needed.

Recommendation 3*: The Executive Office of the President should establish a [government-wide strategic coordinating body](#) tasked with safeguarding and realizing the potential of the U.S. bioeconomy.

- Presided over by senior White House leadership,
- Representation from [science, economic, regulatory, and security agencies](#)
- Responsible for relevant foresight activities and informed by input from a diverse range of relevant external stakeholders.

Designing an Approach

Recommendation 3-1*: The coordinating body should **develop, adopt, and then regularly update a living strategy** with goals for sustaining and growing the U.S. bioeconomy. This strategy should be

- Informed by an ongoing, formal horizon-scanning process
- Identify and raise awareness of means through which the U.S. government can advance the bioeconomy (ex. procurement of bio-based products)

Ongoing

- A “Bioeconomy Executive Order” is still in the works;
- Bioeconomy ISAC has been formed for digital biosecurity:
 - <https://www.isac.bio/>
- post-COVID efforts: Pandemic Preparedness, supply chain and biomedical manufacturing modernization plans, built environments, etc.
- The DOD has funded several large projects intended to leverage the Bioeconomy: BIOMADE, and BOOST

Thank you

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