



BioMADE

The Bioindustrial Manufacturing and Design Ecosystem

Patrick P. Rose, PhD

PM of BioMADE

Science Director for Synthetic Biology

Office of Naval Research Global, London

Tuesday, December 1, 2020

INDOPACOM S&T Board



Positioning Defense



- USD(R&E) stood up the Bioindustrial Manufacturing Innovation Institute to develop new, and advance existing, products, tools and processes at commercial scale.
- BioMADE will serve as a public-private partnership between government, academia, non-profit organizations, and industry to address the spectrum of challenges associated with biomanufacturing of non-medical products.
- The application of biotechnology to industrial processes will transform how the U.S. currently manufactures products, and allow new products and capabilities with the potential to impact essentially every aspect of defense and national security.
- Potential applications include the following: novel and performance-driven chemicals, materials, catalysts, sensors, probiotics, and many others.



Drew Hays / Unsplash



Michael Schiffer / Unsplash



SOURCE: North Carolina State University



Why Biotechnology?



- It will fundamentally change future battlefield strategies.
- It will provide materials with novel properties and unique features enhancing military readiness.
- It will reinforce critical defense supply chain resilience and reduce the logistic burden to maintain military dominance.

Enhanced military systems



E.g., Growable Runways



E.g., Domestic supply chain of rare earth elements

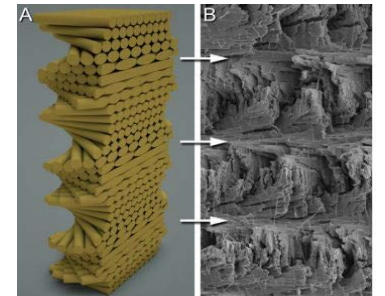
Optimized warfighter health and performance



E.g., Reduced contamination in locally sourced food and/or enhanced nutrition in food sources

Novel Materials

Helicoid structure found in the mantis shrimp.



<https://news.ucr.edu/articles/2019/08/07/new-bio-inspired-technology-poised-disrupt-composites-industry>

E.g., Novel materials with unique structural properties



Biotechnology is an engineering discipline that uses living systems to produce a wide range of technologies and products



On-site production of fuels, lubricants, & critical materials

Real-time monitoring of warfighter & troop physiology and performance

Tunable paint and coatings for signature management

Growable concrete, infrastructure, and dust mitigation for sustained in-field operations

Enhanced materiel for operations in CB contested environments



Persistent marine sensors targeting UUVs



Rapid production of replacement tissues for injured warfighters





Bioindustrial Manufacturing Innovation Institute



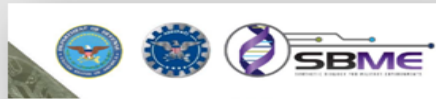
Current State

GAP: Limited domestic pilot and large scale bioindustrial production facilities to ensure independence from foreign suppliers.



Status: Vibrant & healthy ecosystem delivering products with demonstrable market value:

- start-ups,
- bio-foundries,
- large scale synthetic chemistry, and feedstock producers
- FFRDCs



Viability: USG funded TriService & industry S&T projects meet or exceed current standards for size, weight and power of components and systems that require transition to MRL 4 – 7.

Transformation

Process: Create a cohesive national enterprise to advance domestic bioindustrial manufacturing along with a trained workforce.

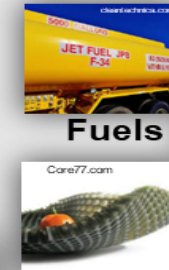


Outcome: Accelerate technology development and create a workforce to provide tools for industrial manufacturing:

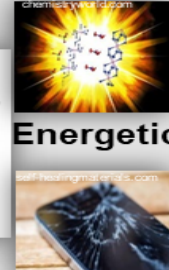
- tool developers
- data managers
- downstream processing
- industrial scale up

Engage & leverage private investment to build a mature manufacturing base

Target State



Fuels



Energetics



Functional



Self-healing

A mature domestic manufacturing industrial base producing raw materials and delivering final products at scale for defense

- Rapid Design – Build – Test mechanism;
- Interchangeable downstream processing;
- Robust scale up of up to 1 million L fermentation capacity;
- Agile manufacturing ecosystem;
- Strong biofoundry base utilizing TriService resources.



Objectives



- Accelerate emergent biomanufacturing technologies and processes with the goal to successfully transition science and technology research into defense and commercial products.
- Serve as a bioindustrial innovation hub, providing the infrastructure to support biomanufacturing enterprises of all sizes and ensuring that the U.S. biomanufacturing industry is a key pillar in an enduring and thriving bioeconomy.
- Establish U.S. technical leadership, greatly expand U.S. capacity, provide key capabilities to ensure DoD biotechnology modernization, and lead to commercialization of biomanufactured products.



BIOINDUSTRIAL MII Team



Patrick Rose

Program Manager



Ms. Jessica Bowen

OSD Liaison Officer



Angela Campo

Deputy Program Manager



Ms. Mary Ann Sharits

Agreements Officer



Jimmy Gollihar

Chief Technology Officer



Questions?

