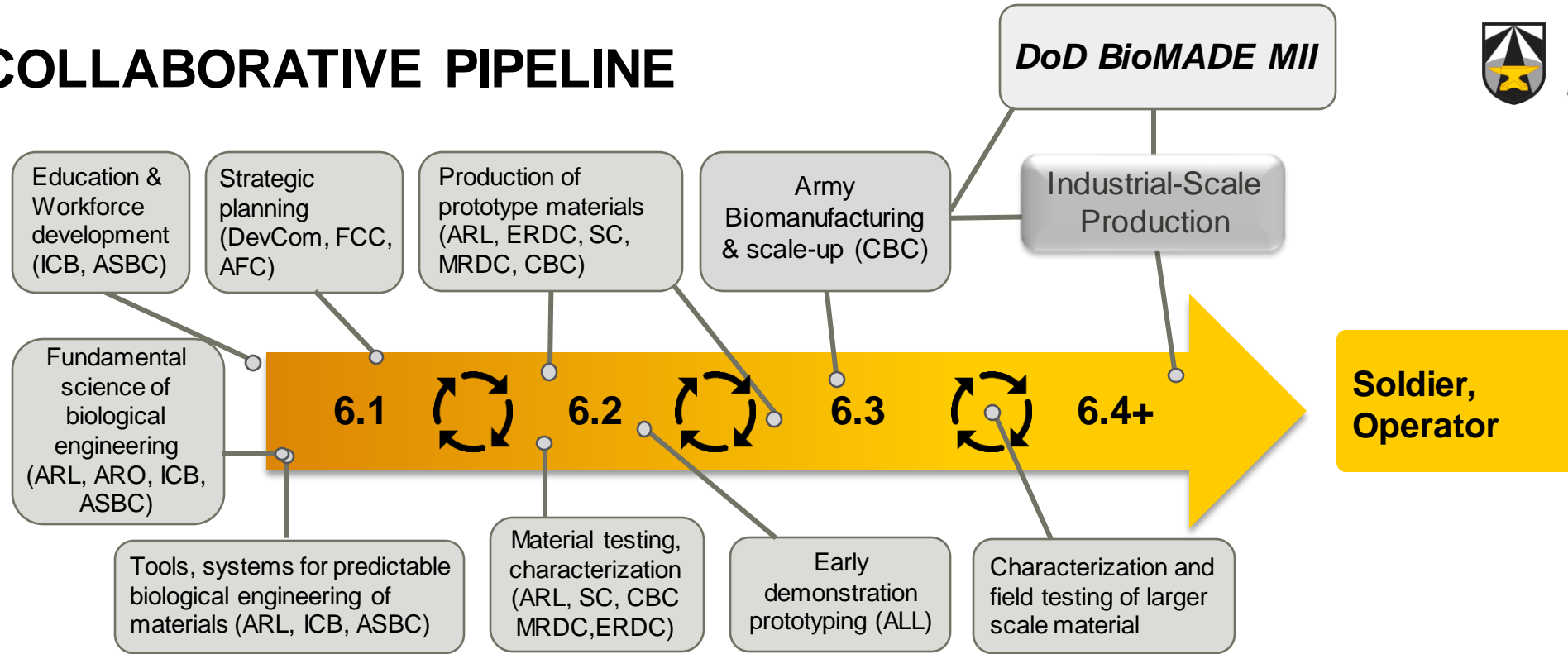**U.S. ARMY**

ARMY RESEARCH OFFICE (ARO) BIOMANUFACTURING OPPORTUNITIES

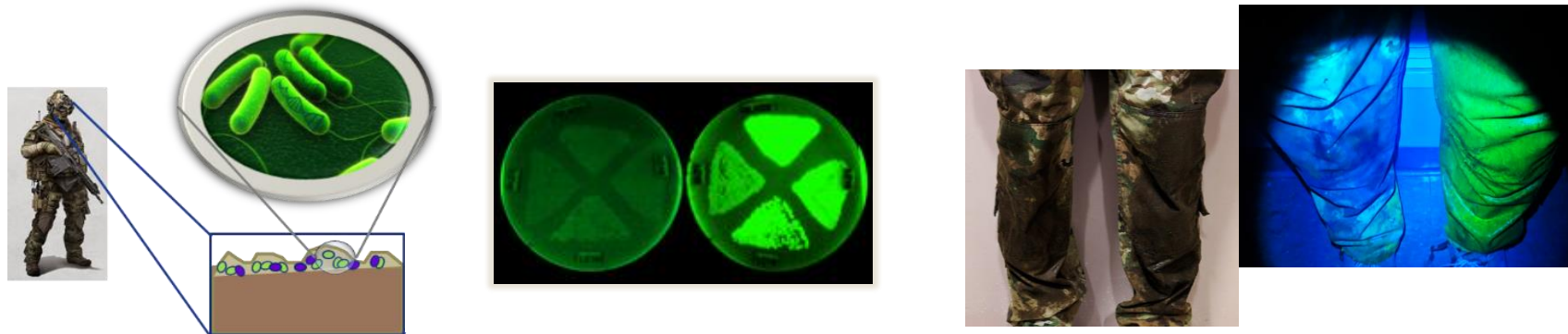**For The OSU "Biomanufacturing Opportunities Workshop"**

5 APRIL 2023

US ARMY

DEVCOM ARL Army Research Office

Approved for Public Release

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Dr. Valerie Martindale, (919) 794-1085

ARMY COLLABORATIVE PIPELINE

DoD BioMADE MII

Education & Workforce development (ICB, ASBC)

Strategic planning (DevCom, FCC, AFC)

Production of prototype materials (ARL, ERDC, SC, MRDC, CBC)

Army Biomanufacturing & scale-up (CBC)

Industrial-Scale Production

Fundamental science of biological engineering (ARL, ARO, ICB, ASBC)

6.1   **6.2**   **6.3**   **6.4+**

Soldier, Operator

Tools, systems for predictable biological engineering of materials (ARL, ICB, ASBC)

Material testing, characterization (ARL, SC, CBC MRDC, ERDC)

Early demonstration prototyping (ALL)

Characterization and field testing of larger scale material

DEVCOM ARL: From Scientific Concept To Discovery of New Tools and Systems To Lab Demo
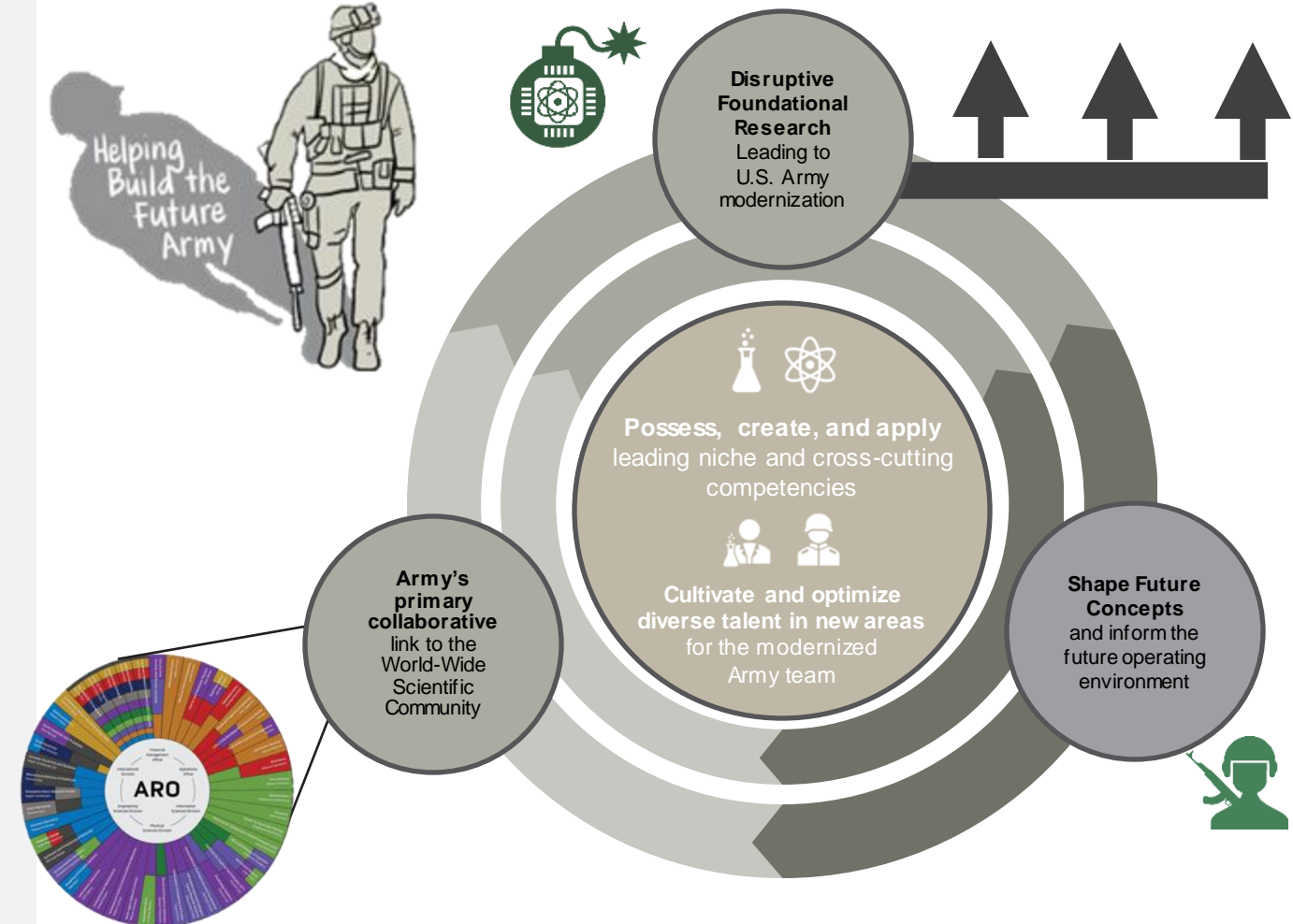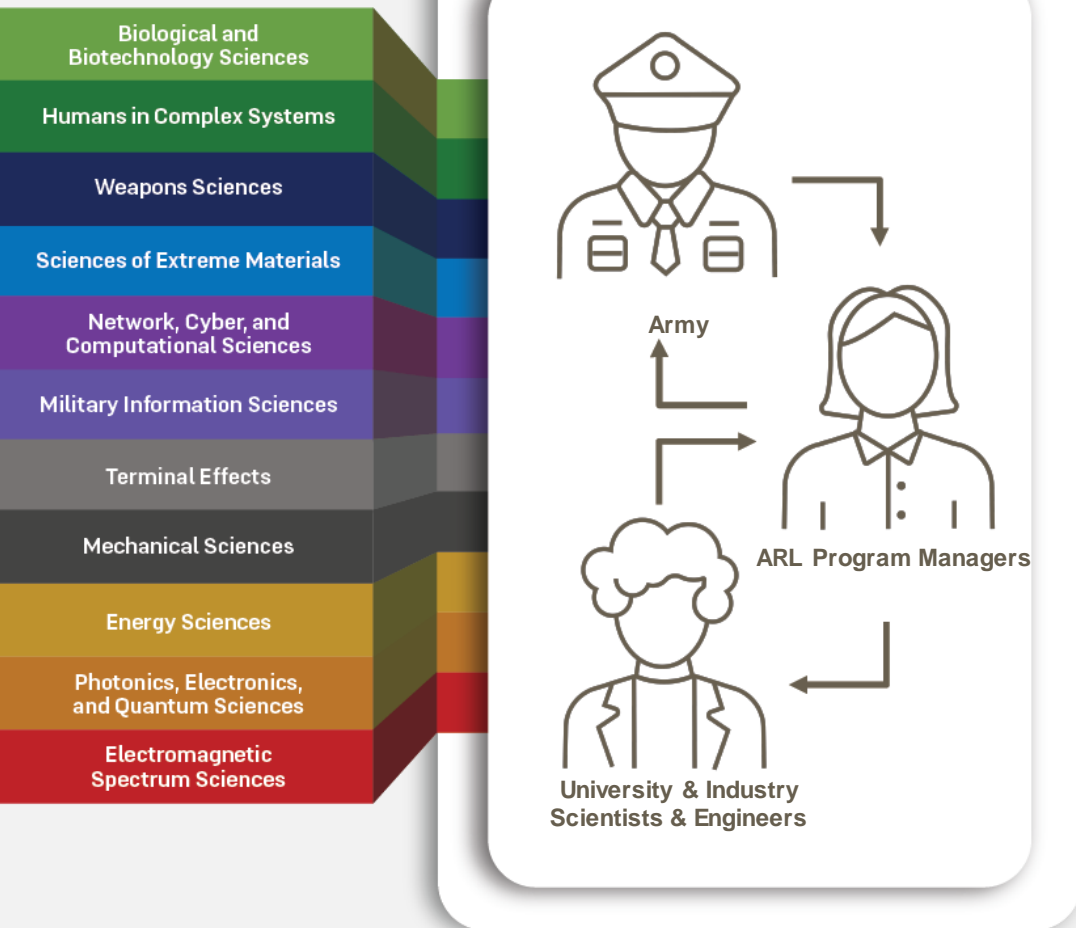
MISSION

ARO's Mission

A component of DEVCOM ARL, the Army Research Office contributes to Army modernization by focusing on **basic scientific research.**

1 **Build the Future**
Create and direct scientific discoveries for revolutionary new Army capabilities

2 **Solve Existing Problems**
Drive science to develop solutions to existing Army technology needs

3 **Accelerate**
Accelerate transition of basic research

4 **Educate**
Educate and train future Army Scientists & Engineers workforce

5 **Prepare**
Create technological superiority for U.S. Forces, and prevent adversary technological surprises

ARL's Mission:
Operationalizing Science for **Transformational Overmatch**

Helping Build the Future Army

Disruptive Foundational Research
Leading to U.S. Army modernization

Possess, create, and apply leading niche and cross-cutting competencies

Cultivate and optimize diverse talent in new areas for the modernized Army team

Army's primary collaborative link to the World-Wide Scientific Community

Shape Future Concepts and inform the future operating environment

ARO CONNECTS THE ARMY TO EXTRAMURAL RESEARCH

Biological and Biotechnology Sciences

Humans in Complex Systems

Weapons Sciences

Sciences of Extreme Materials

Network, Cyber, and Computational Sciences

Military Information Sciences

Terminal Effects

Mechanical Sciences

Energy Sciences

Photonics, Electronics, and Quantum Sciences

Electromagnetic Spectrum Sciences

Army

ARL Program Managers

University & Industry Scientists & Engineers

ARO is the Army's primary face to the Academic Scientific Community.

Program Managers are **subject matter experts** who **have funding authority**.

They play an *active* role in creating and directing new science by brokering relationships and collaborations, guided by Army science and technology strategy.

ARO capitalizes on the intellectual capital of industry and academic institutions around the world.

Program Managers broker relationships between the Army and these institutions to build a scientific *network*– not a pipeline. **The intention is to facilitate scientific breakthroughs**, which then lead to game-changing future technology.

These networks extend to support the training, education, and recruitment of the next scientific generation– effectively using Science to shape the future of the Army.

CONNECTING WITH DEVCOM ARL - ARO

ARL/ARO BAA

www.arl.army.mil/business/broad-agency-announcements

BBS Areas of Interest

Genetics
Biochemistry
Microbiology
Environmental Chemistry

US Army Synthetic Biology Center
Institute for Collaborative Biotechnologies (ICB)

ARO ORGANIZED BY SCIENCE

There are 45 Programs within ARO focused on Science.

Programs are organized into 4 Divisions with DEVCOM ARL's Competencies underlying 100% of the research programs. Competencies provide the Army with foundational expertise that is leveraged to develop new opportunities, build programs, and shape future operational concepts.

Sciences of Extreme Materials	Humans in Complex Systems	Electromagnetic Spectrum Sciences
Photonics, Electronics, and Quantum Sciences	Network, Cyber, and Computational Sciences	Energy Sciences
Military Information Sciences	Terminal Effects	Mechanical Sciences
Biological and Biotechnology Sciences	Weapons Sciences	

*Competencies ensure **transformational overmatch** for the future Army*
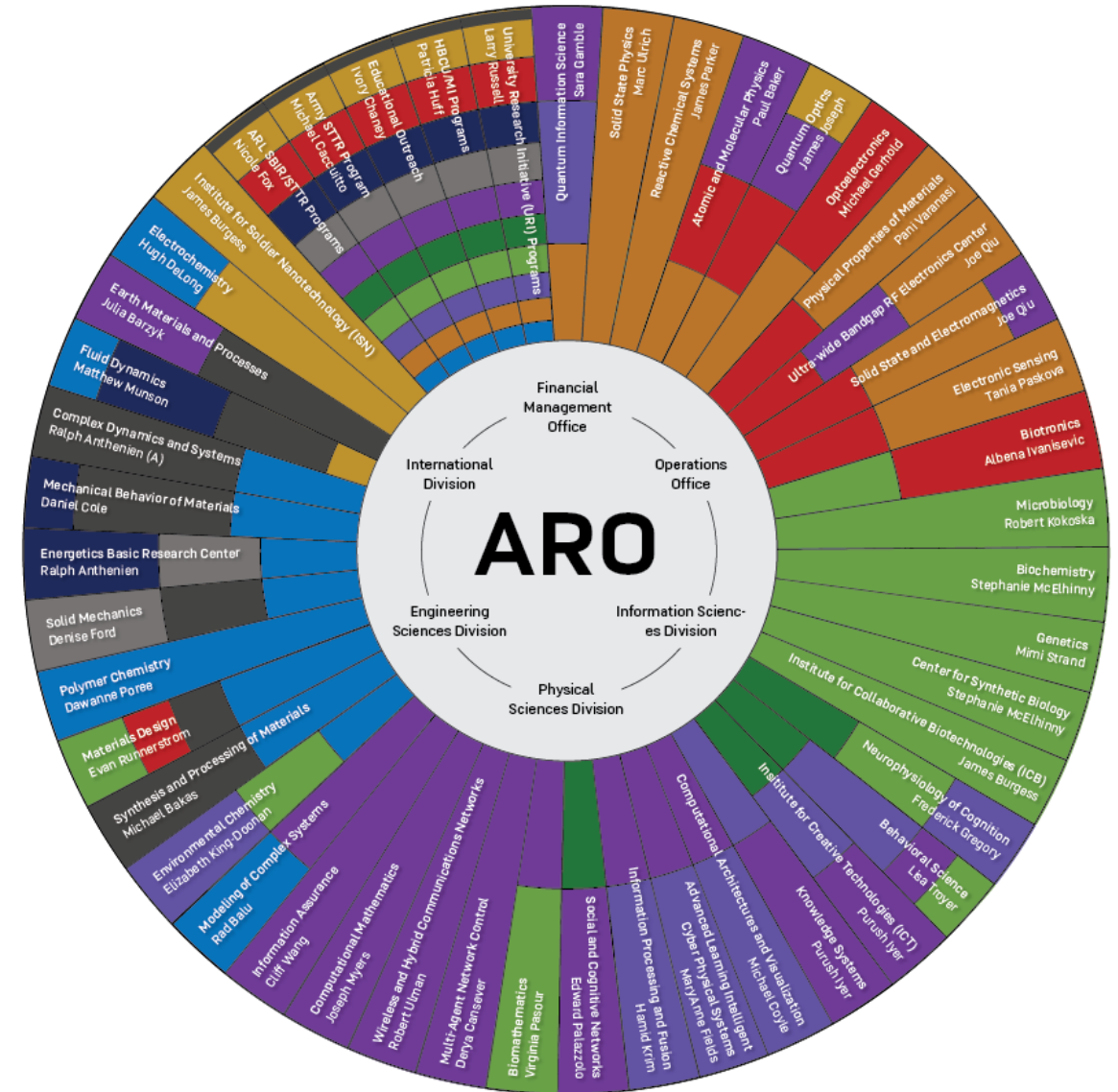
ARO AND OTHER BROAD AGENCY ANNOUNCEMENTS

Award Type	Target	Funding
Single Investigator (SI)	Single-laboratory projects	~$141K/year for ~3.4 years avg*
Short Term Innovative Research (STIR)	Very high-risk pilot projects	$60K for 9 mo.
Early Career Awards (formerly Young Investigator Program)	Early-career PIs	$120K/year for 3 years
Conferences / Workshops / Symposia	Academic State of Science	$10K–$30K
Presidential Early Career Award for Scientists and Engineers (PECASE)	Promising future leaders	$200K/year for 5 years
Defense University Research Instrumentation Program (DURIP)	Instrumentation	$200K/year average FY22
Multidisciplinary University Research Initiative (MURI)	Large multidisciplinary programs	~$1.25M/year up to 5 years
Historically Black College/University and Minority Institution (HBCU/MI)	Minority serving institutions	~$140K/year for 3 years
Small Business Technology Transfer (STTR)	Multi-phase awards bridging academia & industry	$150K (6 mo.) to $1M (24 mo.)
Small Business Innovative Research (SBIR)	Multi-phase research for industry transition	$150K (6 mo.) to $1M (24 mo.)

*FY21 averages; funding level and duration in this award category vary based on scope of project, proposal, evaluations, and PM recommendation.

ARMY CENTER FOR SYNTHETIC BIOLOGY

- **Basic research** program initiated by the Combat Capabilities Development Command (DEVCOM)/Army Research Laboratory (ARL)/Army Research Office (ARO)

- Focused on an area of strategic importance to U.S. national security

- Increase the Army's intellectual capital in synthetic biology & improve its ability to address future challenges

- Bring together universities, research institutions, companies, and individual scholars to support multidisciplinary and cross-institutional projects addressing specific topic areas determined by the Department of the Army (DA)

- Promote research in specific areas of synthetic biology & promote a candid and constructive relationship between the Army Science and Technology (S&T) enterprise and the synthetic biology research community

- US Institutions **ONLY**

Technical Thrust Areas
- Predictive Design of Engineered Biological Materials
- Predictive Design of Engineered Cellular Systems in Defined Environments

Funding Areas

Award	Budget	Base	Option
Team	~$1.5-2M/yr	3 yr	1 x 2 yr
Seedling	$60-250k/yr	1 yr	2 x 1 yr

For Both Funding Areas:

- *****Strong preference for a cooperative agreement*** (allows for maximum interaction, cooperation, and collaboration between the Government and the awardee).

- **ALL** awardees are expected to collaborate and cooperate with and among each other as well as **with DEVCOM ARL and the Army S&T Enterprise**.

ARMY CENTER FOR SYNTHETIC BIOLOGY
TECHNICAL THRUST AREA 1
PREDICTIVE DESIGN OF ENGINEERED BIOLOGICAL MATERIALS

Objective: Develop experimental and computational tools enabling scalable synthesis, assembly and characterization of rationally designed biological materials with control over final material properties
- Seeking **_generalizable_** predictive tools that can be applied to materials beyond those selected for investigation
- Encouraged to focus on materials exhibiting more than one property (multifunctional materials)

Sub-areas may include, but are not limited to:

(1) Comprehensive sampling of the biological material property landscape
- Explore approaches to generate and characterize large libraries of material variants
- Determine relevant biological features impacting material properties of interest
- Identify the boundaries of the biological feature-material property landscape

(2) Material analytical characterization tools
- Develop high-throughput analytical methods to characterize, screen and select material variants with targeted multifunctional properties
- Explore approaches to enable sensitive, non-destructive analysis of buried interfaces

(3) Predictive design tools
- Develop, test and validate generalizable predictive tools that enable informed design of biological materials with targeted multifunctional properties via synthetic biology
- Create algorithms that extract critical biological features underlying material properties
- Develop approaches supporting extrapolation of property prediction to the macroscale

ARMY CENTER FOR SYNTHETIC BIOLOGY
TECHNICAL THRUST AREA 2
PREDICTIVE DESIGN OF ENGINEERED CELLULAR SYSTEMS IN DEFINED ENVIRONMENTS

Objective: Develop experimental and computational tools that support the predictive design of engineered cellular consortia with robust controlled performance in a defined environment
- All experimental effort must be conducted in a controlled **laboratory setting**
- Examples of environments and engineered functions of interest provided in the BAA

Sub-areas may include, but are not limited to:

(1) Genetic modification of consortia
- Develop tools to genetically manipulate environmentally robust chassis organisms
- Develop methods to genetically modify specific organisms within a consortium while in a defined environment

(2) Stability of engineered genetic modifications
- Analyze the fate of engineered DNA within the consortium
- Explore the impact of environmental variation on the function and stability of engineered genetic modifications within the context of a consortium

(3) Control of engineered function
- Develop approaches to experimentally measure the impact of environmental parameters on the function of engineered microorganisms in the context of a consortium
- Design synthetic biology programs that support tightly regulated activation and inactivation of engineered function of the consortium
- Develop and validate predictive tools that identify optimal control schemes to support prolonged regulated function of engineered organisms within a given environment and consortium composition.

How Prospective PIs
Can Engage with ARO

CRITICAL QUESTIONS TO CONSIDER WHEN PITCHING IDEAS

Is it basic research?

- What's the <u>scientific</u> question?
- What foundational knowledge is not currently available about the workings of the universe?
- Proposals focused on specific devices/components/technologies are beyond the scope of ARO's mission.

Is it hard?

- If an "old" question, why haven't we found an answer yet?
- If a "new" question, where's the sticky part?

Why you? Why now?

- What's been done before? Why wasn't it successful?
- What's novel about your skills/abilities/ approach that makes you think there's a shot at an answer?
- What new advance provides opportunity to make new progress?

So what? Who cares?

- What impact will the research make on the scientific community?
- What papers will be written because of your efforts? What papers will stop being written?
- What are the potential implications for the future of technology?

Where's the risk?

- How confident are you that you're asking the right question?
- How will you know when you have an answer? If you find a different answer, will you still learn something?

What will it take?

- What resources (time, money, infrastructure, personnel, partnerships) are required to pursue the research?

ARO BBS PROGRAM: HOW TO ENGAGE

Your 'menu' of ideas

- Suggested initial ideas to share with PM: 3-4 ideas, 1-2 Paragraphs each, 2 pages max

- 2 ideas aligned with the program (see the BAA)

- 1 idea outside the program

- 1 idea characterized as half-baked, super high-risk, possibly "crazy"

- Submit directly to PM any time via email. Feedback is relatively fast.

- Do not ask "what research does ARO want me to do"

Whitepaper

- 5 pages max

- Provides a well-written scientific question and proposes a novel approach

- Describes the level of risk associated with the effort.

- Identifies the resources required to pursue the research (rough order of magnitude).

- Provides a short bibliography positioning the research in the body of knowledge.

- Submit any time via email.

Proposal

- Consult the ARO Core BAA for full details on requirements.

- Expands on the discussion in the whitepaper to adequately describe the proposed effort.

- Provides a reasonably self-contained description; expert reviewers should not have to heavily consult the literature or supplementary material to understand the question and the approach.

- Submit via grants.gov. Preferred receipt in _____ and majority of decision points are in ____.

THANK YOU.

Valerie E. Martindale, PhD, CAsP
Extramural Competency Co-Lead
Biology and Biotechnology Sciences
DEVCOM ARL Army Research Office

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