MSI STEM
Research & Development
CONSORTIUM

Engage Diverse Talent. Promote Innovation. Engineer Futures.

How to Transition from Set-Asides to Core Funding

Alan Arnold, Ph.D.

Outline

- Overview of MSRDC
    - MSRDC CA
    - Success – slide 4
    - Member Map

How do you transition to core funding

- Implicit Bias
    - REE
    - Member care Campaign
    - Slide 5/6

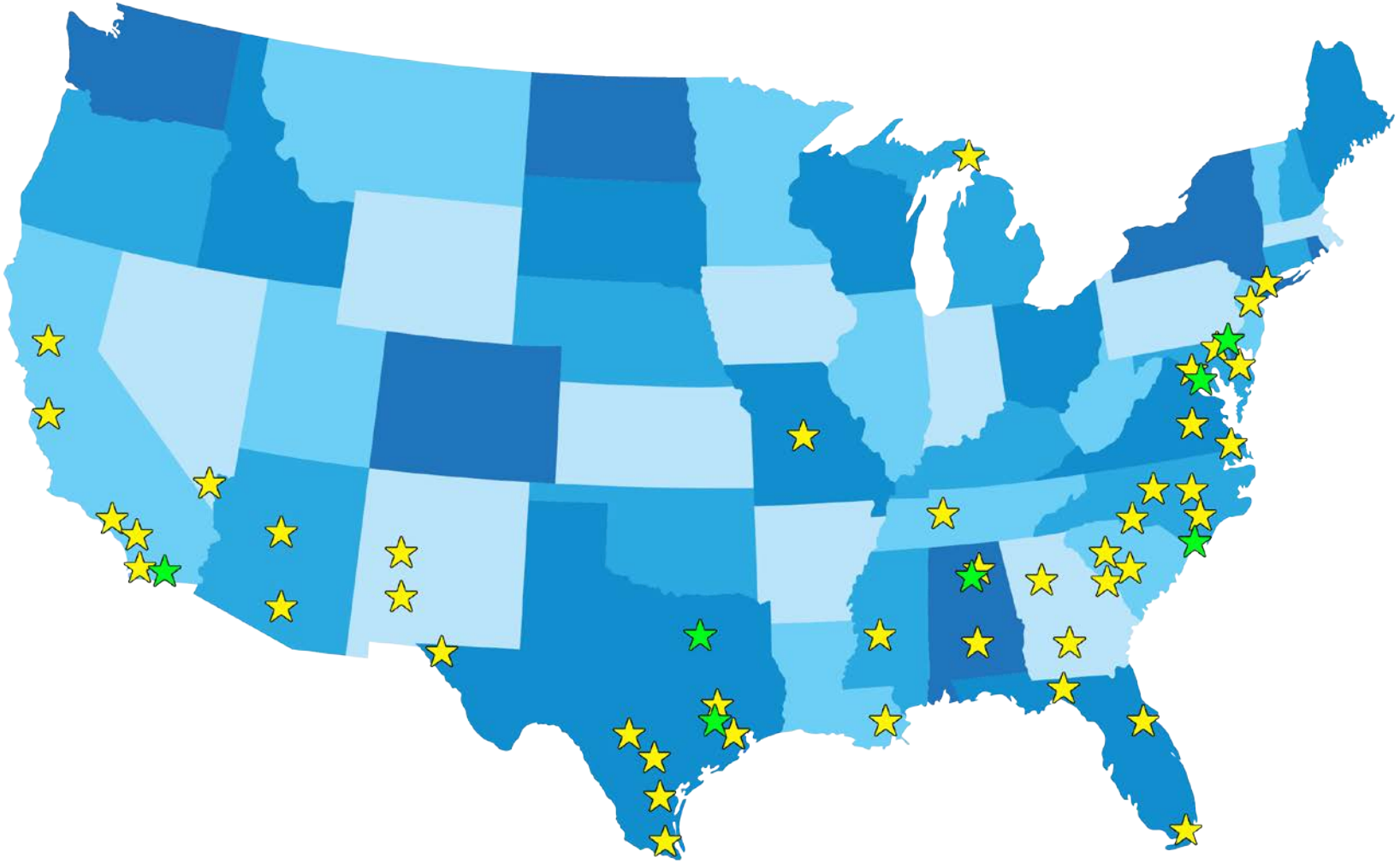
Examples of Member success

- JPEO PPTX
- Research Prospectus
- University Research Cluster
- Example of Government Request for Research Project → Member Response → Member Success Story

The Consortium is…

- A rapidly **emerging ecosystem** of technical innovation driven by underutilized diverse talent
- The first and **only of its kind,** positioned to increase the involvement of MSIs in federal research
- Powered with its **own procurement vehicle** that immediately levels the playing field
- A **force multiplier** to help you scale your research portfolio building strategies
- A **game changer**

Diverse Talent from Coast to Coast and Beyond



60+ MSI Consortium Members

36 Historically Black Colleges & Universities

23 Hispanic Serving Institutions

4 Asian American and Native Pacific Islander Serving Institutions

61-member count includes institutions with multiple classifications.

Statistics are accurate as of January 2020.

MSI STEM Research & Development CONSORTIUM

What We've Accomplished So Far

60+
University Members

1,500+
Individual Subscribers

20+
Private Industry and Collaborative Partners

50
Research Awards

55+
Students Funded

$12M
Research Dollars Awarded

$3M
Principal Investigator and Faculty Support

$2.2M
Collaborative Partner Support

$1.4M
Facilities and Equipment Support

$843K
Student Support

MSI STEM Research & Development CONSORTIUM

MSRDC's Cooperative Agreement

MSRDC's Cooperative Agreement is a blend of a traditional Cooperative Agreement (CA) and an Other Transactions Agreement (OTA)

What types of research can I perform under MSRDC's CA?

The CA states that our members are eligible for basic, applied and advanced research as well as advanced technology development. The federal government classifies this as ***basic, applied and advanced technology development research.***

Can the CA be used by non-DoD agencies?

Yes, Consortium members can engage in negotiations with the government for funding from non-DoD entities to use the CA, provided it is for basic, applied or advanced research, (i.e. funding appropriated for research by Congress).

What is an Other Transaction Agreement (OTA)?

Other Transactions (OTAs) are legally binding instruments that may be used to engage non-traditional contractors such as industry and academia for a broad range of research and prototyping activities. OTs are typically defined by what they are not: **they are not standard** procurement contracts, grants or cooperative agreements.

What is the benefit of using an OTA?

As an **alternative** to the complex Federal Acquisition Regulation (FAR), which may discourage small businesses and other non-traditional contractors from seeking to work with the Government, OTAs provide a commonsense, flexible and user-friendly way of linking buyers and sellers of advanced technologies through a rapid, efficient and cost-effective acquisition instrument. An OTA replaces nothing. It simply is an additional tool that Congress has authorized to help Government program managers accomplish their missions.

OTAs offer **great flexibility** in tailoring the terms to a particular project and the needs of the participants, achieving the best approach to fulfilling the Government's technology needs. Projects can therefore be awarded more quickly and cost-efficiently and engage more small and large businesses, as well as academic institutions

Growing List of Government Research Partners

Department of Defense

Department of State

Department of the Army

Armament Research & Development Engineering Center

Department of Homeland Security

Edgewood Chemical & Biological Center

Joint Program Executive Office Chem Bio Defense

Communications Electronics Research Development Center

Joint Munitions Command

Defense Threat Reduction Agency

Department of the Navy

Army Material Systems Analysis Activity

How We're Changing the Narrative

Despite our success there are still obstacles that our members must overcome.
They are exceptional and talented, but we must overcome the underlying problem.

So, why does it matter?

MSI STEM Research & Development CONSORTIUM

Implicit Bias

A simple bias can directly interfere with the achievement of our objectives.

MSRDC members face implicit biases frequently. The most frequently heard phrases:

"If you're a minority or from an MSI (minority-serving institution), you should [only] apply for minority set-aside money."

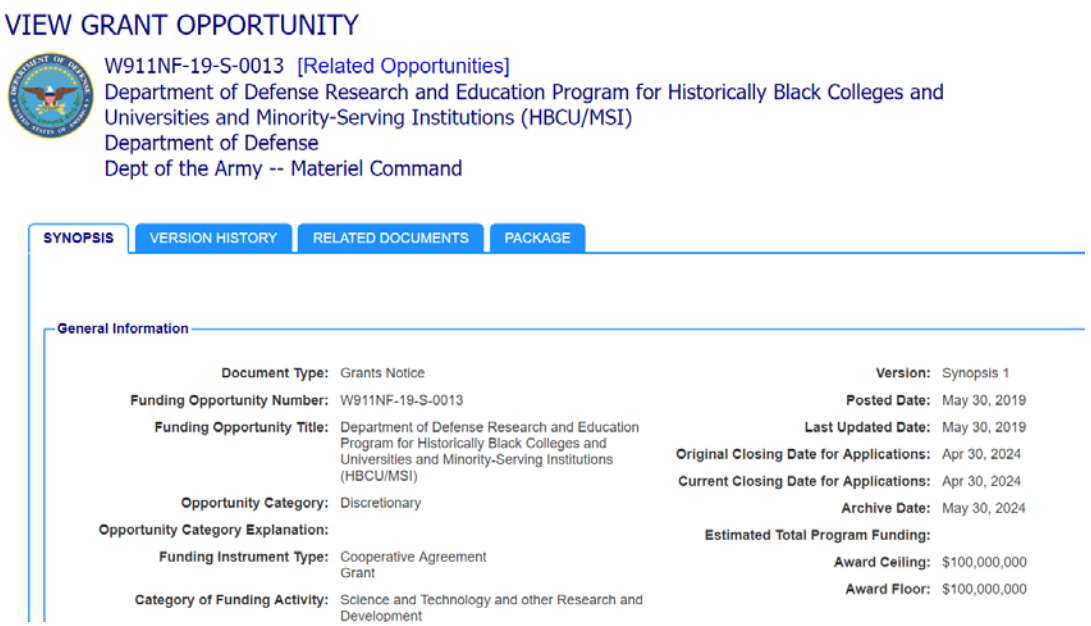
- or -

"Isn't there already set-aside funding for minority institutions?"

TED Article: http://bit.ly/msrdcTED

MSI STEM Research & Development CONSORTIUM

Eliminating Biases



VIEW GRANT OPPORTUNITY

W911NF-19-S-0013 [Related Opportunities]
Department of Defense Research and Education Program for Historically Black Colleges and Universities and Minority-Serving Institutions (HBCU/MSI)
Department of Defense
Dept of the Army -- Materiel Command

SYNOPSIS | VERSION HISTORY | RELATED DOCUMENTS | PACKAGE

General Information

Document Type:	Grants Notice	**Version:**	Synopsis 1
Funding Opportunity Number:	W911NF-19-S-0013	**Posted Date:**	May 30, 2019
Funding Opportunity Title:	Department of Defense Research and Education Program for Historically Black Colleges and Universities and Minority-Serving Institutions (HBCU/MSI)	**Last Updated Date:**	May 30, 2019
		Original Closing Date for Applications:	Apr 30, 2024
Opportunity Category:	Discretionary	**Current Closing Date for Applications:**	Apr 30, 2024
Opportunity Category Explanation:		**Archive Date:**	May 30, 2024
Funding Instrument Type:	Cooperative Agreement Grant	**Estimated Total Program Funding:**	
		Award Ceiling:	$100,000,000
Category of Funding Activity:	Science and Technology and other Research and Development	**Award Floor:**	$100,000,000

VIEW GRANT OPPORTUNITY

W911NF-19-S-0013-RFI-01 [Related Opportunities]
Request for Information - HBCU/MI Quantum Sciences Research Capabilities
Department of Defense

SYNOPSIS | VERSION HISTORY | RELATED DOCUMENTS | PACKAGE

General Information

Document Type:	Grants Notice	**Version:**	Synopsis 4
Funding Opportunity Number:	W911NF-19-S-0013-RFI-01	**Posted Date:**	Oct 24, 2019
Funding Opportunity Title:	Request for Information - HBCU/MI Quantum Sciences Research Capabilities	**Last Updated Date:**	Oct 23, 2019
		Original Closing Date for Applications:	Dec 05, 2019
Opportunity Category:	Discretionary	**Current Closing Date for Applications:**	Dec 05, 2019
Opportunity Category Explanation:		**Archive Date:**	Jan 04, 2020
Funding Instrument Type:	Cooperative Agreement Grant	**Estimated Total Program Funding:**	
Category of Funding Activity:	Science and Technology and other Research and Development	**Award Ceiling:**	$5,000,000
		Award Floor:	$5,000,000
Category Explanation:			
Expected Number of Awards:			

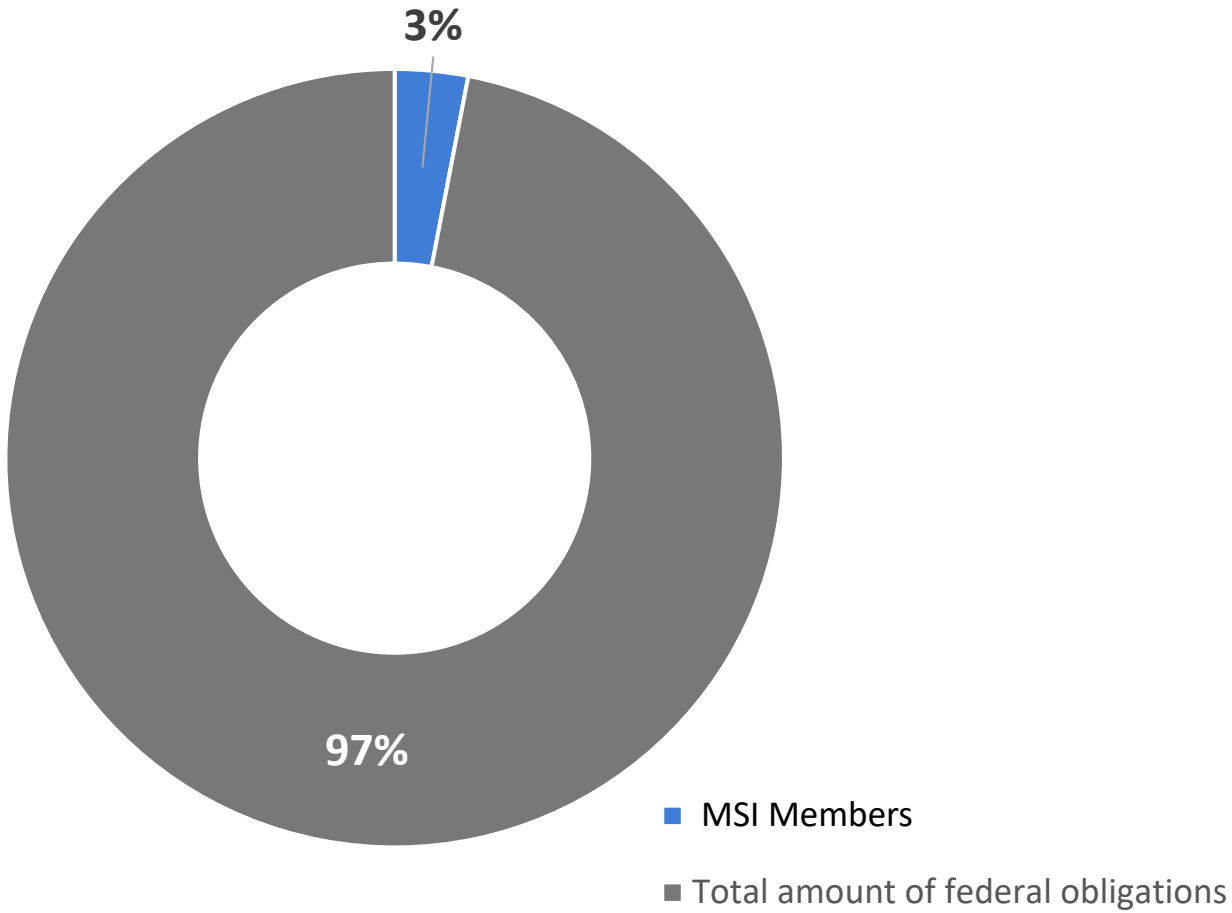
Many MSIs believe they can only compete for set-aside or earmarked funds. They don't believe they can compete for other funding opportunities.

THEY CAN AND THEY SHOULD

MSI STEM Research & Development CONSORTIUM

How Much Money is Available?

MSRDC members have tremendous access to federal funding opportunities. Here's where we are today.



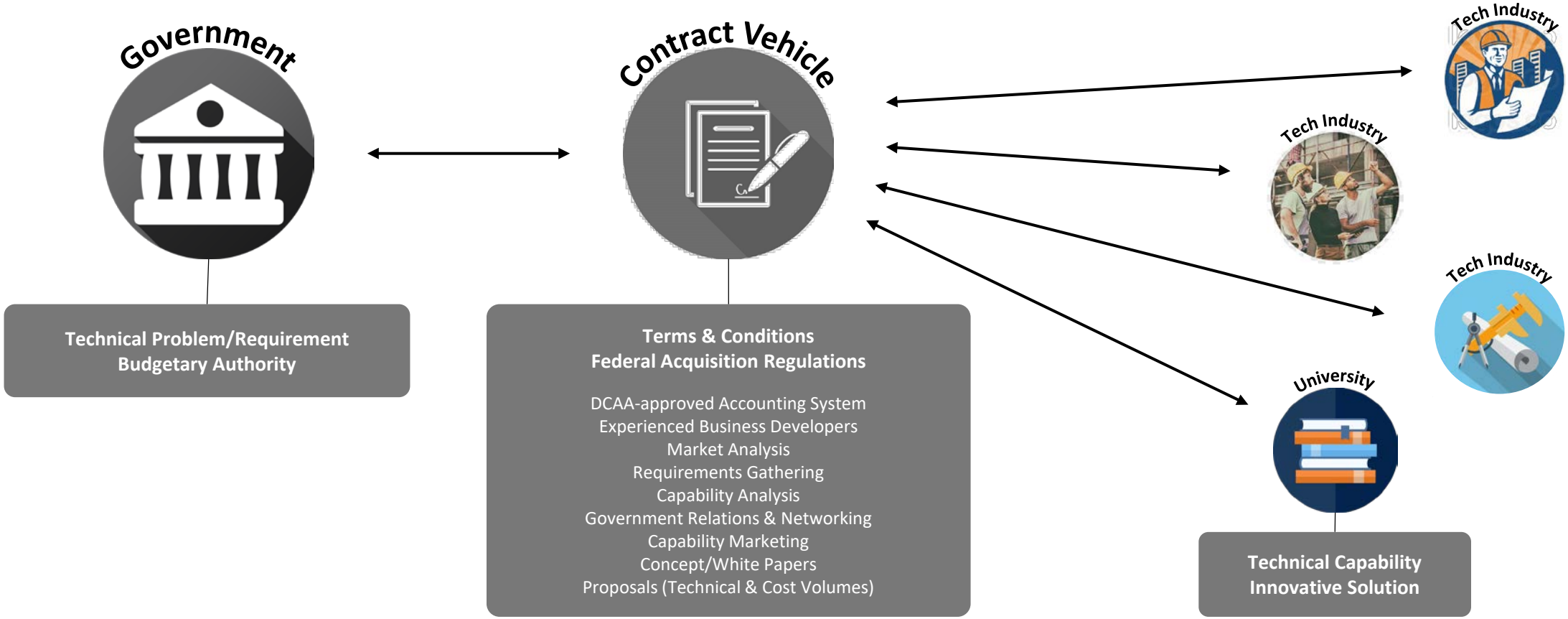
Over the past three years, the Department of Defense's budget for Research, Development, Test and Evaluation (RDT&E) programs has surged to a historic high, growing 36 percent since fiscal year 2016 to $96 billion. This growth would continue under President Trump's budget request for for fiscal year 2020, with the RDT&E budget rising 9 percent above the current level to about **$104 billion**.

Source: http://bit.ly/msrdc1

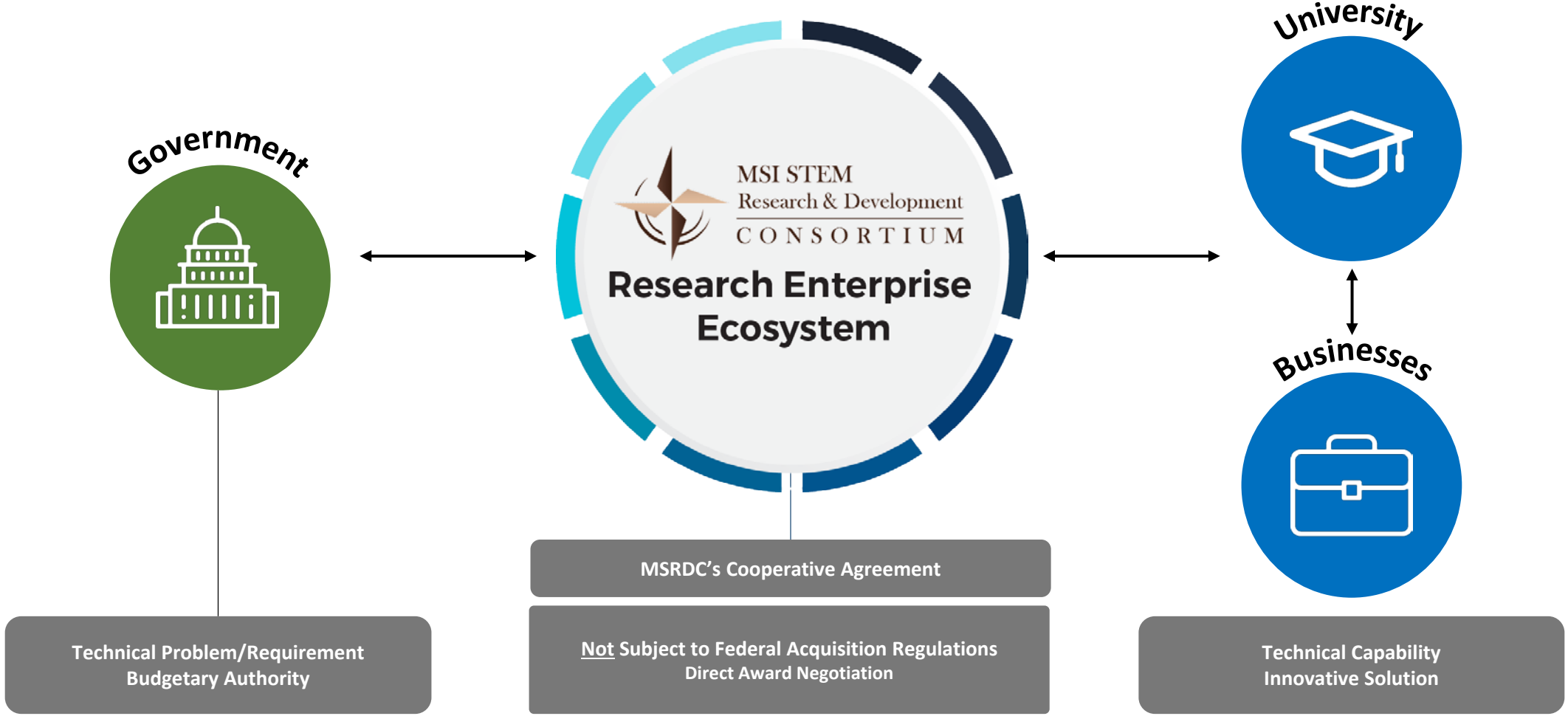
MSI STEM Research & Development CONSORTIUM

Typical Requirements for Doing Business with the Government

HIGHLY COMPETITIVE ENVIRONMENT



How the Consortium Does Business with the Government



A Closer Look at Our Ecosystem

Member Care Campaign

How we're changing the narrative… one school at a time.

Site Visits

With a wealth of new opportunities, we are scheduling site visits to our member schools to create deeper relationships and develop new pathways for research portfolio success.

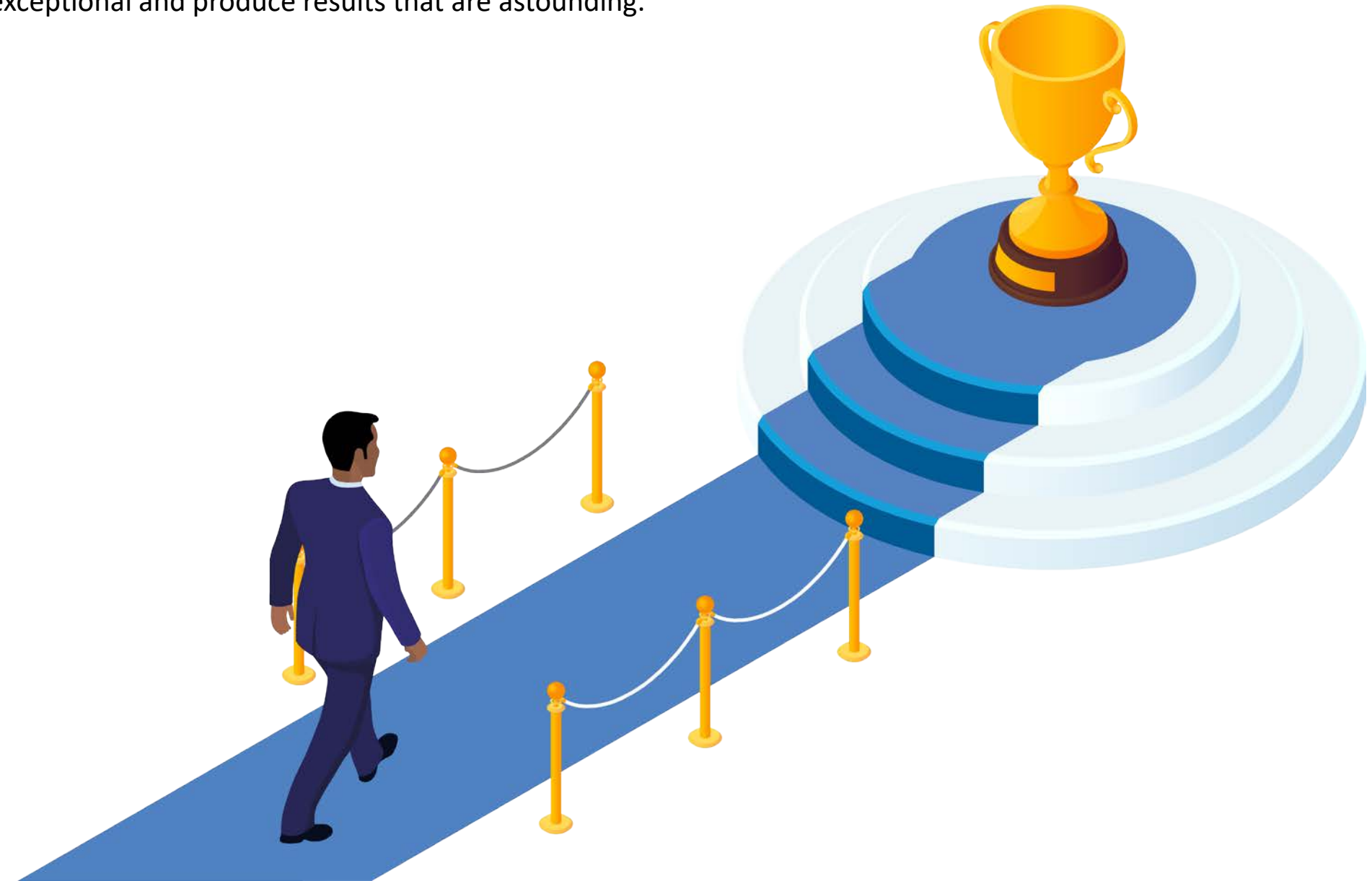
Purpose

1. Educate our members about how to compete more effectively and win core funding
2. Learn about our members' capabilities, technology and research ideas

MSI STEM Research & Development CONSORTIUM

What Can Success Look Like?

Our members are exceptional and produce results that are astounding.

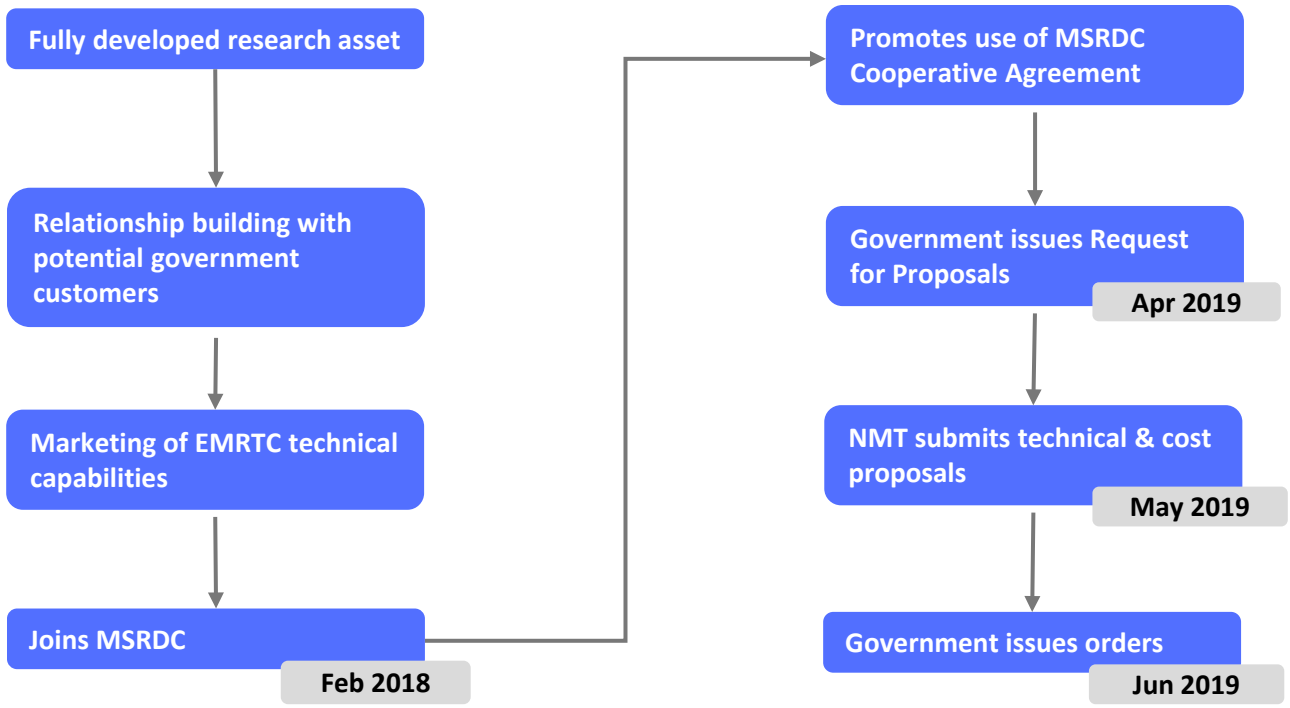


MSI STEM Research & Development CONSORTIUM

Case Studies

NEW MEXICO TECH
SCIENCE • ENGINEERING • RESEARCH UNIVERSITY

Energetic Materials Research & Testing Center (EMRTC)



Within 15 months of joining MSRDC, NMT won **5** awards totaling over **$3.8M** within a span of just **90 days**… with **no competition**.

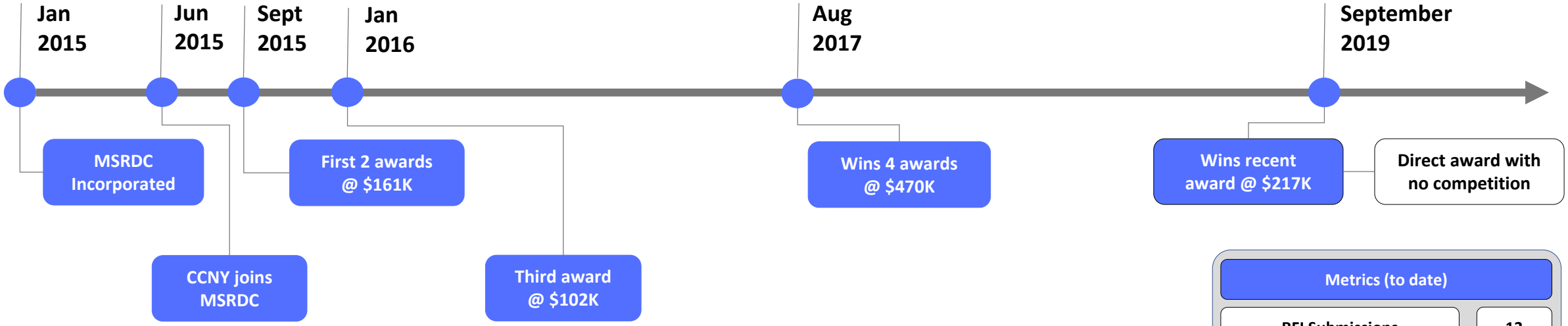
Success Metrics	
Time to leverage MSRDC membership	15 months
Number of competitors	0
Number of customers	3
Number of Request for Proposals	6
Number of private industry subcontractors	2
Number of awards won	5
Total value of awards won	$3.8M
Value of subcontracts to industry partners	$1.7M
Procurement time, start to final award	90 days

MSI STEM Research & Development CONSORTIUM

Case Studies

The City College of New York

FUNDED AREAS OF EXPERTISE	
Communication Technology	Artificial Intelligence
Chem Bio Defense	Cyber Security



Metrics (to date)	
RFI Submissions	13
Awards (to date)	8
Funding (to date)	$1M
Students Supported	10
Student Financial Support	$227k

MSI STEM Research & Development CONSORTIUM

Example: University Research Cluster

MORGAN STATE UNIVERSITY

SCHOOL OF COMPUTER, MATHEMATICAL, AND NATURAL SCIENCES

Research Clusters

"Growing the Future, Leading the World"

Advanced Materials

Faculty: Ramesh Budhani, Dereje Seifu, Birol Ozturk, Yucheng Lan, Willie Rockward, Hongtao Yu, Alexander Samokhvalov

Contact: Abdellah Lisfi, Professor, Physics

Mission:

To conduct research on the synthesis and characterization of functional materials in the bulk form (single crystal and polycrystalline) as well as thin films, multilayered structures, nanowires, nanotubes, and nanoparticles for their applications in modern technology sectors such as sensing, microwave, and telecommunication devices, the automobile industry, and renewable clean energy.

Publications:

- Alotaibi S, Samba J, Pokharel S, Lan Y, Uradu K, Afolabi A, Uniu I, Basnet G, Aslan K, Flanders BN, Lisfi A. Individually grown cobalt nanowires as magnetic force microscopy probes. Applied physics letters. 2018 Feb 26;112(9):092401.
- Aryee D, Seifu D. Shape anisotropy and hybridization enhanced magnetization in nanowires of Fe/MgO/Fe encapsulated in carbon nanotubes. Journal of Magnetism and Magnetic Materials. 2017 May 1;429:161-5.
- Lisfi A, Pokharel S, Morgan W, Warren G, Wuttig M. The power of torque magnetometry: defect induced switching in hexaferrite nano-structures. Nanotechnology. 2014 Sep 24;25(41):415702.

Artificial Intelligence & Machine Learning

Faculty: Paul Wang, Erik Sakk, Iman Dehzangi, Monir Sharker

Contact: Md Mahmudur Rahman, Associate Professor, Computer Science

Mission:

To partner with local AI companies and promote AI adoption in organizations throughout Maryland and the country, attract and train students in machine learning research to develop data science talent to meet Maryland's needs, perform interdisciplinary academic research and collaborate with other institutions, and contribute to the economic development of Maryland through technology transfer and business innovation.

Publications:

- O'Connell J, Li Z, Hanson J, Heffernan R, Lyons J, Paliwal K, Dehzangi A, Yang Y, Zhou Y. SPIN2: Predicting sequence profiles from protein structures using deep neural networks. Proteins: Structure, Function, and Bioinformatics. 2018 Jun;86 (6):629-33.
- Rahman MM. A soft image representation approach by exploiting local neighborhood structure of self-organizing map (SOM). Soft Computing. 2016 Jul 1;20(7):2759-68.
- Sakk E, Alexander A. On the variability of neural network classification measures in the protein secondary structure prediction problem. Applied Computational Intelligence and Soft Computing. 2013 Jan 1;2013:3.

Bioenvironmental Science & Technology

Faculty: Hongtao Yu, Scott Knoche, Saroj Pramanik, Viji Sitther, homas Ihde, Douglas Dluzen, Ming Liu

Contact: Chunlei Fan, Associate Professor, Biology

Mission:

o provide a unified and interdisciplinary understanding of natural and engineered environmental sysms, with emphasis on aquatic ecosystem dynamics and modeling, environmental biotechnology and enetic engineering, environmental chemistry, the intersection of human health disparities, aging, and he environment as well as the environmental and natural resource economics.

Publications:

Ozbay G, Fan C, Yang Z. Relationship between Land Use and Water Quality and Its Assessment Using Hyperspectral Remote Sensing in Mid-Atlantic Estuaries. Water Quality. 2017 Jan 18:169-222.
Thongda W, Zhao H, Zhang D, Jescovitch LN, Liu M, Guo X, Schrandt M, Powers SP, Peatman E. Development of SNP panels as a new tool to assess the genetic diversity, population structure, and parentage analysis of the eastern oyster (Crassostrea virginica). Marine biotechnology. 2018 Jun 1;20(3):385-95.
Olsen E, Kaplan IC, Ainsworth C, Fay G, Gaichas S, Gamble R, Girardin R, Eide CH, Ihde TF, Morzaria-Luna HN, Johnson KF. Ocean futures under ocean acidification, marine protection, and changing fishing pressures explored using a worldwide suite of ecosystem models. Frontiers in Marine Science. 2018 Mar 1;5:64.

Cellular Mechanisms in Health & Disease

Faculty: Saroj Pramanik, Gerald Rameau, Mathumathi Rajavel, Viji Sitther, Douglas Dluzen, Yuejin Li, Simon Nyaga

Contact: James Wachira, Associate Professor, Biology

Mission:

To investigate specific aspects of molecular functioning of cells, including signaling, the interactions of genomes, and the environment in predisposing urban populations to adverse health outcomes and the application of molecular technologies in solving environmental problems.

Publications:

- Tabatabai B, Chen H, Lu J, Giwa-Otusajo J, McKenna AM, Shrivastava AK, Sitther V. Fremyella diplosiphon as a biodiesel agent: identification of fatty acid methyl esters via microwave-assisted direct in situ transesterification. Bioenergy research. 2018 Sep 1;11(3):528-37.
- Yin H, Guo HB, Weston DJ, Borland AM, Ranjan P, Abraham PE, Jawdy SS, Wachira J, Tuskan GA, Tschaplinski TJ, Wullschleger SD. Diel rewiring and positive selection of ancient plant proteins enabled evolution of CAM photosynthesis in Agave. BMC genomics. 2018 Dec;19(1):588.
- Nyaga SG, Denaro F, Hazel K, Akobundu B. Upregulation of Antioxidant Enzymes in Pancreatic Cancer Cells and Tissues. Microscopy and Microanalysis. 2018 Aug;24(S1):1302-3.

Computational Biology & Bioinformatics

Faculty: Asamoah Nkwanta, Vojislav Stojkovic, James Wachira, Guoping Zhang, Iman Dehzangi, Ming Liu

Contact: Douglas Dluzen, Assistant Professor, Biology

Mission:

To apply computational methods and algorithms to understand biological mechanisms and develop technologies at the interface of biology and computing to solve societal problems and advance the fundamental understanding of biological processes by integrating data, modeling, and theory into the scientific processes.

Publications:

- Dehzangi, A., López, Y., Lal, S.P., Taherzadeh, G., Sattar, A., Tsunoda, T. and Sharma, A. Improving succinylation prediction accuracy by incorporating the secondary structure via helix, strand and coil, and evolutionary information from profile bigrams. PloS one, 13(2), p.e0191900, 2018.
- Dluzen D.F., Noren Hooten N., De S., Wood WH III., Zhang Y., Becker K.G., Zonderman A.B., Ferrucci L., Evans M.K. Extracellular RNA profiles with human age, Aging Cell 2018; e12785.
- Nguewou-Hyousse H, Nkwanta A. A Perl algorithm for computing RNA folding rates. International Journal of Evolution Equations. 2014;9(1):1.

Cybersecurity

Faculty: Vojislav Stojkovic, Jonathan Farley, Monir Sharker, Monireh Dabaghchian

Contact: Paul Wang; Chair and Professor, Computer Science

Mission:

To develop and apply secure computer architecture, trusted computing, and advanced cryptography technologies, to explore new frontiers in computer science, quantum computing and post-quantum cryptography in protecting the cyberspace and diminishing the cyber threats, and to promote workforce pathway learning for computer science and cybersecurity students.

Publications:

- Wang SP, Ali A, Guin U, Skjellum AT. IoTCP: A Novel Trusted Computing Protocol for IoT. Journal of The Colloquium for Information System Security Education 2018 Aug 30 (Vol. 6, No. 1, pp. 16-16).
- Hußelier WA, Ramos MJ, Wang S. NFC Unlock: Secure Two-Factor Computer Authentication Using NFC. In2017 IEEE 14th International Conference on Mobile Ad Hoc and Sensor Systems (MASS) 2017 Oct 22 (pp. 507-510). IEEE.
- Wang SP, Ledley RS. Computer architecture and security: Fundamentals of designing secure computer systems. John Wiley & Sons; 2012 Oct 25.

Mathematical Modeling of Biological Systems

Faculty: Xuming Xie, Najat Ziyadi, Elisabeth Kemajou-Brown, Mingchao Cai

Contact: Asamoah Nkwanta, Chair and Professor, Mathematics

Mission:

To use mathematical and computational methods to understand biological systems and contribute to medical knowledge and practice, to develop new pure and applied mathematical methods that will be useful in analyzing biological systems, and to provide insight into finding solutions for specific biological problems.

Publications:

- Ziyadi N. A male-female mathematical model of human papillomavirus (HPV) in African American population. Mathematical biosciences and engineering: MBE. 2017 Feb;14(1):339-58.
- Cai M, Huang P, Mu M. Some multilevel decoupled algorithms for a mixed navier-stokes/darcy model. Advances in Computational Mathematics. 2018 Feb 1;44(1):115-45.
- Sun Z, Kemajou-Brown I, Mencoukeu-Pamen O. A risk-sensitive maximum principle for a Markov regime-switching jump-diffusion system and applications. ESAIM: Control, Optimisation and Calculus of Variations. 2018;24(3):985-1013.

Sensors for Environmental & Biological Applications

Faculty: Hongtao Yu, Ramesh Budhani, Yongchao Zhang, Fasil Abebe, Birol Ozturk, Alexander Samokhvalov

Contact: Angela Winstead, Chair and Professor, Chemistry

Mission:

To develop chemical and biological sensors that can address critical regional and national issues in bio-environmental research and to form collaborations that are capable of contributing to the fundamental knowledge required to design and develop biosensing systems for detecting, monitoring, and mediating the impact of environmental pollutants on urban and rural ecosystems.

Publications:

- Nandu N, Salih Hizir M, Roberston NM, Ozturk B, Yigit MV. Masking the Peroxidase-Like Activity of the Molybdenum Disulfide Nanozyme Enables Label-Free Lipase Detection. ChemBioChem. 2018 Sep 9.
- Abdalrahman MA, Abebe F, Briggs J, Kassel WS, Burdette SC, Seitz WR, Planalp RP. A bifunctional 2, 2': 6', 2''-terpyridine-based ligand for ratiometric Cu (II) sensing. Journal of Coordination Chemistry. 2017 Apr 3;70(7):1123-36.
- Hughes SI, Dasary SS, Singh AK, Glenn Z, Jamison H, Ray PC, Yu H. Sensitive and selective detection of trivalent chromium using hyper Rayleigh scattering with 5, 5'-dithio-bis-(2-nitrobenzoic acid)-modified gold nanoparticles. Sensors and Actuators B: Chemical. 2013 Mar 1;178:514-9.

STEM Education

Faculty: Farin Kamangar, Cleo Hughes Darden, Yun-Chi Chen, Asamoah Nkwanta, Angela Winstead, Md Mahmudur Rahman, James Wachira, Edward Dillon, Birol Ozturk

Contact: Christine Hohmann, Professor, Biology

Mission:

To develop and disseminate evidence-based interventions that improve students' attraction, retention, graduation, and success in STEM, enhance scholarly research on practices focused towards underrepresented students in STEM, and to design and implement societally relevant courses and training options.

Publications:

- Jackson A, Boorman EP, Kamangar F, Hohmann CF. Student Affect During an HBCU Summer Research Program. Understanding Interventions. 2018 Dec 6;9(2):6351.
- Kamangar F, Silver G, Hohmann C, Hughes-Darden C, Turner-Musa J, Haines RT, Jackson A, Aguila N, Sheikhattari P. An entrepreneurial training model to enhance undergraduate training in biomedical research. InBMC proceedings 2017 Dec (Vol. 11, No. 12, p. 18). BioMed Central.
- Darden CH, Ellington RM, Zaveri J, Bapna S, Akli L, Hargett S, Bhattacharya P, Emdad A, Nkwanta A. Interventions Addressing Recruitment and Retention of Underrepresented Minority Groups in Undergraduate STEM Disciplines. In Culturally Responsive Strategies for Reforming STEM Higher Education: Turning the TIDES on Inequity 2019 Jan 14 (pp. 229-247). Emerald Publishing Limited.

MSI STEM Research & Development CONSORTIUM

Innovative Solution Teams

MSRDC Researchers

Collaborative Industry Partners

MSRDC Cooperative Agreement

Federal Partners
ECBC
JPEO-CBRN

MSRDC Solution Teams

- MRSDC members have a wealth of research capabilities uniquely positioned to enhance early detection and identification of WMD components utilizing big data analysis and artificial intelligence algorithms.
- Validation of targeted detection methods will be done in conjunction with ECBC/JPEO-CBRN
- Collaborative interdisciplinary teams will be formed between MSRDC members, Industry partners and ECBC scientists

MSRDC is requesting an audience with DTRA R&D Directorate and/or JPEO PM(s) focused on enabling capabilities for detection with the intention of utilizing MSRDC solution teams' approach to solve R&D objectives

DTRA's Research & Development Directorate Objectives

- Development of improved detection devices for traditional and nontraditional chemical agents
- Development of diagnostics for existing and emerging infectious disease threats
- Improved capabilities for development of new/improved medical and material countermeasures for both pre- and post-exposure

Joint Program Executive Office for Chemical and Biological Defense

Mr. Douglas Bryce

- Mr. Bryce is aware (via direct conversations) of MSRDC's capability to develop solution teams
- JPEO would be able to test detection solutions to enhance their Integrated Layer Defense Process

MSRDC: Getting to Agile: Product vs Process

MSRDC provides: 1) unique collaborative environment to promote innovation, commercialization, and technology stewardship; 2) in-house technical subject matter expertise to vet member capabilities; and 3) cooperative agreement not governed by FAR regulations for innovation following lean startup methodologies.

Federal Partnerships allow MSDRC to move quickly to:

1) Identify agency need and key stakeholders
2) Identify capable partners and best solution to technical issue
3) Create a platform for knowledge sharing
4) Develop innovative solutions
5) Experiment, analyze and pivot
6) Deliver results and reporting to DTRA/ECBC/JPEO larger DoD

ECBC Scientists Collaboration

Bio: Dr. Daniel Angelini (BioDefense Team)

Chem: Dr. Bob Kristovich (Toxicology Team, newly Acting Deputy at CCDC)

- ECBC scientists are interested in a MSRDC | ECBC solution team collaboration
- **ECBC** would provide the ability to model and validate detection solutions from **MSRDC/JPEO**

Selected MSRDC Members with expertise DTRA R&D Objectives

MORGAN STATE UNIVERSITY · HOWARD UNIVERSITY · NORTH CAROLINA A&T STATE UNIVERSITY · THE UNIVERSITY OF TEXAS UTSA AT SAN ANTONIO

For a full list of member capabilities, visit our website

MSRDC can call on top-tier researchers to develop innovative solutions to complex issues. For a full list of our member institutions, visit our website

MSI STEM Research & Development CONSORTIUM

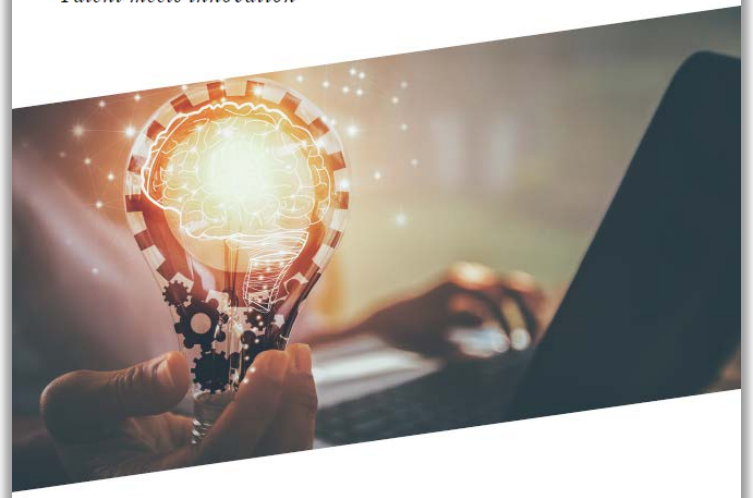
Research Prospectus

The Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense

MSI STEM Research & Development CONSORTIUM

RESEARCH PROSPECTUS

Talent meets innovation



www.msrdconsortium.org

JPEO-CBRND

The Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense

The Joint Program Executive Office (JPEO)

JPEO for Chemical, Biological, Radiological, and Nuclear Defense exists to manage our nation's investments in chemical, biological, radiological, and nuclear (CBRN) defense equipment. Research and development areas:

- Protect - Identify threat and hazards
- Respond - Detect, identify and measure CBRN - Characterize CBRN
- Recover - Control hazardous waste - Mitigate Contamination

The Defense Threat Reduction Agency (DTRA)

DTRA enables the Department of Defense, the United States Government and International partners to counter and deter weapons of mass destruction and improvised threat networks. Research and development areas:

- Development of improved detection devices for traditional and nontraditional chemical agents
- Development of diagnostics for existing and emerging infectious disease threats
- Improved capabilities for development of new/improved medical and material countermeasures for both pre- and post-exposure

Research Requirements & Capabilities

Clinical Application
Detection & Treatment

Battlefield Application
Detection & Protection

MSRDC + JPEO | 4

Selected Researchers

Dr. Ju-Ahng Lee
NC Central University
Biomedical & Biotechnology Research Institute
jlee@nccu.edu
Expertise: Manufacturing Engineering Materials Engineering, Biomedical Engineering, Tissue Engineering

Dr. Hyung D. Bae
Howard University
Dept. of Mechanical Engineering
hyung.bae@howard.edu
Expertise: Fiber optic sensors for multi-parameter sensing, optical sensors for biomedical applications, MEMS, polymer based nano/micro fabrication

Dr. Seong W. Lee
Morgan State University
School of Engineering
Seong.Lee@morgan.edu
Expertise: Efficient combustion process and emissions control technologies for fluidized bed combustion systems, gasification processes, design and testing of biomass and biofuel reactors, renewable energy technologies

Dr. Magesh Thiyaga Rajan
Texas A&M University Corpus Christi Science, Engineering & Computing Sciences
magesh@tamucc.edu
Expertise: Plasma science, portable atmospheric cold plasma technologies, cancer treatment, hemorrhage control, wounds healing, infection treatment, dermatology, surgical sterilization, drug delivery and food processing

Dr. Jian Sheng
Texas A&M University, Corpus Christi College of Science and Engineering
jian.sheng@tamucc.edu
Expertise: Wall shear stress and 3D flow over surfaces textured by microfibers, microfluidics, and biological interactions at oil water interfaces

Dr. Mathumathi Rajavel
Morgan State University Medical Laboratory Science
mathumathi.rajaval@morgan.edu
Expertise: Molecular Microbiology, manipulating bacteriophages to combat infections caused by bacterial pathogens, bacterial/bioagent detection, environmental bacterial decontamination, vaccine delivery

Dr. Byron Purse
San Diego State University Department of Chemistry
bpurse@mail.sdsu.edu
Expertise: Molecular design, synthetic organic chemistry, self-assembly, molecular encapsulation, fluorescence, molecular medicine

Dr. Richard Coffin
Texas A&M University Corpus Christi Department of Physical & Environmental Sciences richard.coffin@tamucc.edu
Expertise: Petroleum exploration and production; Conventional/unconventional reservoirs; Natural/shale gas production; Control, scheduling, planning, safety, risk analysis, and uncertainty in energy systems; Biofuel biochemistry and energy metabolism

Call for White Papers

How our members answered the call.

DEPARTMENT OF THE ARMY

US ARMY CONTRACTING COMMAND – ABERDEEN PROVING GROUND

EDGEWOOD CONTRACTING DIVISION

E4215 AUSTIN ROAD

ABERDEEN PROVING GROUND, MD 21010-5401

Request for White Papers

Hereby Issued

Supporting

United States of America, hereinafter called the Government

Through

The Minority Serving Institutions Science, Technology, Engineering & Mathematics Research & Development Consortium (MSRDC)

Fiscal Year 16

Number: W911SR-14-2-0001 RWP-1601

PART 2 – RESEARCH AREAS

2.1 Planned Funding. Funding is available for White Papers titled **"Models for use in Predictive Toxicology evaluating organophosphate compounds", "Science of Chemical and Biological Protection" and "Science of Chemical and Biological Sensing"** submitted under this Request for White Papers. Funding is "Subject to Availability of Funds" for the other identified White Paper Topic. However, the Government may request project proposals for accepted White Papers. The project proposals may be funded should a customer with funding become available. **PLEASE NOTE: The Government reserves the right to award one, multiple or no project against this request should that be in its best interest.**

An Opportunity Presents Itself

Topic #2: Science of Chemical and Biological Protection: "Funding Available"

The protection of the Warfighter is critical when operating in a hazardous environment. Protective clothing, respiratory protection, and hazard mitigation processes are all components to this topic. Fundamental science in protection includes the development of novel multifunctional materials that perform multiple functions such as adsorption, catalysis and sensing. Also included is the development of advanced personal protective equipment (such as masks), novel air filtration and purification technologies, and associated enabling materials/research. New chemistries for hazardous material decontaminants are also desired as well as further elucidation of the methods and processes by which decontaminants and contaminants interact with materials.

Research areas include but are not limited to:

1. Novel filtration media
2. Integrated protective fabrics
3. Dynamic multifunctional materials
4. New decontamination formulation development
5. Reactive coatings
6. Decontamination profiles (contaminant-material-decontaminant interactions)

MSRDC Members Answered the Call

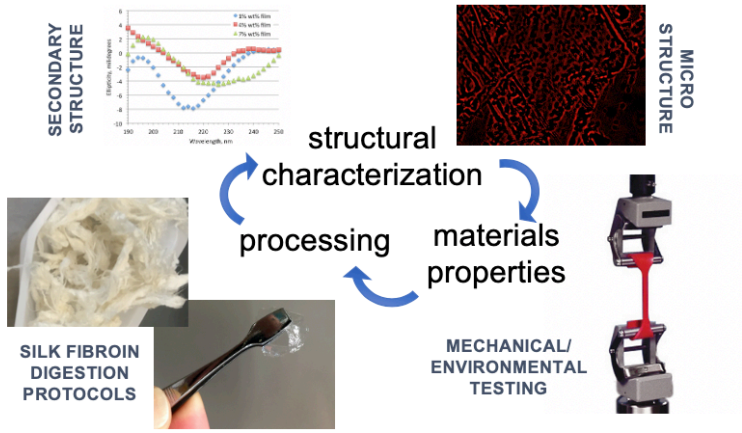
Our members provided a customized technical solution to a complex issue.

Phase II: Rapid processing of a co-continuous filtration membrane
(Topic #2) Raymond Tu - CCNY, W911SR-14-2-0001 RWP-1601

Description of Effort: Design a scalable method for the construction of a co-continuous quasi-periodic silk-based membrane for respiratory filtration.

Challenges:
- Understand the evolution of co-continuous structures with solvent and thermal phase changes
- Relate structure and mechanics in fibroin membranes
- Engineer humidity/chemical stability in membranes
- Engineer surface chemistry of fibroin membranes

Risk: Characterization of structure-property relationships in a scalable biopolymer. Engineering chemical and mechanical stability for practical application of membranes.



Proposed Technical Approach: We aim to use an iterative approach that varies parameters in silk fibroin processing to yield well-controlled pore structures and membrane mechanics.

Benefits of Proposed Effort:
(a) Scalable process for creating a co-continuous membrane using a biocompatible periodically sequenced poly-peptides.

(b) Research training at CCNY – CUNY, where the PI has a record of training minority PhD (2 of 6) and undergraduate (12 of 25) researchers in line with the goals of 10 USC 2362.

ROM Cost Schedule: Total $85,000 (1-year)

34,000–Student stipend	6,000-Summer Salary
8,000-Research Supplies	5,000-Equipment
2,000-Conference Travel	30,000-Indirect Costs

Deliverables: (1) dynamic characterization of evolving co-continuous pore networks, (2) determination of membrane mechanics, (3) characterization of chemical stability, and (4) chemical modification of pore interface.

Point of Contact:
Raymond S. Tu
160 Convent Ave.
CCNY – Steinman Hall, T313
New York, NY 10031
Phone: 212-650-7031
email: tu@ccny.cuny.edu

Figure 1 Quad Chart

Post-Research Success

Exceptional stories as told by our members.

MSI STEM Research & Development CONSORTIUM

MEMBER STORIES

The City College of New York (New York, NY)

Making Better Silk: New and Improved for Gas Masks

Silk has always been an adaptable, flexible fiber. For millennia, it has been spun into satin, jacquard, shimmery Thai silk and rough, absorbent "raw" silk. Now a team led by Raymond Tu of the City College of New York is working on ways to manipulate silk at an even more basic level, taking it back to a liquid state that can then be re-spun according to precise criteria.

The final goal: better gas masks that can filter out specified gases. "Silk is very common feedstock material. It's cheap," said Tu, an associate professor of chemical engineering at CCNY. It's also strong, flexible and doesn't irritate human skin.

"It has traditionally just been used in the fibrous state that comes from the silkworms," Tu added. "But if you do some fairly simple processing, you can take it from the fibrous state to a liquid state. You can precipitate it, spin it on a surface, or you can do some other tricks."

Silkworms usually just spin silk to make their cocoons. But silk spinners such as spiders can vary the property of the silk they spin, as needed. They can make it thicker or thinner, sticky or strong. "It's crazy," Tu said. "Silk actually transitions from a liquid form into a solid form as they are spinning it. How they spin it, with mixtures of different proteins, affects its properties."
Tu's team uses lithium bromide to break down the silk material so that it can be remade into a fabric precisely tuned to filter out particles of certain sizes. The trick is to make a fabric that can filter, while allowing the free flow or air that the wearer needs to breathe.

So What's Next?

Connect with us. Let's connect to discuss your plans and how we can help.

(202) 684-7953

busdev@msrdconsortium.org

www.msrdconsortium.org

1275 K Street NW, Suite 850
Washington, DC 20006

MSI STEM Research & Development CONSORTIUM