GRAND CHALLENGE INITIATIVE

GEORGE MASON UNIVERSITY

Grand Challenge Initiative

Lightning Talks & Matchmaking Mixer

Andre W. Marshall, PhD

Vice President for Research, Innovation, and Economic Impact

One Grand Challenge, Six Grand Solutions

- Advancing 21st-century education for all
- Building a climate-resilient society
- Driving responsible digital innovation and sustainable infrastructure
- Improving human health, well-being, and preparedness
- Pioneering space exploration, research, and collaboration
- Strengthening peace, trust, and engagement in democracy

EDUCATION *Transforming education to break barriers and to create inclusive and accessible learning opportunities for the workforce of the future, empowering communities worldwide.*	**CLIMATE** *Activating research, scholarship, and creative activities for actionable solutions to foster resilient communities and ensure a sustainable future.*	**DATA** *Harnessing AI, other emerging technologies, and sustainable cyberinfrastructure to solve critical human challenges, promote ethical innovation, and power a smarter future.*
PUBLIC HEALTH *Empowering individuals and fostering thriving communities through lifelong health solutions and resilience for military and civilian populations alike.*	**SPACE** *Pioneering space innovations for Earth observation, planetary exploration, and space weather prediction to advance technology and protect global society.*	**PEACE** *Strengthening trust and engagement in democratic institutions and fostering global stability by bridging economic divides and advancing strategic alliances and diplomacy.*

Why GCI Matters

Advances Strategic Research for Global Impact

- Fosters interdisciplinary collaboration
- Positions George Mason as a leader in developing bold, scalable solutions
- Attracts external funding and partnerships

Empowers the University Community

- Creates new opportunities for experiential learning, mentorship, and development
- Encourages innovation and entrepreneurship
- Reinforces George Mason's identity as a forward-thinking institution

Strengthens Regional Resilience and Collaboration

- Promotes partnerships with government, industry, and community organizations
- Builds sustainable systems that improve quality of life and regional competitiveness
- Serves as a model for how universities can lead

GCI Investments (FY26-FY30)

Talent

Strategic Hiring to energize and build research and innovation capacity.

- Tenure-Track Faculty (20-30) | **1:1 match** (central: unit contributions)
- $2.5M Permanent added over 5 years

- Postdocs/graduate students | **1:1 match** (central: unit contributions)
- $2.5M over 5 years

Projects & Programming

Strategic Seed Funding to lead major research proposals and projects | **3:1 match** (central: unit contributions)

- Pilot projects, students, grant development, events, and conferences
- $5M over 5 years

Infrastructure

Strategic Infrastructure Investments in development and acquisition of cutting-edge lab capability | **3:1 match** (central: unit contributions)

- Equipment, instrumentation, materials, supplies, and facilities – requires match and sustainability plan
- $5M over 5 years

TOTAL: $15M ($2.5M Permanent) over FY26-FY30

George Mason is committing $10M and asking for $5M from the state via 6YP

What Success Looks Like

GEORGE MASON COMMUNITY

Empowered faculty, students, and staff driving mission-aligned innovation

REGION & STATE

Stronger partnerships and tangible improvements in community resilience

RESEARCH OVERALL

Scalable, interdisciplinary solutions that shape national and global discourse

Importance of Working With Your College(s)

Start NOW

College alignment and buy-in is **REQUIRED.**

Engagement

Teams to engage with Department Chairs, ADRs, and Deans to discuss ideas and work with administrative offices on proposal development.

Dean's Letter

This is a ***detailed letter of commitment*** for ***specific matching funds***. It CANNOT be obtained at the last minute.

GRAND CHALLENGE INITIATIVE

FY26 Request for Proposals Timeline

OCTOBER 15, 2025

RFP Release

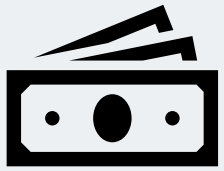
FEBRUARY 2, 2026

Due Date

APRIL 30, 2026

Funding Decisions

JUNE 1, 2026



Funding Available

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Resources

- Request for Proposals
- FAQs (To Be Updated Regularly)
- Contact GCI@gmu.edu

GRAND CHALLENGE INITIATIVE

Agenda

Round 1 (10:10-11:30)

10:10-11:00: Lightning Talks

11:00-11:30: Mixer

Round 2 (11:40-1:00)

11:40-12:30: Lightning Talks

12:30-1:00: Mixer

GRAND CHALLENGE INITIATIVE

Ferah Munshi, fmunshi@gmu.edu
College of Science
Anamaria Berea, Hina Kazmi, Peter Plavchan, Piotr Pachovicz, Rob Parks, Phil Cunio, Phil Yang,
Jie Zhang, Gabrielle Belle, Jules Goldspiel, Leigh McCue

SPACE INSTITUTE
AT GEORGE MASON UNIVERSITY

A Visionary, Transdisciplinary Space Institute at GMU

In support of GCI Solution: "Pioneering space exploration, science and research."

Vision: An institute for cutting-edge space mission development, R&D, STEM education & outreach supported by public-private-partnerships (P3s), including government and commercial/industry space sectors.

Mission: Provide a platform for a new generation of space sector leaders to advance space exploration and research, to lead economics, policy and legal analyses that inform the nascent space policy & business frameworks.

Strategic Goals:

1. Facilitate collaboration with stakeholders across academia, government, and commercial space sector
2. Build, launch, and operate space missions
3. Develop cross-disciplinary coursework and degree programs to enable Space Institute Vision and Mission
4. Lead in space science research

GRAND CHALLENGE INITIATIVE

Dieter Pfoser
dpfoser@ – GGS & Center for GeoIntelligence, COS

Sarah Campbell – AVPR for Defense & Security Initiatives, ++

Aerial Intelligence and Digital Earth Histories

180,000,000 images – 80 years

Laurence Bray
lbray2@gmu.edu
Graduate Division, Office of the Provost

Possible support:

- Innovative ideas on integrating graduate education and post-doctoral affairs into proposals
- Funding to grow and support graduate students and post-doctoral fellows
- Professional development opportunities for graduate faculty, staff, and students

GRAND CHALLENGE INITIATIVE

Erdal Yiğit
eyigit@gmu.edu, Department of Physics and Astronomy, College of Science

Team members: D. Tong (AOES), Y. Tang (AOES), A. Gann (P&A), F. Camelli (P&A), C. Rautenberg (Math), K. Sun (Cyber.), J. Pan (Cyber.), B. Weigel (Phys&Ast), E. Roesler (Psychol.), J. Suh (Educ.)

Institute for Whole Atmosphere & Space Weather Prediction

- Establishment of a first-of-its-kind transdisciplinary institute on monitoring and prediction of Earth's atmosphere and space environment, concentrating on severe weather phenomena and space weather
- Real-time monitoring and prediction from surface to outer space to protect technological infrastructure, human health and activities from disturbances in the atmosphere and space environment of Earth and other planets.
- Relevance to national security, defense, insurances, space industry, and public health
- Partnerships with NASA, NOAA, NRL, APL, and industry.

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CHALLENGE INITIATIVE

Kristen Wright
kwrigh22@gmu.edu
Office of Community Engagement and Civic Learning (CECiL)

OFFICE OF COMMUNITY ENGAGEMENT AND CIVIC LEARNING
George Mason University

CECiL: A Resource for Partnership and Civic Engagement

What We Do

- High impact student experiences
- Civic and democratic engagement programming
- Community partnerships
- Civic engagement course designation
- Faculty support

A Resource for GCI Proposals

- **Partnership Development:** We can help make **c**onnections with local non-profit organizations
- **Student Engagement**: We can help provide infrastructure and best practice for engaging students in this work
- **Curricular Connections:** We can help embed efforts into curriculum through CE designation
- **Strengthening peace, trust, and engagement in democracy**

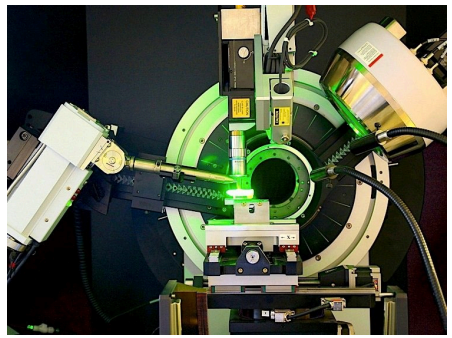
GRAND CHALLENGE INITIATIVE

An Integrated Molecular Analysis Core

–Unlocking molecular underpinnings across disciplines

Mikell Paige
mpaige3@gmu.edu

COS, Department of Chemistry and Biochemistry
Center for Molecular Engineering (CME)



X-ray diffraction
(APS & WRAIR)

NMR

Protein
Synthesis &
Purification

Chemical
Synthesis &
Purification

Research Question

Chemical & Biochemical Synthesis

Structural Analysis

Molecular Analyses

Quantitative Analyses

Interdisciplinary Project

AlphaScreen

ITC

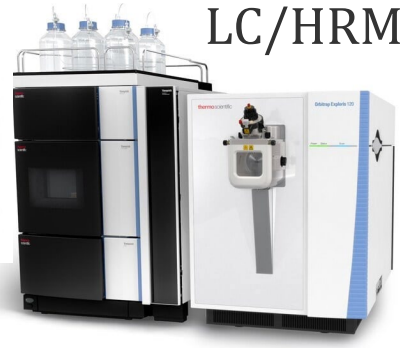
Thermodynamic/ Kinetic Analysis

DSC

GC/MS

LC/MS/MS

LC/HRMS



GRAND CHALLENGE INITIATIVE

Kun Sun

ksun3@gmu.edu
IST/CEC

Prof. Kun Sun, Information Sciences and Technology, College of Engineering and Computing
Prof. Xiaokuan Zhang, Computer Science, College of Engineering and Computing
Prof. Ketian Zhang, International Security, Schar School of Policy and Government
Prof. Michael Hunzeker, International Security, Schar School of Policy and Government

SMART: Securing the U.S. Research Enterprise via Software Supply Chain Risk Assessment

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Karen T. Lee

klee57@gmu.edu
Office of Student Creative Activities and Research (OSCAR),
Undergraduate Education

How can OSCAR help you include undergraduate students in research and creative projects?

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Maryam Parsa

mparsa@gmu.edu

Center for Efficient Next-Generation Computing: Neuroscience for AI, and AI for Neuroscience

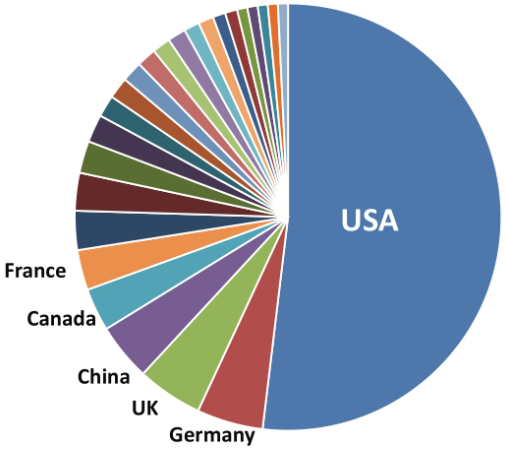
VISION TO MAKE AI SYSTEMS LEARN AND REASON LIKE ANIMALS & HUMANS

Team members (26 faculties):

College of Engineering and Computing. **ECE:** Maryam Parsa, Ethan Ahn, Khaled Khasawneh, Sai Manoj, Peter Pachowicz, Kai Zeng, Cameron Nowzari, Xuan Wang, Liling Haung, **CS:** Xuesu Xiao, **IST:** Ozlem Uzuner, **BioEng:** Siddhartha Sikdar, **SEOR:** Ali Raz.

College of Science. **Neuroscience (and bioengineering):** Giorgio Ascoli, Holger Dannenberg, **Math:** Harbir Antil, Rebecca Goldin, Rebecca RG, **Physics and Astronomy:** Patrick Vora, Rainald Lohner, John Cressman.

College of Humanities and Social Sciences. **Psychology:** Theodore Dumas, Craig McDonald, Elizabeth Phillips, Yi-Ching Lee, Eileen Roesler.



# of Data centers in 2024

"Human and nonhuman animals seem able to learn enormous amounts of background knowledge about how the world works through observation and through an incomprehensibly small amount of interactions in a task-independent, unsupervised way"

GRAND CHALLENGE INITIATIVE

Chaowei Phil Yang

cyang3@gmu.edu
College of Science (with ORC, Health, Peace, Engineering and Policy)

Alaister J. Neil/ORC, Harbir Antil/Math, Jie Zhang/Physics, Daniel Tong/AOES, Amira Roess/Health, Daniel Rothbart/Carter and Dieter Pfoser/GGS, Fengxiu Zhang/Schar, Jie Xu/SO, Songqing Chen/CS, CEC, and 20+ faculty

Digital Twin Center of Excellence:

Vision: enable productive and healthy life on Earth via digital replica, predication and solution optimization for scientific, engineering, and societal challenges.
Mission: conduct high-impact use-inspired innovative research and facilitate cross-disciplinary and cross-sectoral partnerships to advance and lead DT innovation.
Goal: build a sustainable collaborative platform for catalyzing Mason cyberinfrastructure research and education in a transformative fashion.

GRAND CHALLENGE INITIATIVE

Anne Osterman / Wendy Mann
aelguind@gmu.edu / wmann@gmu.edu
University Libraries

How the University Libraries can support the Grand Challenge Initiative

GRAND CHALLENGE INITIATIVE

Leveraging the Institutes

IDIA - Max Albanese (malbanes@gmu.edu)
ISE - Leah Nichols (lnicho5@gmu.edu) and
Julianna Gwiszcz (jgwiszcz@gmu.edu)
IBI - Amy Adams (avanmete@gmu.edu)

GCI teams are invited to prepare a poster for the IDIA Industry Day on December 2.

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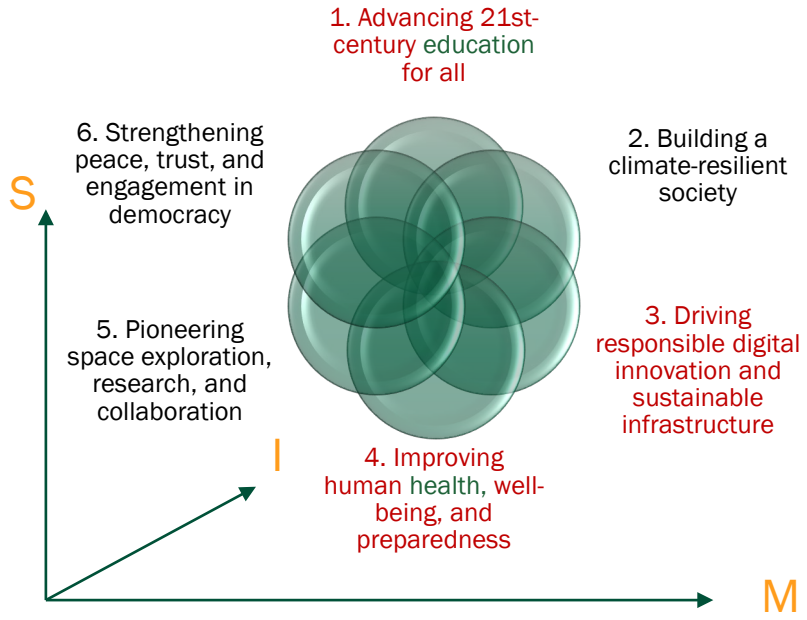
Mixer

Lightning Talks will begin again at 11:40

mSPARK: Mathematics, Statistics, and Intelligence Advancing Knowledge, Transforming Energy and Health

- **Presenter:** **Jiayang Sun**, Prof, Chair, B. Dunn Eminent Scholar, jsun21@gmu.edu, Statistics, CEC
- **Team:** John Stufken, Jiayang Sun, Statistics, CEC; Maria Emelianenko, Harbir Antil[CAMI], Padhu Seshiyer[COMPLETE], Math, CoS; Ziyu Yao, CS; Ozlem Uzuner, IST; Jie Xu, SEOR, CEC

  Others: Energy, BME, CPH, INOVA, IBI/IDIA/ISE …?
- **Supporting Info:** Build on MS2DC + SoC, CoS, VSE, Fuse, Fairfax, LSBE, 81+, …, Transform D &I → E^2H w outstanding Fac, grounded in m-d intelligence, Student Facing, Drive sustainable solutions … and a National Institute.



Data and Intelligence Driving a Sustainable Future

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Abhishek Ray, aray8@gmu.edu, Costello College of Business
Nirup Menon, Mariia Petryk, Pallab Sanyal

Dare Vitam: Values-Aligned AI for Complex Problem Solving

The Challenge:

- **AI fails** at complex (human-values/social psychology) problems despite augmenting worker productivity
- **Alignment bottleneck**: systems misalign with human values and welfare

Proposed Solution: Robopsychology & Emotion-Aware AI

- Model **AI with human cognition and value** representation through interpretable architectures
- **Enable AI emotion-awareness** for richer human-AI communication of norms and preferences
- **Predict moral/ethical** implications across layered decision problems

Implementation Approach:

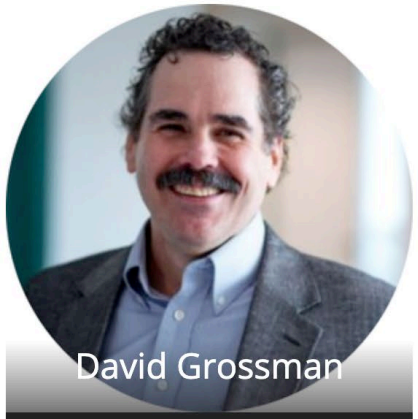
- **Integrate robopsychology** with AI approaches (e.g., preference learning and inverse RL) with value modeling.
- **Develop metrics** testing ***AI-human alignment*** across nested goals (tasks, governance, welfare)
- ***Outcome***: AI that collaborates with humans to restructure problems, reveal hidden trade-offs and values, and coordinate at scale.

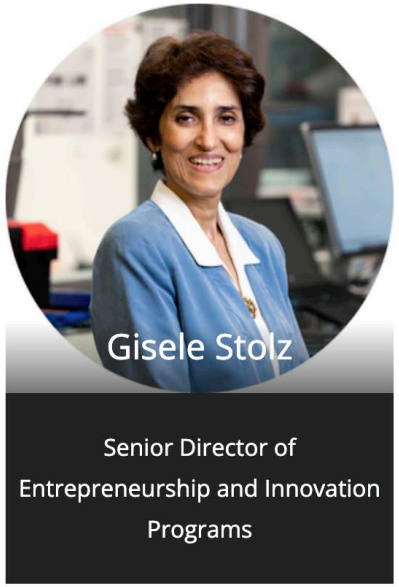
Collaboration Needs: Psychology expertise, cognition/sentience model development

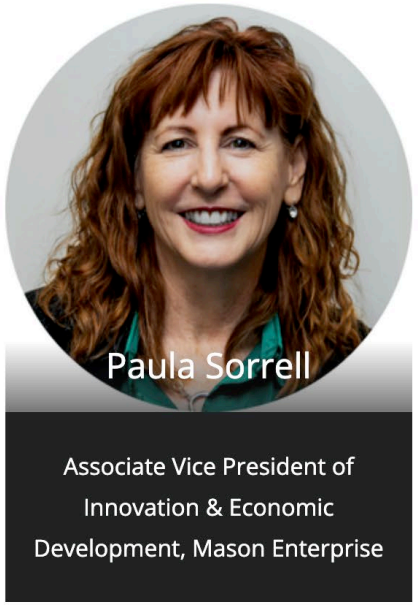
We already have: Business needs, technology frameworks, and impact delivery

Gisele Stolz
gstolz2@gmu.edu

MASON ENTERPRISE™
George Mason University®





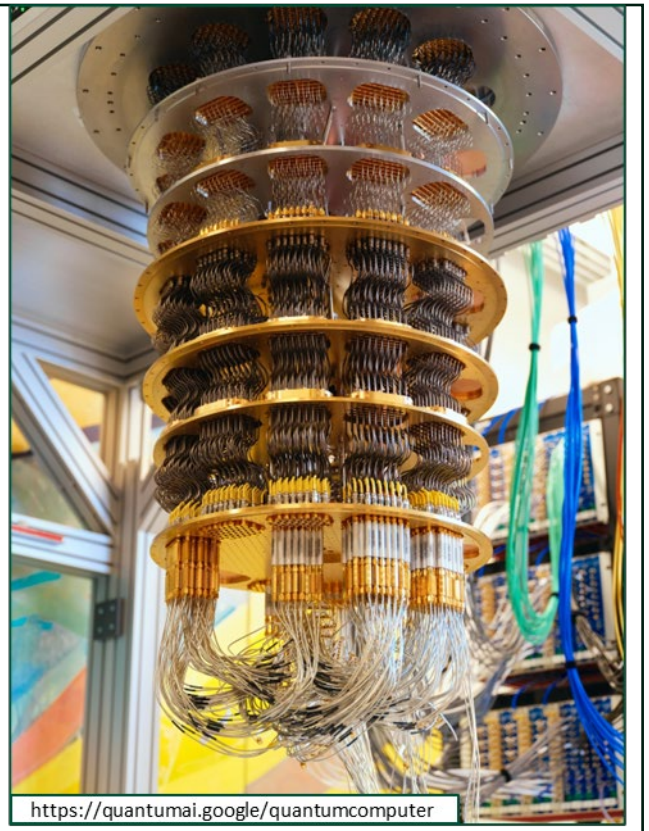


Empowering faculty and researchers to translate academic innovation into real-world impact

GRAND CHALLENGE INITIATIVE

Patrick Vora
pvora@gmu.edu
Department of Physics & Astronomy

Weiwen Jiang, Jessica Rosenberg, Krzysztof M. Gaj, Fei Li, Michael Jarret, Ming Tian, Maria Emelianenko, Andre Clayborne, Nancy Holincheck


https://quantumai.google/quantumcomputer

Bringing the Quantum Revolution to Mason

Securing a Mason-owned quantum computer by Jan 2027

- Located in FUSE and used for algorithms research + hardware test bed.

Hire 4 new faculty in COS and CEC focused on quantum hardware and quantum applications research

- Leverage NanoFabrication Facility and the new Mason Quantum test bed.
- Areas could include:
  - Cryogenic microelectronics, qubit development, quantum transduction, networking technologies, use cases for quantum computers

Owning hardware lets us bring quantum computing to other disciplines at Mason

Build quantum hardware courses at the MS and BS levels

- Augments interdisciplinary quantum software MS launching F26 (pending SCHEV)

MITRE
Fairfax County Economic Development Authority
Booz | Allen | Hamilton
Fairfax County PUBLIC SCHOOLS ENGAGE • INSPIRE • THRIVE
leidos

Sarah Wittman
switman@gmu.edu
Costello College of Business

Vivian Motti (College of Engineering & Computing); Anya Evmenova (College of Education & Human Development)

Building Infrastructure and Opportunities, and Removing Barriers, for Societal Participation for People with Disabilities (PwD)

GRAND CHALLENGE INITIATIVE

Office of Advancement
and Alumni Relations
CORPORATE AND
FOUNDATION RELATIONS
George Mason University

Angelina Jarrouj, Director, Foundation Relations
ajarrouj@gmu.edu; cfradmin@gmu.edu
Corporate and Foundation Relations/Office of Advancement and Alumni Relations

Private Funding Support for the Grand Challenge Initiative:

- Focus on philanthropic fundraising from non-federal sources
- Partner with colleges, schools, and units to provide enterprise-wide engagement strategies for foundations and corporations
- Provide fundraising support for President and Provost-led initiatives, multi-disciplinary efforts, and unit/college priorities
- Partner with unit-based Advancement colleagues, the Office of Sponsored Programs, Research Development and others

GRAND CHALLENGE INITIATIVE

Denise A. Hines, Ph.D.

dhines2@gmu.edu

College of Public Health

Team Members confirmed and tentative from Social Work, Nursing, GCH, Psychology, Carter School, Engineering, & Statistics

Violence and Trauma Across the Lifespan

- Generate transformative impact by addressing violence and trauma across the lifespan
- Multidisciplinary, equity-centered approach.
- Integrating research, practice, and community engagement
- Develop innovative models of prevention and intervention.
- Catalyze new partnerships across academic, clinical, and policy sectors
- Produce actionable data to inform systems-level change.
- Expand training and workforce development in trauma-informed care
- Targeted investments in talent, infrastructure, and programming
- Reduce the burden of trauma, promote resilience, and advance justice for vulnerable populations.
- Looking for partners in issues related to violence and trauma and/or who can help with the co-creation of innovative prevention and intervention models.

GRAND CHALLENGE INITIATIVE

Raedeh Basiri
rbasiri@gmu.edu
College of Public Health

Team Member(s) Names, Affiliations: TBD

AI-based Personalized Nutrition to Prevent Chronic Diseases And Promote Health

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Pandemic Preparedness and One Health*

Fatah Kashanchi, Ph.D.

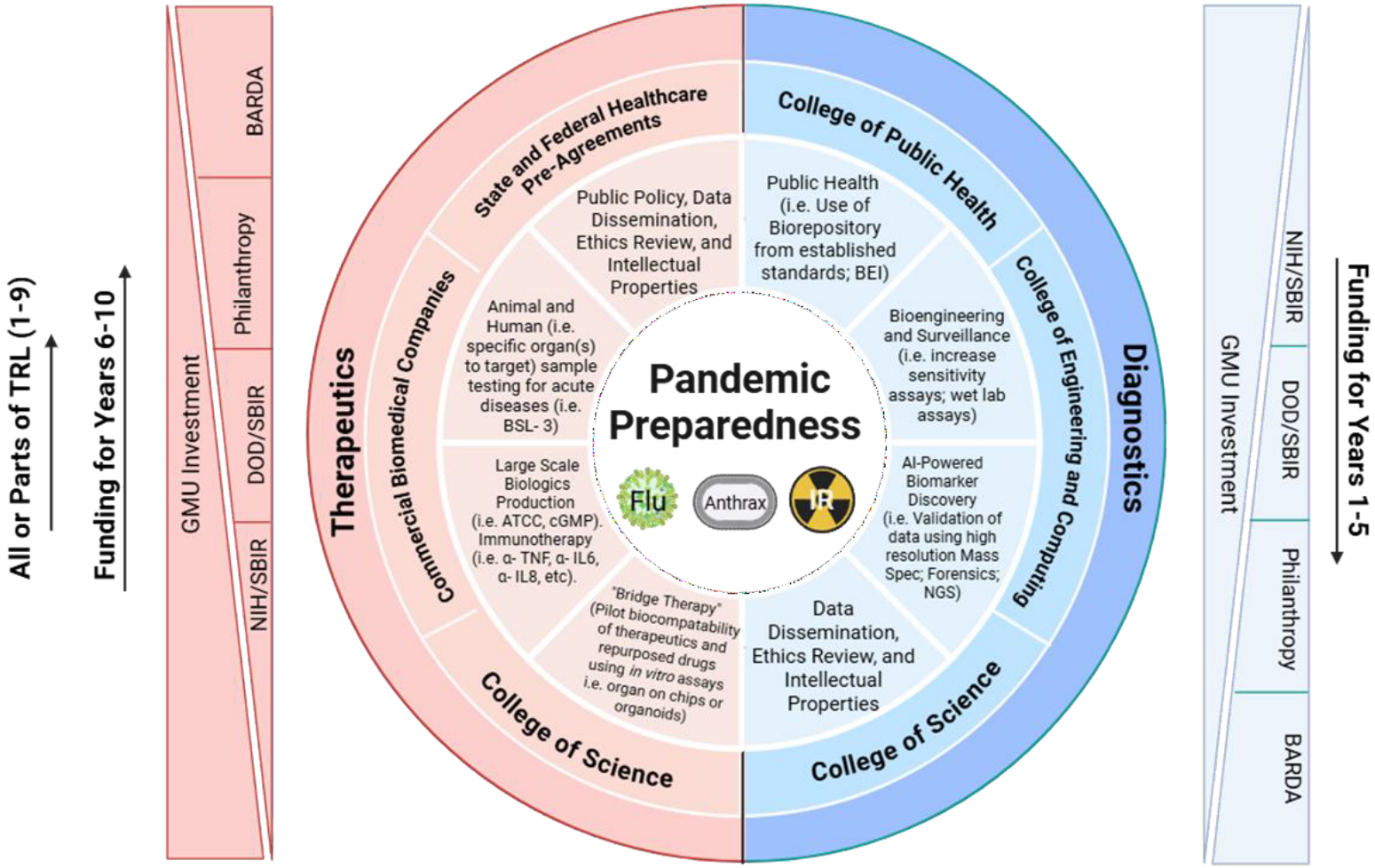
Founder and Past President (asicbio.org)
Fkashanc@gmu.edu
Center of Infectious Disease Research (CIDR) /
School of Systems Biology

Team and Affiliates (World's Top 2% Scientists)
Philosophy: "Big Tent" and inclusive

Academics:
CIDR (Kashanchi, Hakami, Van Hoek, Wu) BRL (Alem, Anthony, Roziner)
CAPMM (Liotta)
Dept of Chemistry (Paige) Dept of Forensics (Eckerode) Climate Change (Maibach)
Dept of Environmental Science (Perry)
Office of Research, Innovation, and Economic Impact (Stolz, Grossman)

Companies:
ATCC (Branscome, Molestina) Serpin pharma (Gelber)
Ceres (Lepene)
General Exosomics (Paytan) Virongy Biosciences (Hetrick)

Graphical Abstract



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*Bill Gates: How To Prevent The Next Pandemic

Sunny Shin
sshin35@gmu.edu
College of Public Health
Farrokh Alemi, Michael S. Bloom, Alison Evans Cuellar, Y. Alicia Hong, Yikuan Li, Kyeung Mi Oh, Stefanos Tyrovolas, Hong Xue

Catalyzing Mason's Capacity for Transdisciplinary, AI-Driven, Community-Engaged Solutions to Advance Lifelong Health and Well-Being

GRAND CHALLENGE INITIATIVE

Monique van Hoek, Professor

mvanhoek@gmu.edu, School of Systems Biology

Center for Infectious Disease Research (CIDR)

http://cidr.science.gmu.edu, **Discovery Hall**, **SciTech campus**

van Hoek – Antibiotic resistant bacteria and new antibacterial agents
Kashanchi – Extracellular Vesicles and HIV-1 Pathogenesis
Hakami – Intercellular Vesicle Transport (EV Exchange),Regulation of the Innate Immune Response to viral infection.
Wu –HIV Rev-dependent vectors for targeting HIV reservoirs

Complementary support and resources:

* **Biomedical Research Laboratory (BRL)**
* **Institute for BioHealth Innovation (IBI)**
* **Center for Applied Proteomics and Molecular Medicine (CAPMM)**

GRAND CHALLENGE INITIATIVE

Liang Luo
lluo5@gmu.edu
Department of Modern and Classical Languages
College of Humanities and Social Sciences

(Team Members: Lisa Breglia, Senior Associate Dean, CHSS, Xiaomei Cai, Communication/Office of the Provost, Young Jung, Korean Studies/MCL, and many more; External Partners: Fan Yang, UMBC; Tansen Sen, NYU Shanghai; Charlie Yi Zhang, University of Kentucky/Lingnan University, and many more)

Global Asias Research and Creativity Hub

(GLOBAL ARCH) (Existing funding: "Establishing Locally Rooted Asian American Studies," Mellon Foundation, $150,000, 2025-2026. Funding opportunities: Korea Foundation, Japan Foundation, Taiwan Economic and Cultural Office, Mellon Foundation, Luce Foundation, East-West Center, University of Hawaii)

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Antti Pentikainen
apentika@gmu.edu
Mary Hoch Center for Reconciliation, Carter School, GMU

Nations Need Help to Heal

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University Life: *Partnering for a Prosperous Future*

EDUCATION

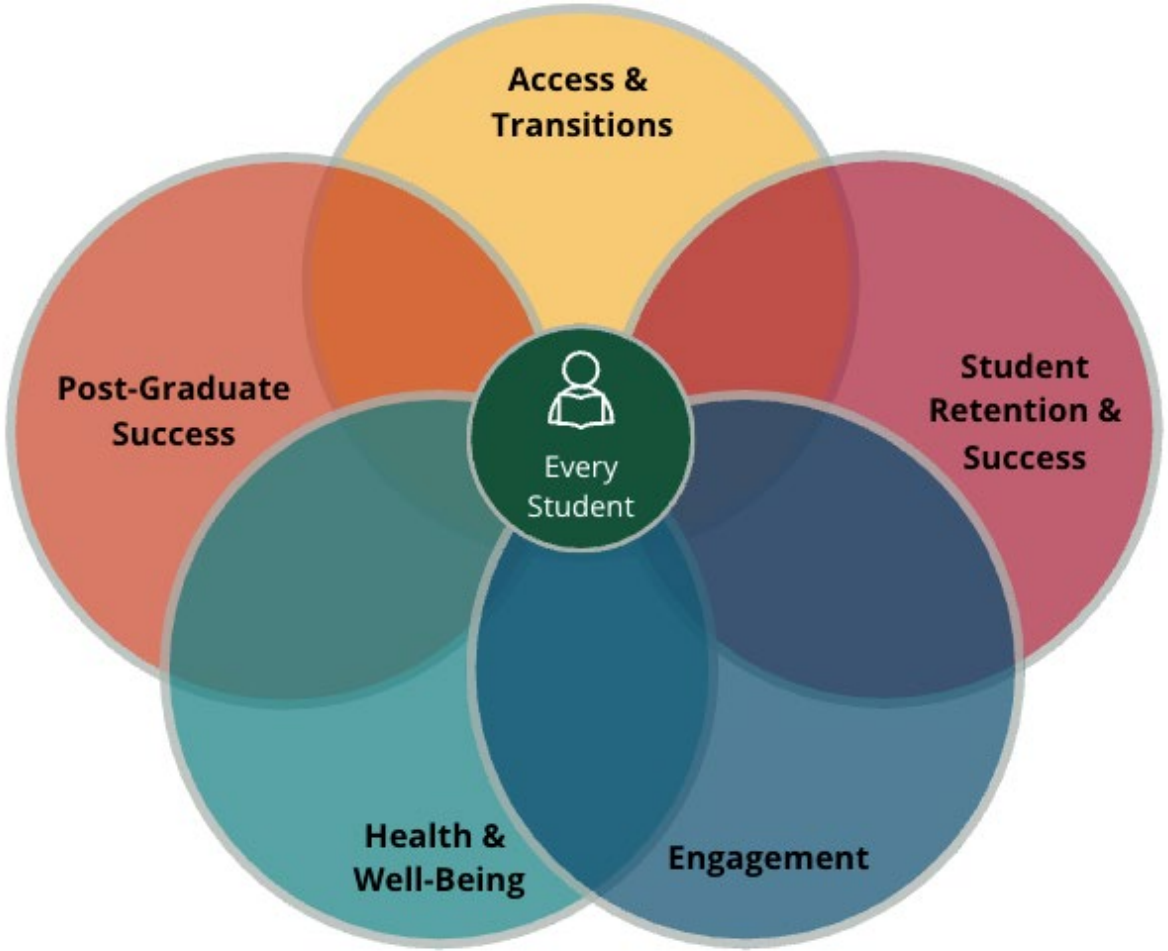
Advancing 21st-Century Education for All

PUBLIC HEALTH

Improving Human Health, Well-being, and Preparedness

PEACE

Strengthening Peace, Trust, and Engagement in Democracy



- K-12 Engagement / Access (EIP)
- FirstGen+ Resources
- Pell-Eligible Student Pathways
- Career Everywhere Ecosystem

- Fully staffed health and counseling centers
- Telemental health services (partner vendor)
- Suicide Prevention Platform (Mindwise)
- Interpersonal Violence Support Services
- ADHD Testing Service
- Mason Autism Support Initiative (MASI)
- Executive Functioning Program (EFP)
- Leadership & Well-Being Certificates
- Executive Coaching Industry Partnerships

- Dialogue Across Differences
- Braver Campus Debates: Bridging Divides
- Spirituality & Interfaith Center
- Creating community, civic engagement, and belonging

Lori Cohen Scher, Ph.D. | *Senior Assistant Dean for University Life* | *lcohen@gmu.edu*

GRAND CHALLENGE INITIATIVE

Mixer

Mixer ends at 1:00 p.m.