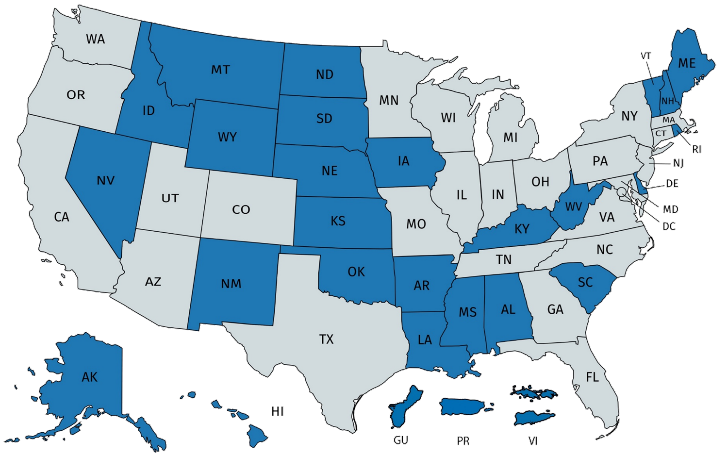
EPSCoR Jurisdiction Research Programs

aligned with

Ames Research Center Priorities

"NASA EPSCoR Virtual Research Discussions with SSC" Virtual Meeting held on June 22, 2023, from 1:00-2:30 p.m. EDT



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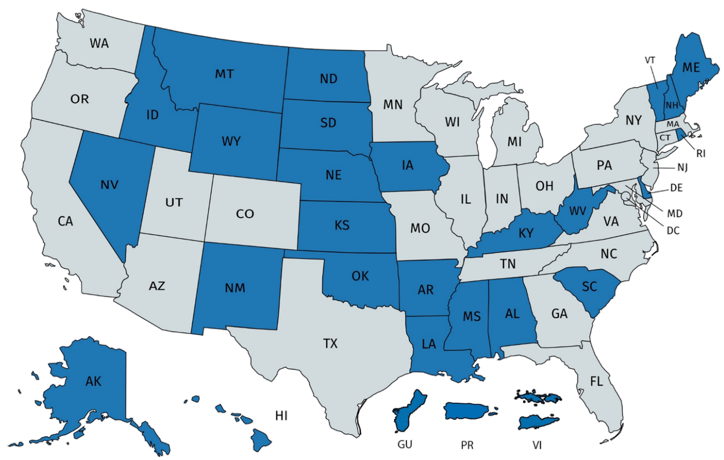
Ames Research Center Priorities

Full Researcher Booklet

https://lanasaepscor.lsu.edu/wp-content/uploads/2023/06/EPSCoR-ARC2023Researchers-v20230608.pdf

Introduction to Ames Research Center

Harry Partridge



NASA Centers

Ames Today

Occupants (FY23)

~1,300 civil servants; ~1,900 on-site contractors
~5,800 NRP workforce
~700 students (OSTEM, Pathway, NRP (CMU) & Chabot SCC)

Real Property

~1,900 acres; 400 acres security perimeter
5M building ft^2
Airfield with ~9,000 and 8,000 ft. runways

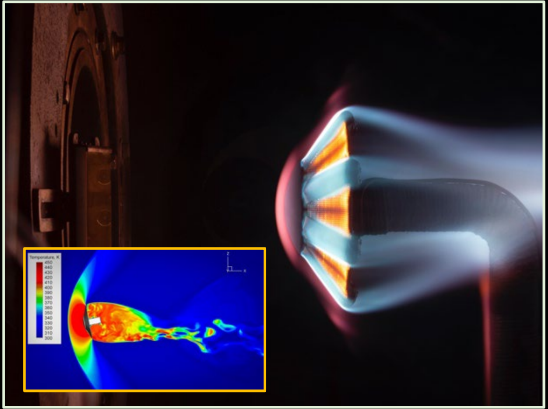
Budget (FY23)

~$1B (includes reimbursable/EUL)

Core Competencies

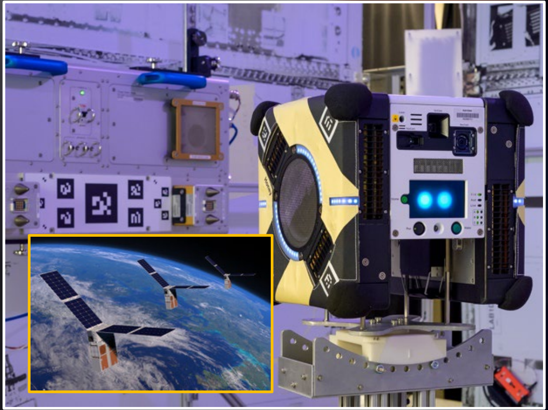
Air Traffic Management

Entry Systems

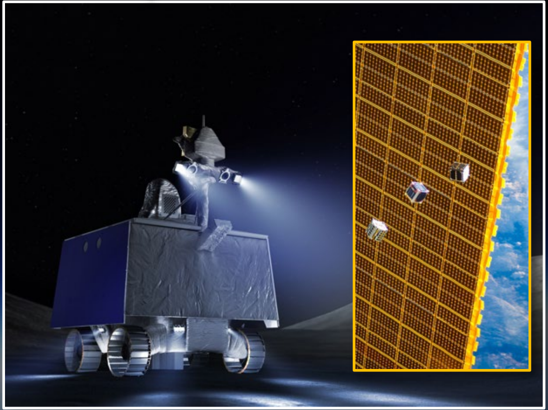


Advanced Computing & IT

Intelligent / Adaptive Systems



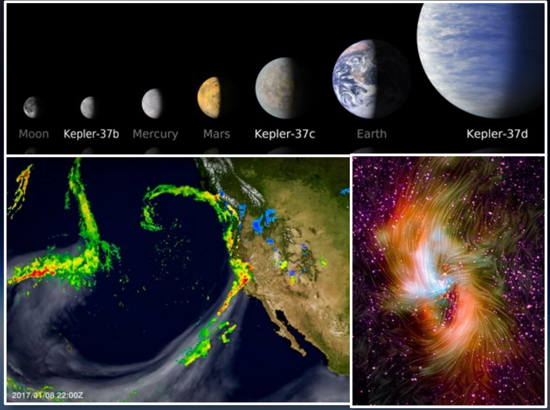
Cost-Effective Space Missions



Aerosciences

Astrobiology & Life Science

Space & Earth Sciences



A Brief Summary of the NASA EPSCoR Program

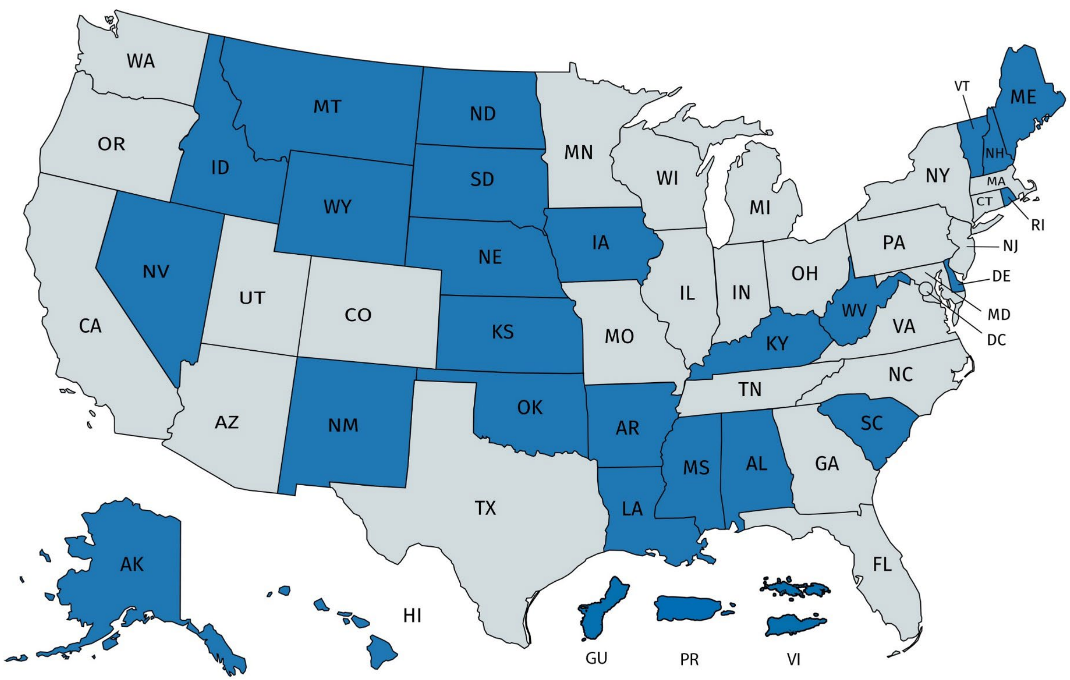
T. Gregory Guzik, Chair and Director
NASA EPSCoR Caucus, Louisiana NASA EPSCoR & Space Grant
Department of Physics & Astronomy
Louisiana State University, tgguzik@lsu.edu

EPSCoR was established in 1988

- Congress formally established the "*Experimental Program to Stimulate Competitive Research (EPSCoR*)" in 1988 in order to help address a major discrepancy in the distribution of competitive research awards.
- Eligible jurisdictions receive less than 0.75% of the total NSF Research and Related Activities budget.
- The 28 EPSCoR states receive just 13.6 percent of all NSF research funds. A larger portion – 15% – went to just eight of the nation's research universities.
- The 1988 statute stipulated that the program was to increase research and infrastructure capacity, thereby improving the ability of institutions in EPSCoR states to compete for non-set-aside federal R&D funding.
- Participating states were required to demonstrate a commitment to the program by establishing science and technology governing committees to ensure NSF funding was sensitive to the state's overall strategy for research. Congress also required significant cost sharing between states and the federal government.
- In 2017 (P.L. 114-329) the program was reaffirmed and renamed to the "*Established Program to Stimulate Competitive Research.*"

EPSCoR Jurisdictions and Agencies

- Jurisdictions are currently eligible if their most recent 5-year funding level of NSF research support is equal to or less than 0.75% of the total NSF Research and Related Activities budget. This amount excludes EPSCoR funding from the count.



NASA EPSCoR was established in 1992

- Established in 1992 (P.L. 102-588) to enable jurisdictions to develop an academic research enterprise directed toward capability in aerospace and aerospace-related research and to contribute, in turn, to the jurisdiction's economic viability.
- Management function at NASA assigned to Office of Education (now Office of STEM Engagement).
- Established linkage between National Space Grant College & Fellowship Program and the NASA EPSCoR program.
  - Some similar research and workforce development goals
  - Require jurisdiction Space Grant Director to also be PI on all NASA EPSCoR projects
- The National NASA EPSCoR Caucus was organized by the jurisdiction Directors in 2012 to create an effective network of persons and institutions to support the NASA EPSCoR program.
  - The Caucus took the initiative to organize and conduct this meeting

NASA EPSCoR Objectives

- Contribute to and **promote the development of research capability in NASA EPSCoR jurisdictions** in areas of strategic importance to the NASA mission.
- Improve the capabilities of the NASA EPSCoR jurisdictions, including minority serving institutions, to **gain support from sources outside the NASA EPSCoR** program.
- **Develop partnerships** among NASA research assets, academic institutions, other agencies, and industry.
- Contribute to the overall **research infrastructure, science and technology capabilities of higher education, research faculty diversity, and economic development of the jurisdiction.**

NASA EPSCoR Program Opportunities

Research Infrastructure Development (RID): This “base” funding is awarded to all jurisdictions. Used for jurisdiction management, travel support for jurisdiction researchers to NASA centers, seed money research projects.

Research Implementation: Three-year research project support, focused on a major NASA interest area, and addressing jurisdiction needs.

ISS Flight Opportunity: Awarded only to Science-Is who have developed an instrument under NASA EPSCoR research that could be tested on the ISS. Funds only for travel and review support. No instrument development.

Suborbital Flight Opportunity: Open to all researchers in a jurisdiction to develop and fly a NASA relevant payload on a suborbital balloon, sounding rocket, aircraft, or reusable rocket vehicle.

Rapid Response Research (R3): In third year of implementation. More focused on specific tasks identified at the NASA centers or mission directorates rather than innovative research in a general area of interest. Offers an opportunity for developing a close working relationship with NASA researchers.

NSF RII Track-4:@NASA: Joint NSF / NASA EPSCoR focuses on faculty from institutions with high enrollments of students from underrepresented populations in STEM to collaborate with researchers at the NASA research centers.

NASA EPSCoR Program Opportunities

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NASA EPSCoR Components

01

Research

3 years
$750,000
Matching funds

02

Research Infrastructure Development (RID)

5 years
$1,000,000
Matching funds

03

International Space Station

3 years, $100,000

Suborbital

3 years, $250,000

04

Rapid Response Research (R3)

1 year
$100,000

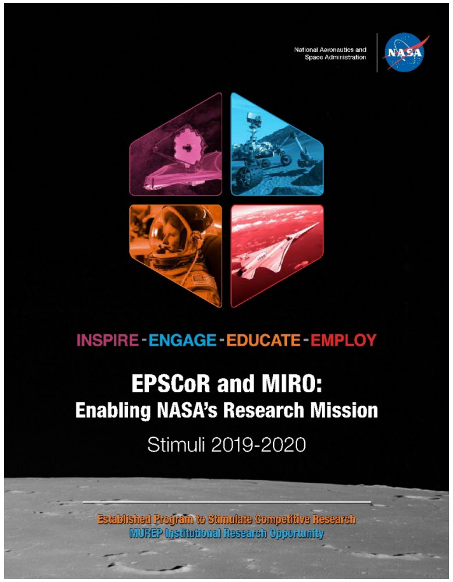
05

NSF RII – Track 4 @NASA

2 years:
NSF $3,000,000
10 awards

NASA EPSCoR research examples

- The NASA EPSCoR Stimuli document provides success stories that illustrate how state interests meet NASA interests. See file “Example NASA EPSCoR Research Projects 2020.pdf” and link below to the complete listings for 2017 through 2020.
  - https://www.nasa.gov/stem/epscor/home/EPSCoR_Stimuli.html



Diversity and Inclusion

- **NASA EPSCoR Opportunities are open to ALL institutions in each jurisdiction**
  - Includes HBCU, Tribal Colleges, Community Colleges, and other MSI
  - There are more that 859 MSI in the EPSCoR states
- **NASA EPSCoR focus is on research infrastructure development in jurisdictions that are NOT heavily funded by federal agencies**
  - MSIs in such jurisdictions are resource poor and usually can not develop independent research programs without assistance
- **NASA EPSCoR is a federal / state partnership program and, consequently, jurisdiction as well as NASA needs must be addressed**
  - For most jurisdictions improving diversity in research and economic development is a priority
- **Some jurisdictions have implemented programs to encourage majority / minority collaborations within the state as part of the evaluation of pre-proposal for limited submission NASA EPSCoR opportunities**

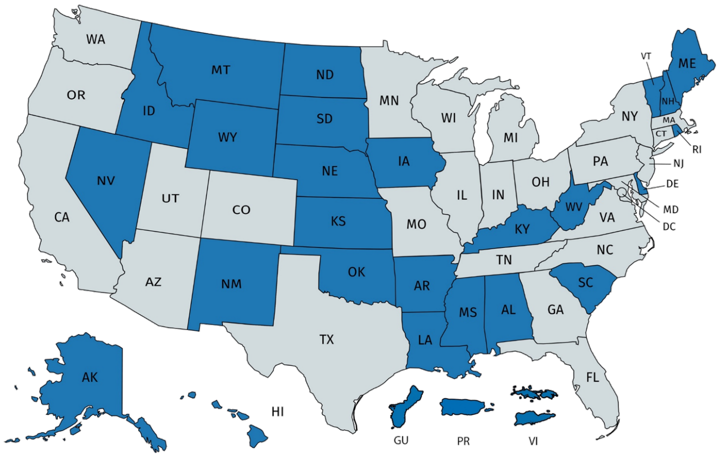
NASA EPSCoR is focused on research

- **NASA EPSCoR is a higher education program focused on aerospace research**
  - Relevant to research and technology development in all NASA Mission Directorates and at all NASA Centers
  - Graduate student training useful for research infrastructure development but is not the primary goal of the program
- **Primary goal of NASA EPSCoR is to develop infrastructure for aerospace research in jurisdictions**
  - Institutions in EPSCoR jurisdictions are an under-utilized resource for NASA to advance science and technology development
  - For 2021-2022 there are more than 230 different NASA EPSCoR research projects across 28 jurisdictions
- **Later in this meeting jurisdiction researchers will provide "flash" presentations on research interest / capabilities directly relevant to Ames Research Center priorities**
  - These sample the 51 EPSCoR jurisdiction researchers who have submitted a brief bio and capability statement
- **Plan is for jurisdiction researchers who have already expressed interest in Ames projects to hold another virtual meeting next month (7/13) to explore possible collaborative efforts**
- **Jurisdiction Directors will then support researcher travel to Ames, as appropriate, for face-to-face talks**

Part 1

Topics:

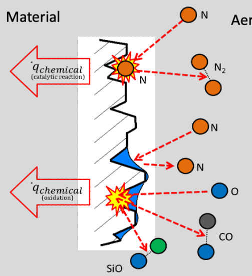
1. Entry Systems
2. Advanced Computing and IT systems
3. Aerosciences and Airborne Science



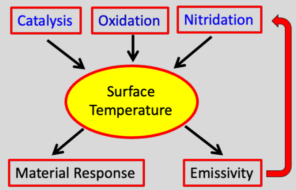
Quantitative Measurement of Gas-Surface Reaction Rates for Planetary Entry

Motivation

Material responds and surface evolves, changing the boundary condition



SiC gas/surface interactions



Material response feedback

Planetary entry on ballistic trajectory causes detached shock that creates a high temperature plasma – typically resolve with carbon based ablator

Hypersonic flight in earth atmosphere requires stable and sharp leading edges to minimize drag – high heat fluxes for non-ablators and transpirants

Our Research

Tools

- 30 kW ICP Torch Facility
- Nanosecond laser system
- Multi-component plasmas

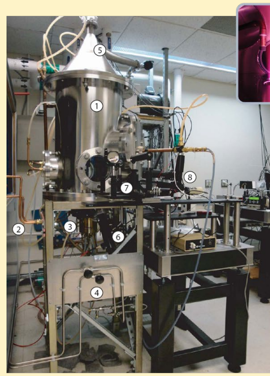
Applications

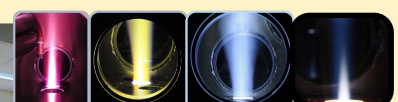
- Material screening
- Targeted reaction rates
- Material response characterization

Outcomes

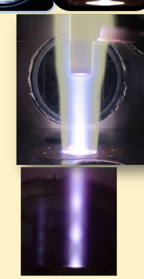
- Reaction rates
- Uncertainty estimates
- Improved material knowledge

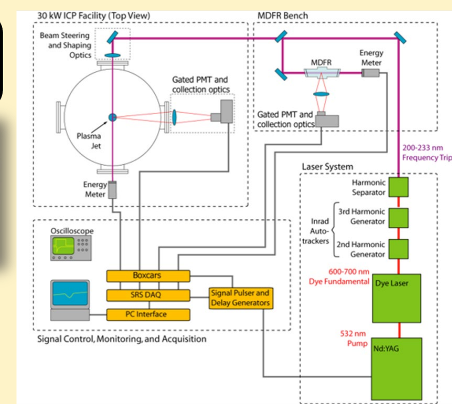
Experimentation

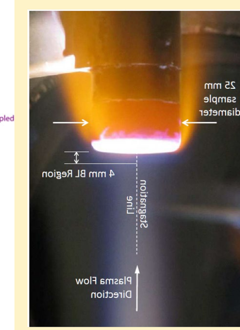




(1) Test chamber **(2)** Water cooled leads to coil from 30 kW RF power supply **(3)** Injector block with coil and quartz tube **(4)** Gas injector controls **(5)** Heat exchanger and vacuum system **(6)** 2-color pyrometer **(7)** Emission collection optics **(8)** TALIF collection optics Flow reactor optical table at rear right.







PLASMA TEST & DIAGNOSTICS LABORATORY

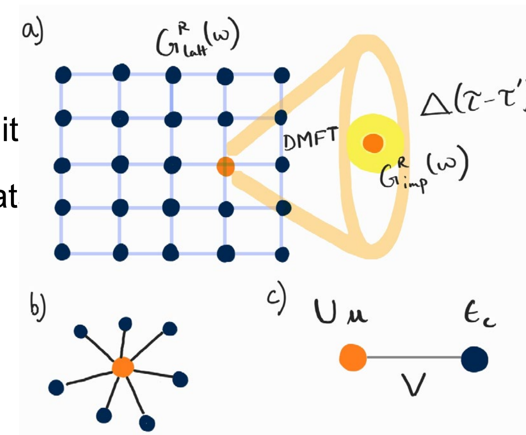
Dr. Douglas G. Fletcher

Unleashing the potential of quantum algorithms for the simulation of correlated quantum materials

LSU
Department of Physics & Astronomy

Importance of Materials Design for Extreme Environments

- Designing materials and their mechanical structures for energy storage, propulsion, and space and planetary environments is critical for NASA mission



Limitations of current modeling

- Very small system sizes, often not representing the physical thermodynamic limit
- Quantum machine learning is being used for classical data not truly quantum dat

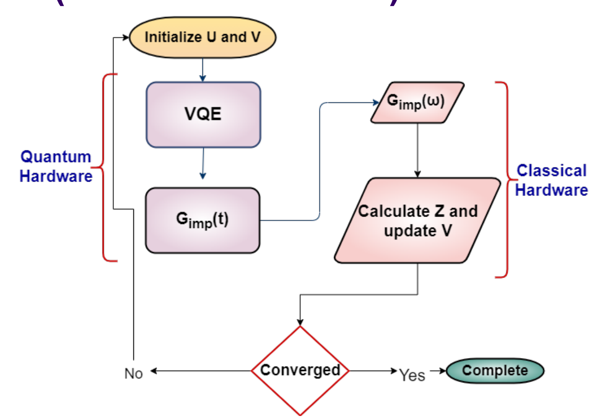
Our Proposal:

1. Studying the thermodynamic limit instead of a very small finite size

- Dynamical Mean Field Theory and Dynamical Cluster Approximation.
- Finding the Ground State by variational quantum eigensolver,
  Trotter propagation or variational quantum eigensolver for finding excited states and Green functions.

2. Utilizing Quantum Machine Learning approaches on Quantum Data (not classical data)

- Creating a Quantum Materials database for **TRULY** quantum data, that is the wavefunctions itself. (in term of variational wavefunctions or related ones).
- Demonstrate capability of detecting important physical quantities, such as transport and phase transitions.

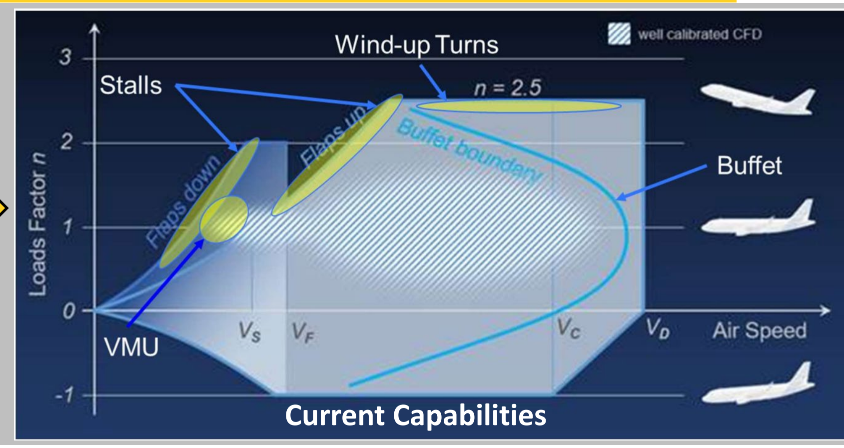


Dynamic Adaptive Mesh Refinement for Wall Modeled LES of Complex Aero-Configurations

Motivation

Aircraft Certification

Analysis



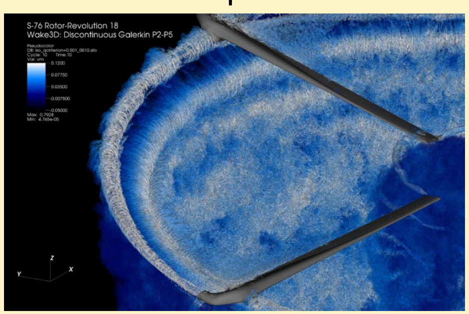
Our Research

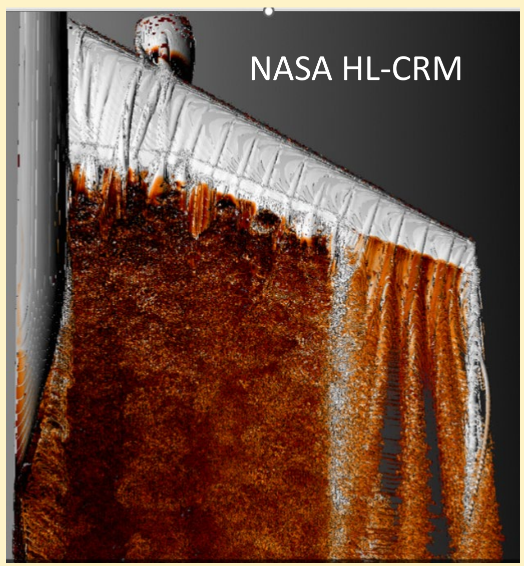
Tools
- High-fidelity CFD framework
- Heterogeneous computing

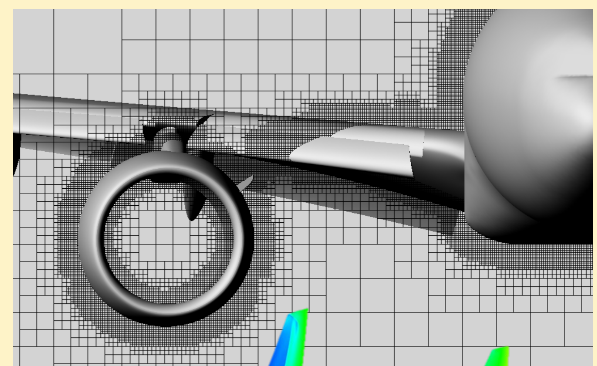
Applications
- Fixed-wind aircraft
- Rotorcraft
- Real gas hypersonics

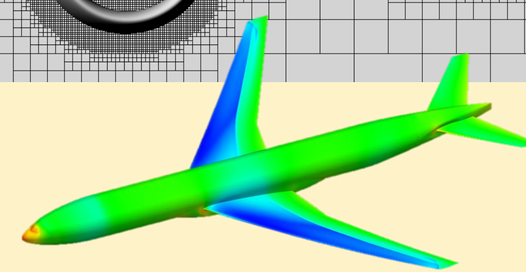
Outcomes
- More accurate predictions
- Faster time to solution
- Better aircraft designs

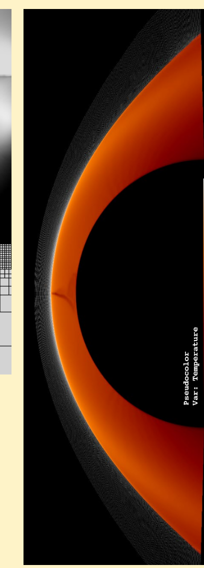
Sikorsky S-76
Helicopter Rotor











School of Computing

Dr. Andrew Kirby

UW

Aerosciences and Airborne Science: Machine Learning and deep learning models for hyperspectral unmixing of waterbodies

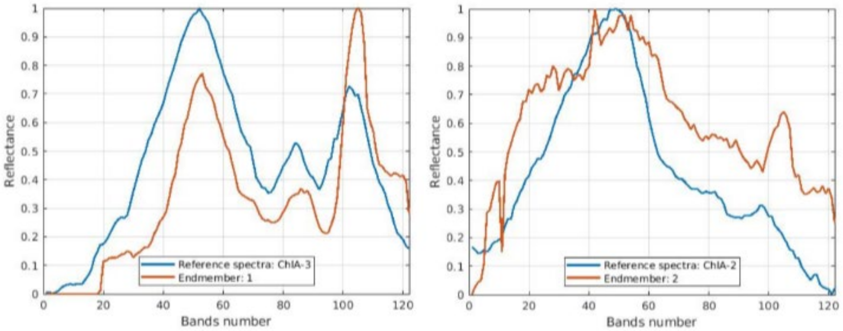
ARC research / development priority: Airborne Science for examining our own world & beyond from the sky, including air quality, smoke observations and modeling, coral reefs, coastal aquatic quality, ocean carbon, and current observations and modeling

Anticipated ARC focused research / development project

- Development of deep learning autoencoder architecture for spectral unmixing of water constituent spectra from airborne hyperspectral / multispectral images
- Development of ensemble machine learning models for unsupervised labeling of pixels in airborne images from unlabeled airborne image data
- Improving detection /prediction of coral reefs using physics informed machine learning with uncertainty quantization from airborne images
- Sparse dictionary learning and graph embeddings by sensor image data fusion from airborne hyperspectral / multispectral images for improved water quality assessment

Research capability

- Physics informed machine learning models with uncertainty quantization to improve predictions from multidimensional and noisy datasets
- Novel methods such as optimal transport for improving anomaly detection using autoencoders and generative adversarial networks
- Bio-inspired learning approaches such as reinforcement learning, and transfer learning to improve performance of deep learning architectures in classification and prediction, and their application to airborne science



Blind deconvolution non-symmetric autoencoder extraction of endmembers spectra from Lake Erie hyperspectral image

LARSIP
Laboratory for Applied Remote Sensing Imaging and Photonics

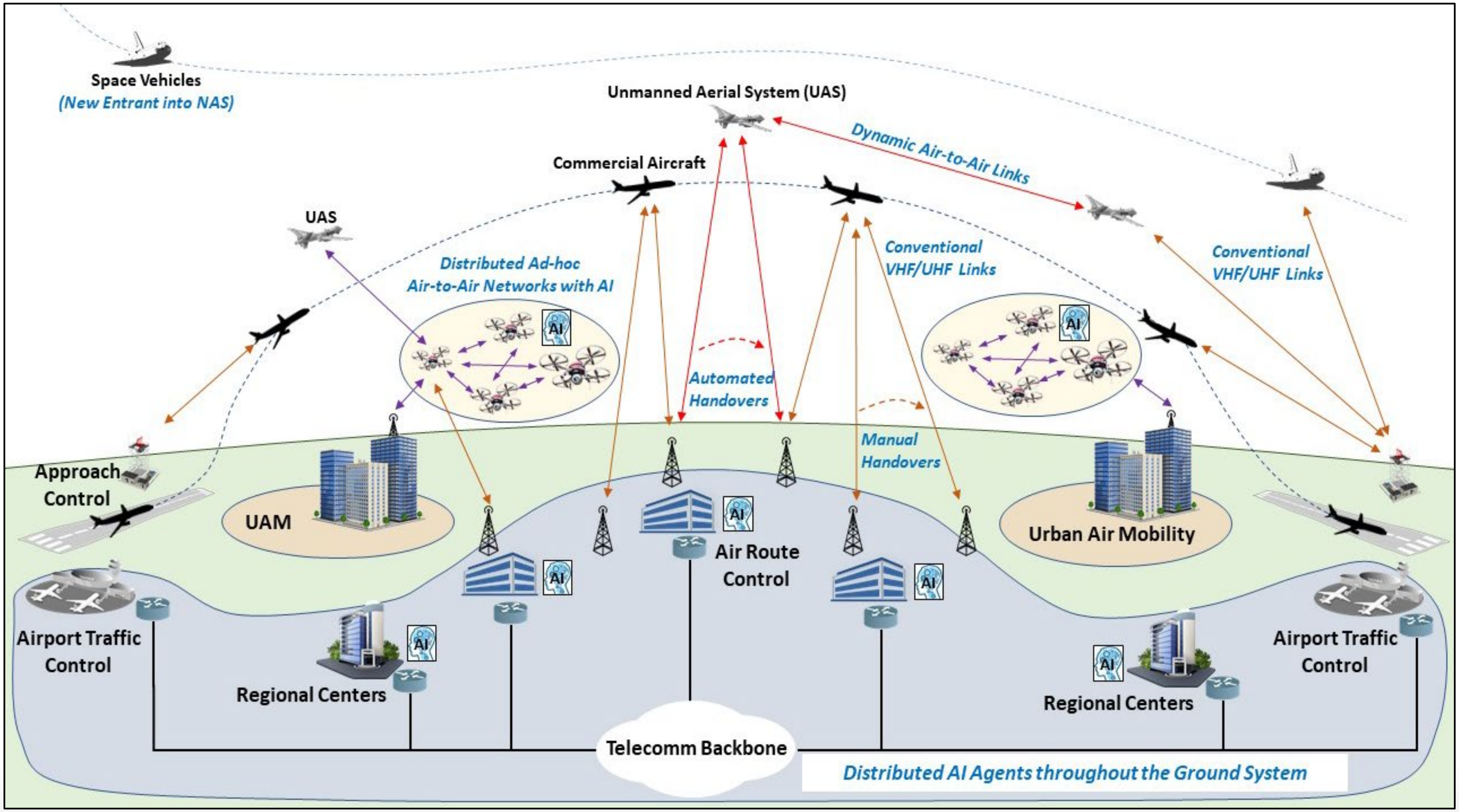
https://uprm.edu/aiig

Dr. Vidya Manian

Department of Electrical & Computer Engineering
University of Puerto Rico, Mayaguez

AI-enabled Joint Air Traffic and Aviation Spectrum Management

Dr. Hongxiang Li, Electrical and Computer Engineering

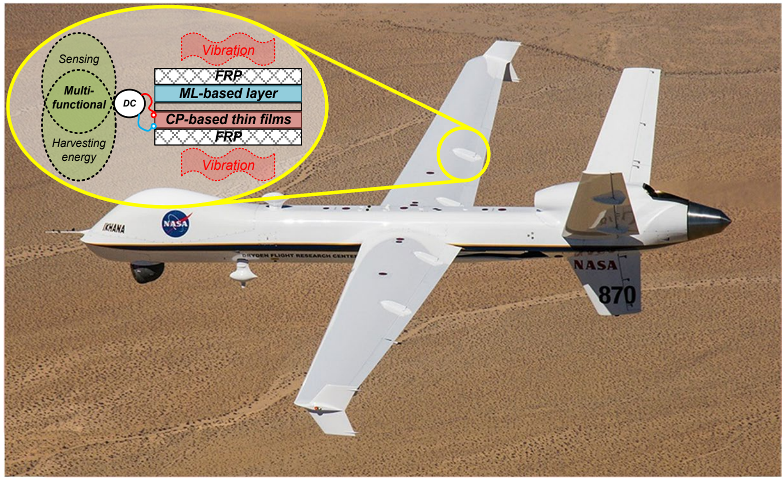


The objective is to ensure safe and efficient air operations by jointly maximizing the national air space and aviation spectrum utilization efficiency.

Lab for Smart Materials and Structures
LaSMaS

PI: Donghyeon Ryu, Ph.D., P.E.

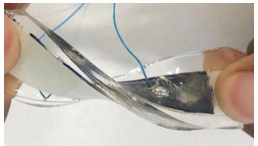
1. Target ARC research/development priority: **3.d. Unmanned Aerial Systems**
   a. Autonomous structural composites (AutoCom) can be used to encode self-powered sensing in fiber reinforced polymer (FRP) structural composites.
   b. AutoCom can be a solution to build next generation UAS that is self-sustainable by generating electricity via mechanical-radiant-electrical (MRE) energy conversion of mechano-luminescence-optoelectronic (MLO) composites.
2. Key aspects of the anticipated ARC focused research/development project:
   a. Novel design of MLO to generate direct current (DC) using mechanical vibration.
   b. DC varies with strain (i.e., DC-based strain sensing) and can be an energy source.
   c. Strain (via self-powered sensing)-based global structural health monitoring approach is used for detecting damage in UAS.
3. Research capabilities of the researcher:
   a. Multi-physics and multi-scale design of novel materials and composites
   b. Advanced sensor technologies for anthropogenic and biological structural
   c. Materials processing and functionalizations



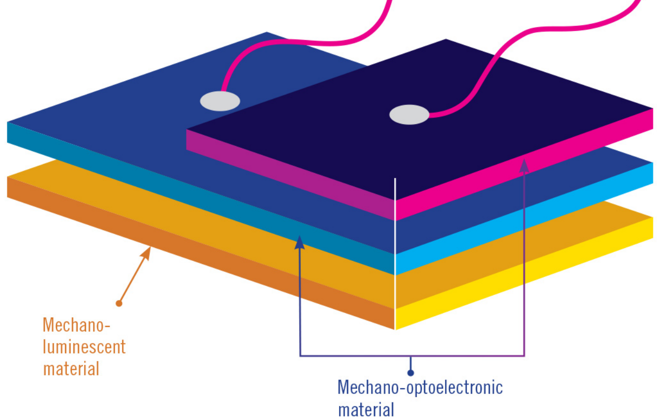
AutoCom-UAS capable of autonomous damage detection and mechanical-radiant-electrical energy harvesting

The layers of a strain-sensing material

A mechano-luminescent-optoelectronic, MLO, composite combines a mechano-luminescent material, which glows under strain, with a mechano-optoelectronic material, which generates current when exposed to light.



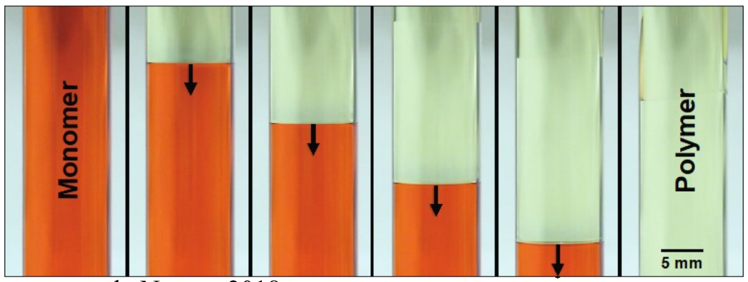
Source: "Glowing under strain," *Aerospace America,* March, 2019



Manufacturing Thermoset Polymer and Polymer Composites via Frontal Polymerization

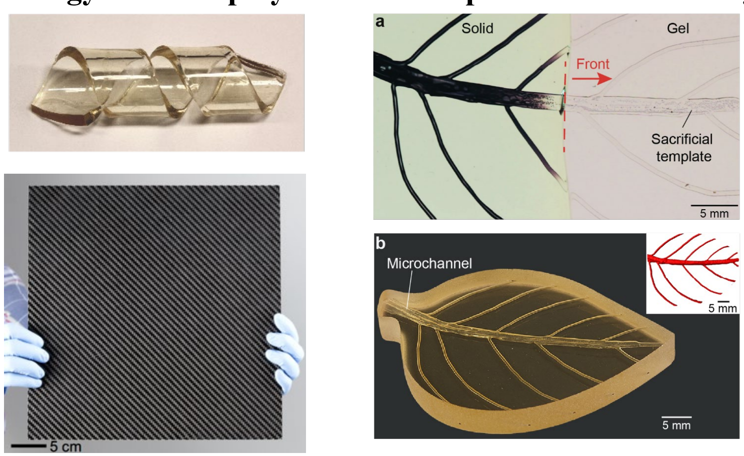
- ARC Research priority: Aerosciences and Airborne Science; novel approaches for composite materials manufacturing to advance urban air mobility
- Energy efficient: self-propagating reaction front driven by exothermic heat

Self-propagating polymerization front for fast curing



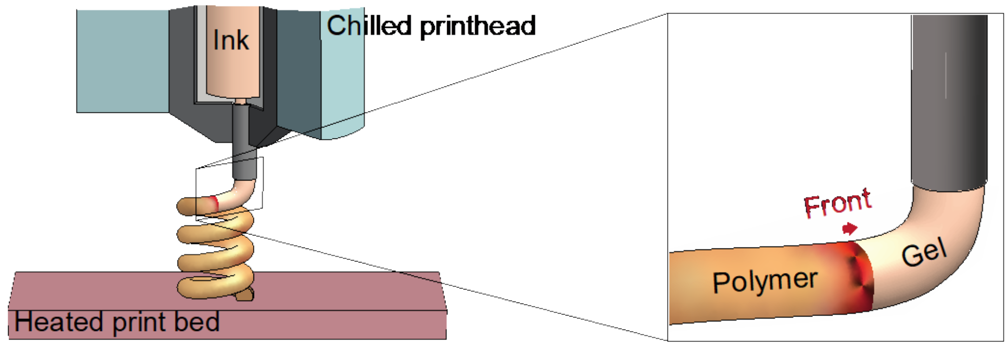
Robertson et al., Nature, 2018

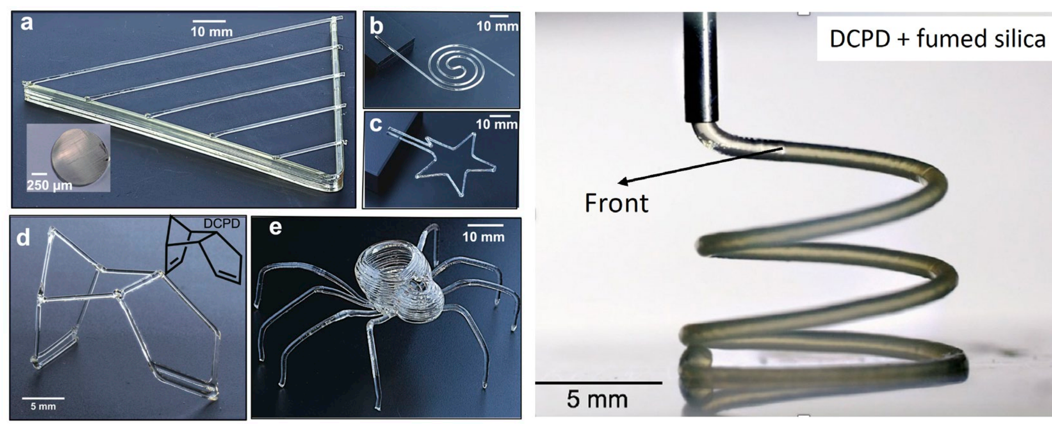
Energy-efficient polymer and composite manufacturing



Garg et al., Nature Communications, 2021

3D printing application



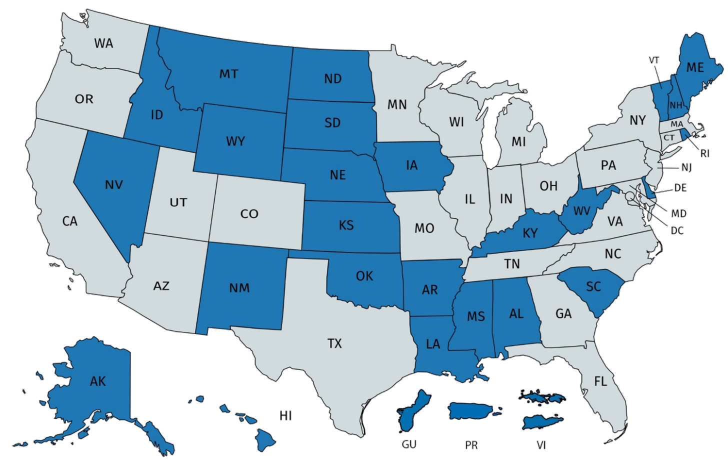


Aw et al., Advanced Materials Technologies, 2022

Part 1
Q&A

Topics:

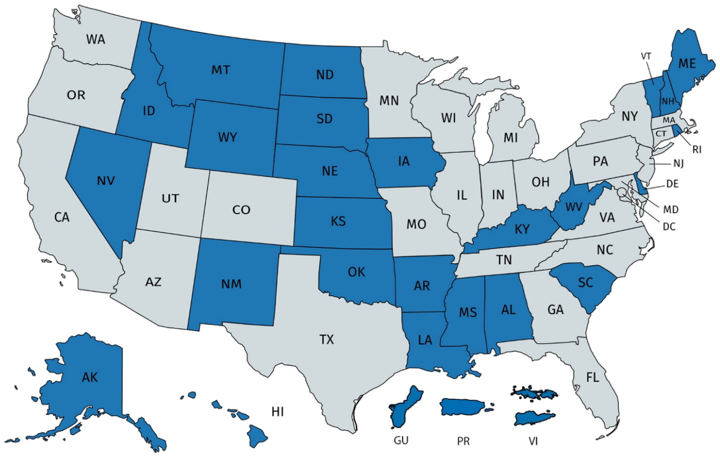
1. **Entry Systems**
2. **Advanced Computing and IT systems**
3. **Aerosciences and Airborne Science**



Part 2

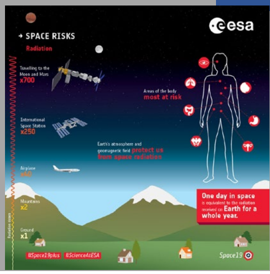
Topics:

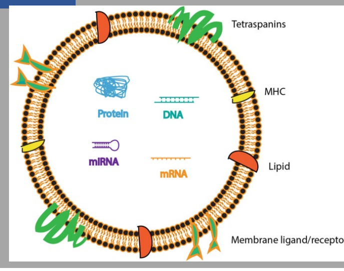
4. Astrobiology and Life Science
5. Cost-Effective Space Missions
6. Intelligent/Adaptive Systems
7. Space and Earth Science
8. Exoplanets



Advancements in Gene Sampling Technology: Unveiling Transcriptomic and Proteomic Biomarkers of Ionizing Radiation Exposure through Exosomal Liquid Biopsy

Motivation





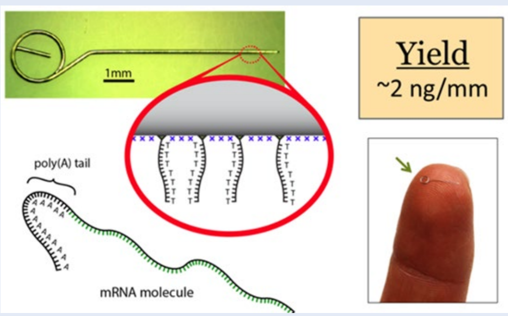
Inspiration

- Biological countermeasures
- Liquid biopsy
- Monitoring astronaut health

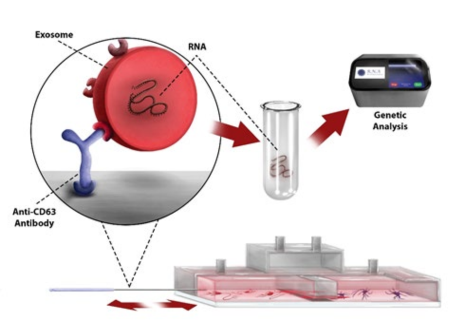
- Mitigation of radiation exposure
- Biomarkers discovery

Gene Sampling Tool

RNA purification



Exosomes purification



Our Research

Tools

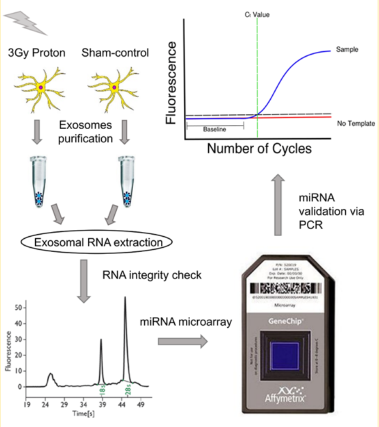
- Gene Sampling Tool for purification, genomic, and proteomics analysis of exosome
- Mass spectrometry proteomic analysis of exosomes

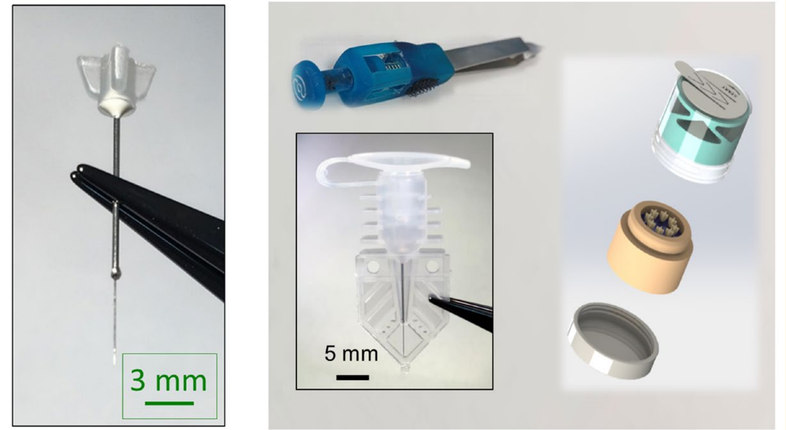
Applications

- Biomarkers discovery
- Non invasive assessment of astronaut health

Outcomes

- Rapid genotyping of exosomal biomarkers
- Integration with a microfluidics platform for sample-in/results-out





The Applied Genomics and Biotechnology Lab

Dr. Gergana G. Nestorova

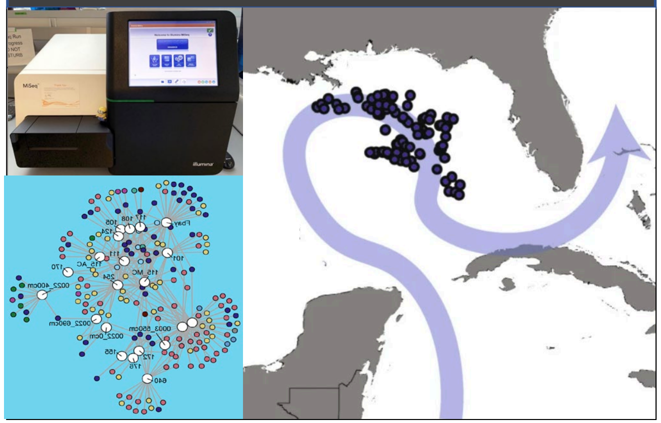
IfM

Biogeography and ecophysiology of extremophiles in the deep biosphere

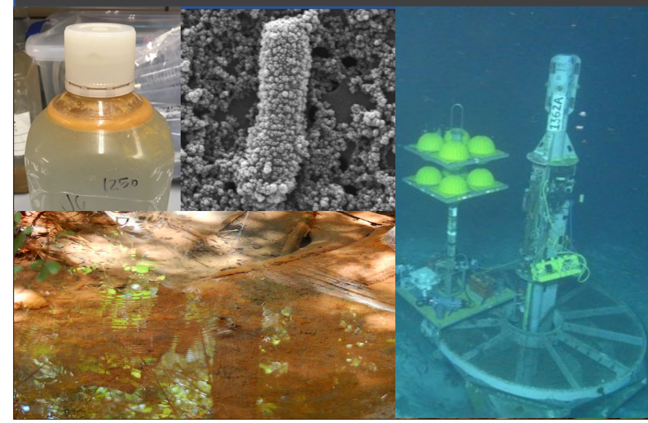
Idaho State University

Dr. Anirban Chakraborty

Microbial biogeography



Ecophysiology of extremophiles



Central Questions:

- How does the microbial ecology of the deep biosphere inform the habitability of life in other planets?
- How do biogeography and dispersal impact the subsurface microbial life?
- What physiological and metabolic traits are crucial for subsurface extremophiles to thrive in their natural habitats?

Habitats of interest

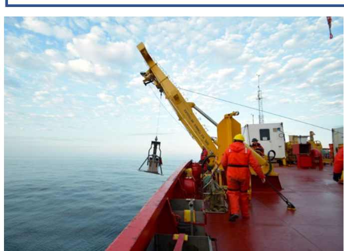
- Deep ocean hydrocarbon seeps
- Oceanic crustal biosphere
- Marine hydrothermal vents
- Deep groundwater systems

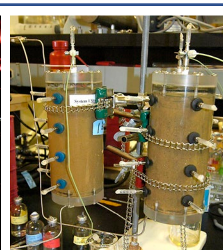
Tools

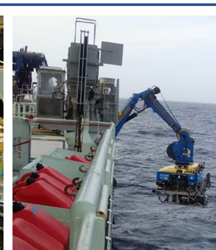
- Field sampling
- Cultivation of extremophiles
- Biogeochemical assays
- Molecular and –omic analyses

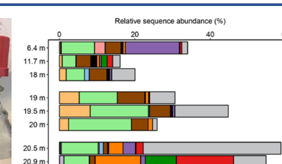
Outcomes

- Exploring novel physiology
- Discovering diverse microbes
- Genomic sequence data







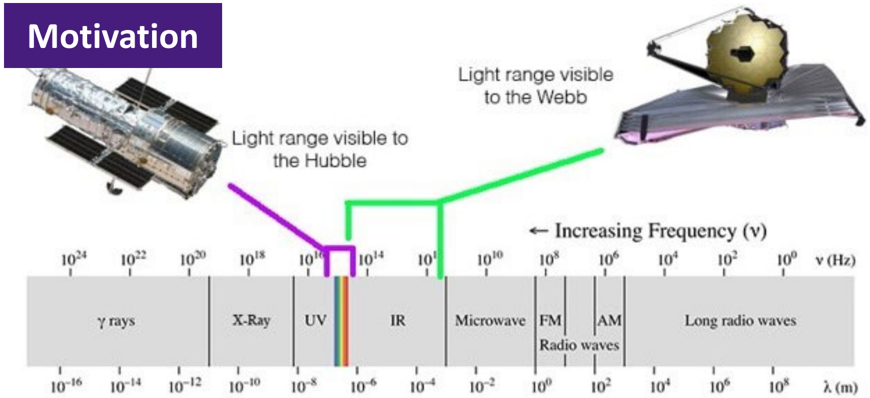


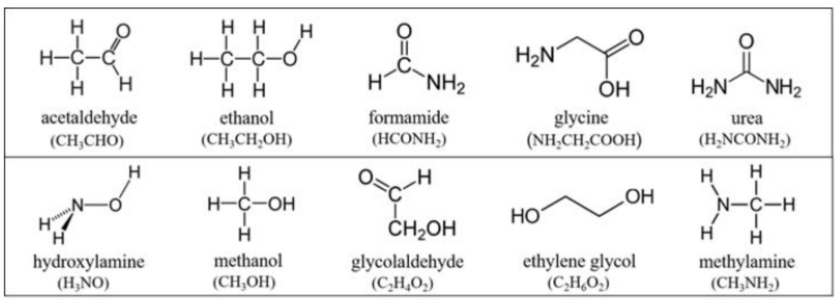
ROAR

Identification of Prebiotic Molecules and Exploration of Astrochemistry through High-Resolution Laser Spectroscopy

UNIVERSITY OF LOUISVILLE

Motivation



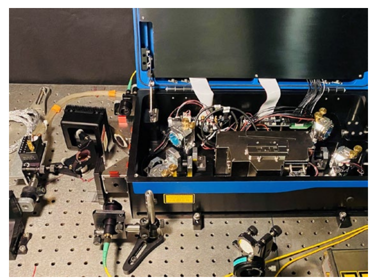


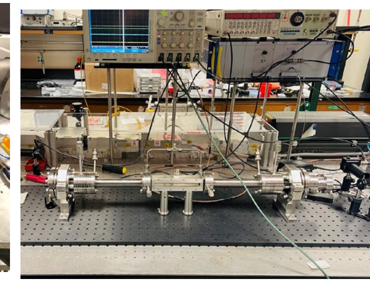
Resources

- Narrow-linewidth, widely tunable lasers covering mid-IR to UV.
- Flow cells.
- Vacuum chambers and molecular-beam sources.
- Laser-spectroscopic apparatuses.

Techniques

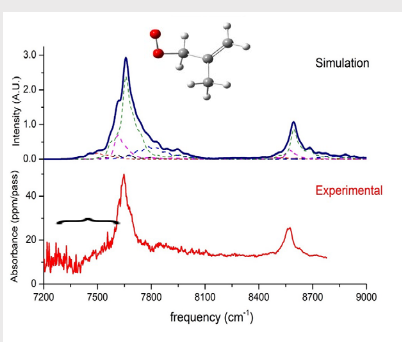
- Laser-induced fluorescence/dispersed fluorescence (LIF/DF).
- Cavity ring-down (CRD) spectroscopy.
- Doppler-free saturation absorption spectroscopy.
- Two-photon spectroscopy techniques.



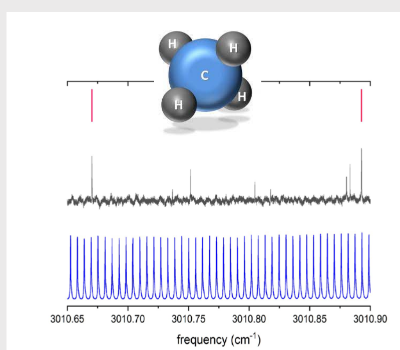


Outcomes

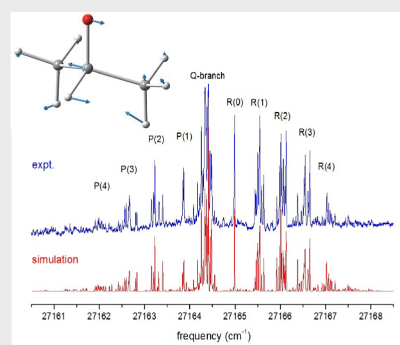
Detection and identification of reaction Intermediates

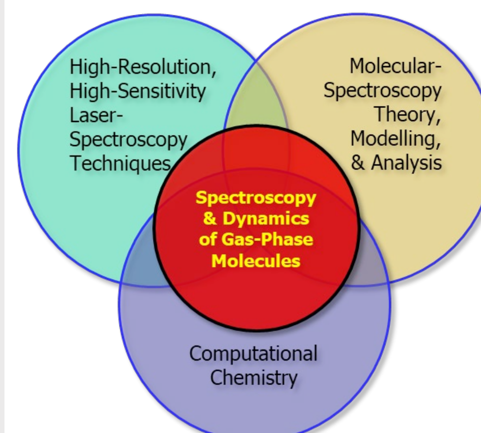


High-resolution high precision spectra of gas-phase molecules



Simulating and understanding experimental spectra



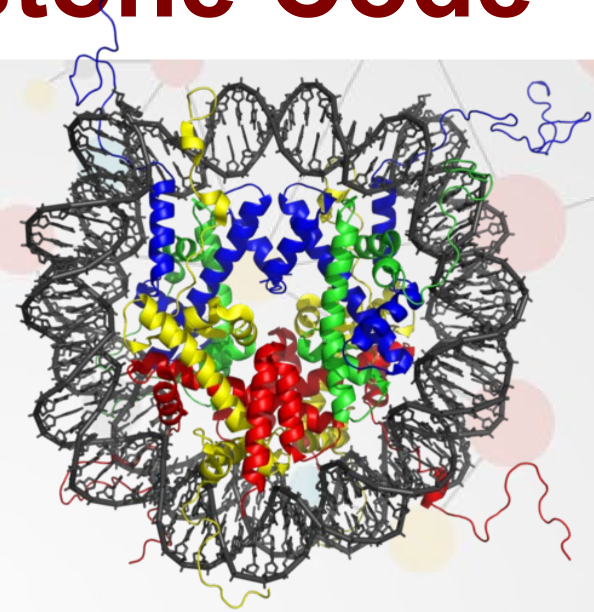


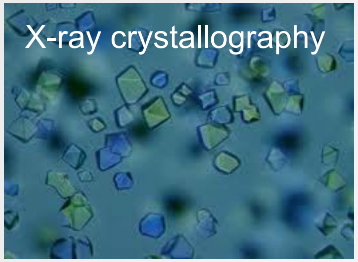
The Glass Laboratory

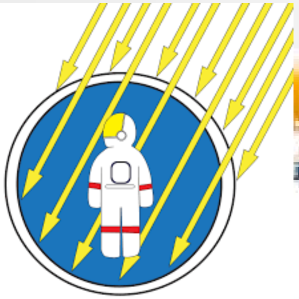
Cracking the Histone Code

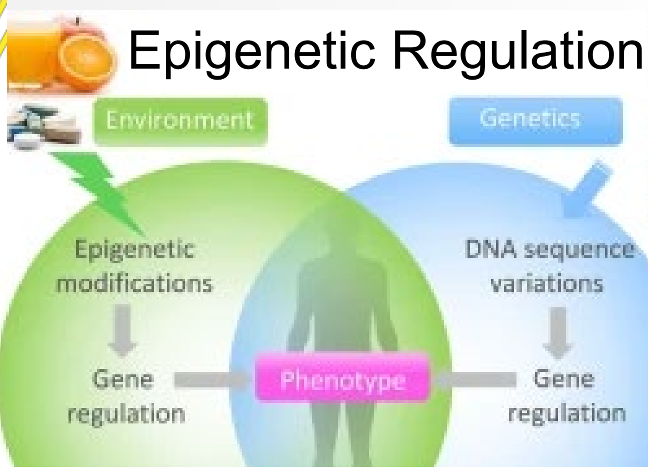
- Department of Pharmacology

Histone modifications form a complex molecular language









How does SP100-C recognize histone modifications?

Connect DNA damage response to inflammation/apoptosis via CARD

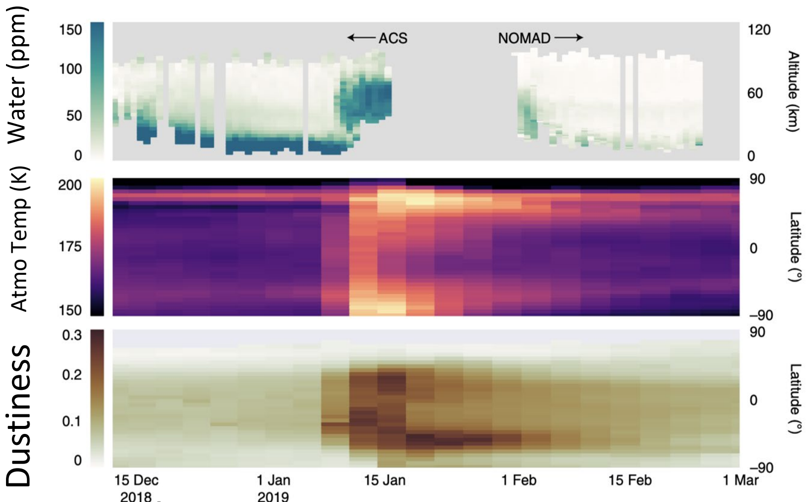
Develop therapeutics to extend space travel

NASA VTSGC

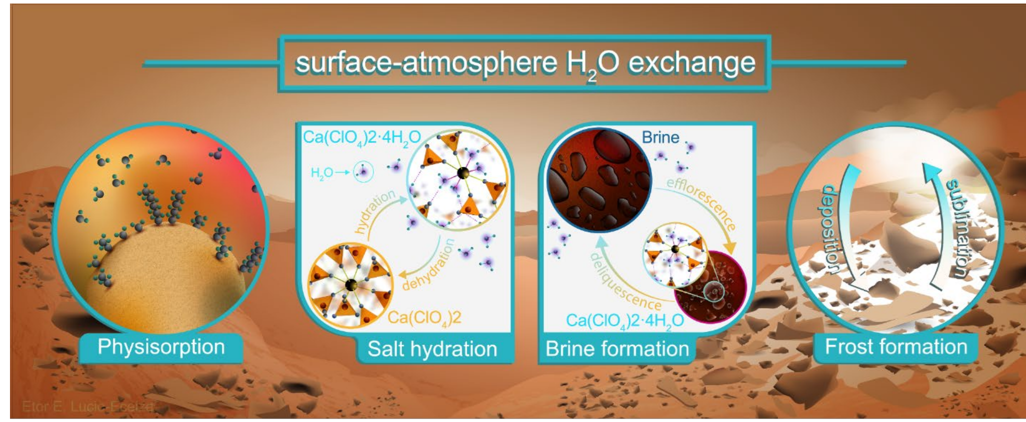
The University of Vermont LARNER COLLEGE OF MEDICINE

Boundary layer processes profoundly impact the martian environment.

Dust enhances water loss.

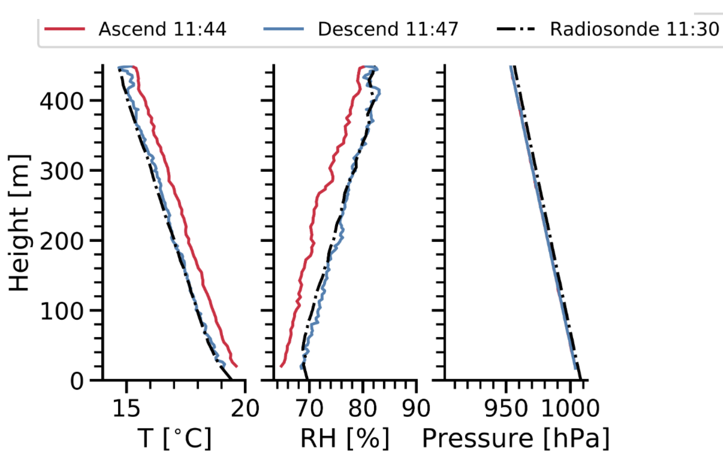


Atmo-surf water exchange de/stabilizes ice.

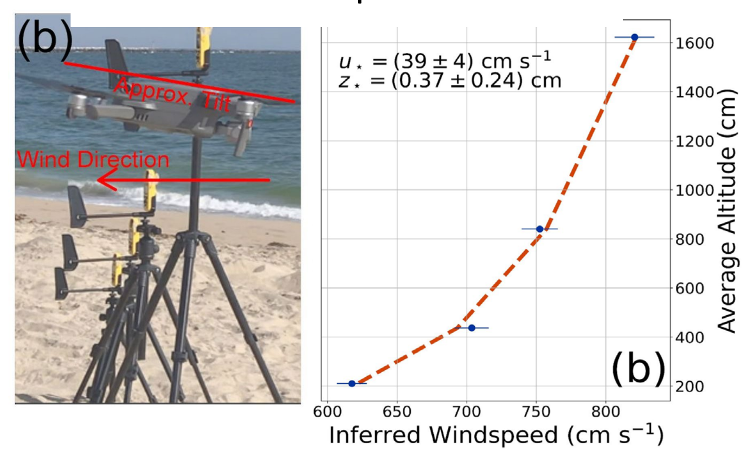


Drone-borne measurements can revolutionize boundary layer science.

Drones can profile near-surface water.



Drones can also profile wind.



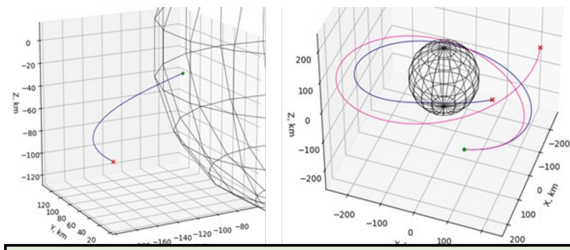
Prof. Brian Jackson - bjackson@boisestate.edu

BOISE STATE UNIVERSITY

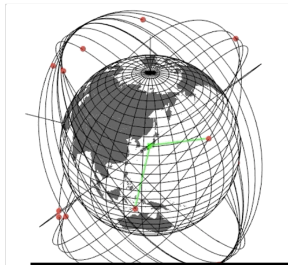
Space Systems Operations Research and Next Generation Space Systems

Mission Design and Operations

- Autonomous operations under uncertainty
- Mission design and scheduling
- Network fault detection & resilience



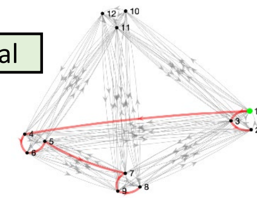
Asteroid exploration using reinforcement learning



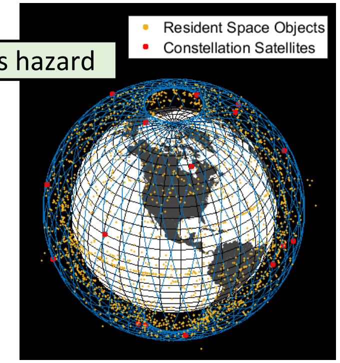
Earth observations

Space Traffic Management & Space Domain Awareness

- Post-mission disposal
- Active debris removal
- Space-based SDA
  - Cislunar space



Active debris removal

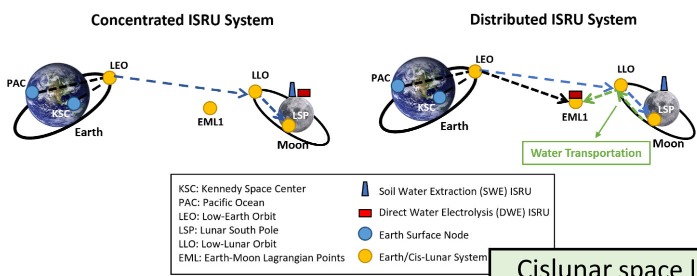


Space debris hazard

Distributed Satellite Systems

On-orbit Servicing & Space Logistics

- *Where do we locate gas stations in space?*
- *In-situ* resource utilization
- Campaign-level mission design & supply chain mng.



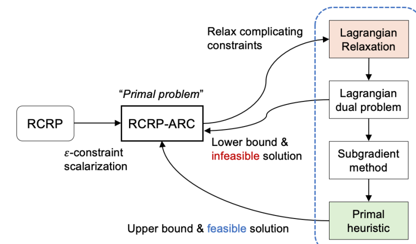
Cislunar space logistics

Operations Research

- ***The science of making "good" decisions.***

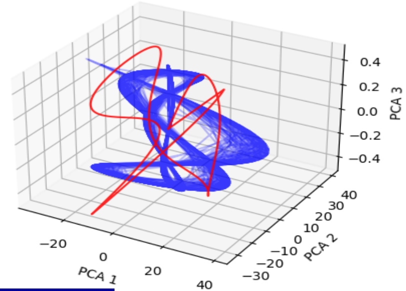
Tools

- Modeling & Simulation
  - Graph-theoretic
  - Network analysis
- Mathematical Optimization
  - NLP, large-scale, decomposition-based
- Artificial intelligence



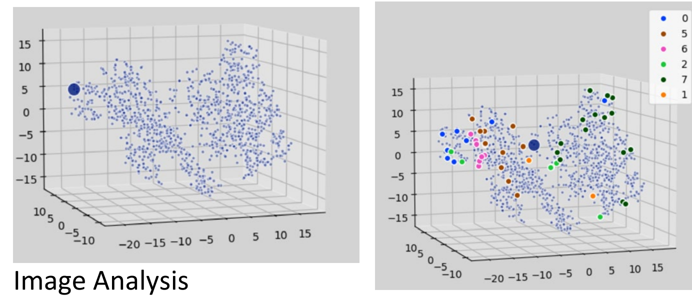
ML for Anomaly/Rare Category Detection – Topic 6: Intelligent/Adaptive Systems

Massive Datasets / Streaming Sensors



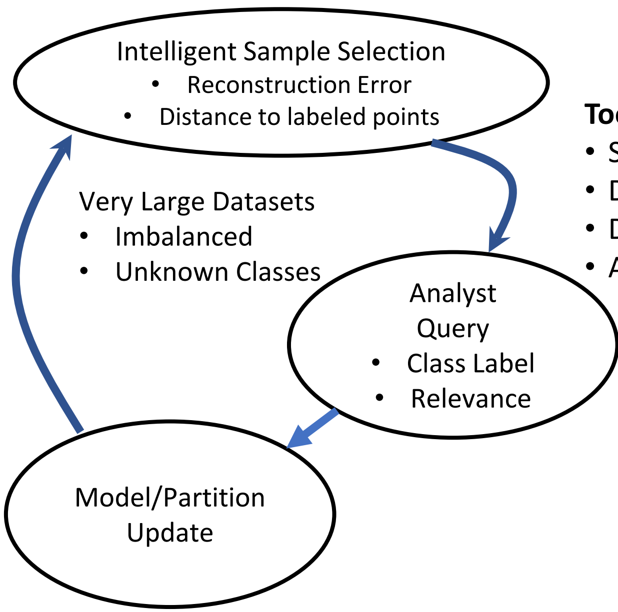
Finding Information Buried in Data/Noise

Tools for Augmenting Human Data Analysis



- Image Analysis
  - Finding Lunar Probes
  - Unusual Geographic Features
- Detecting System Failures
  - Instrument Artifacts
  - Health Monitoring
- Mineral Resource Identification

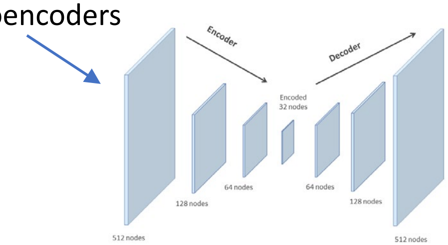
Active Machine Learning Loop



- Unlabeled points used to infer class boundaries
- ***Optimized for new class discovery***

Our Research

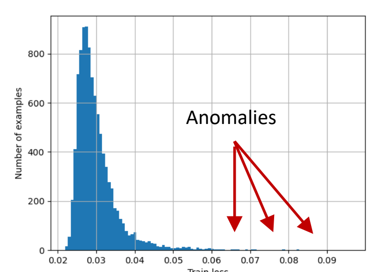
Tools
- Semi-supervised ML
- Dimensionality Reduction
- Deep Neural Networks
- Autoencoders



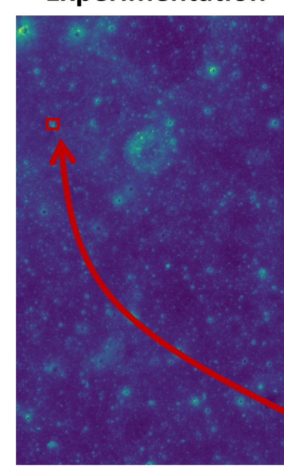
Applications
- Rare category discovery
- System health monitoring
- Failure detection

Outcomes
- 1,000x+ analyst productivity multiplier
- Preventative measure identification
- Proactive decision making

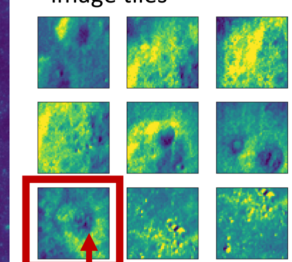
Ranking Anomalies by Reconstruction Loss



Experimentation



Ranger 6 crash autonomously ranked in top 10 out of 9,801 image tiles



Ranger 6 crash site

A / R E D Institute

Anomaly/Relevant Event Detection Institute

Dr. Rohan Loveland

SOUTH DAKOTA MINES
An engineering, science and technology university

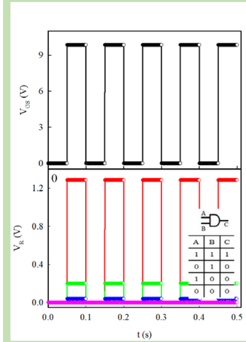
Intelligent/Adaptive Systems: Complementing humans in space: Electro-spun polymer nanofibers for devices and sensors

Motivation

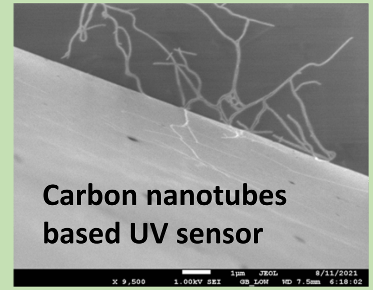
Workforce Training

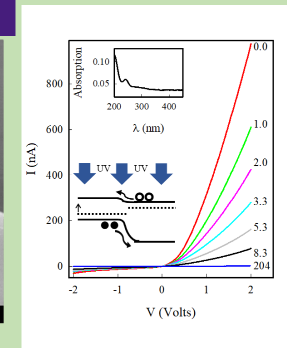
Tight space, Harsh environment

Logic gates



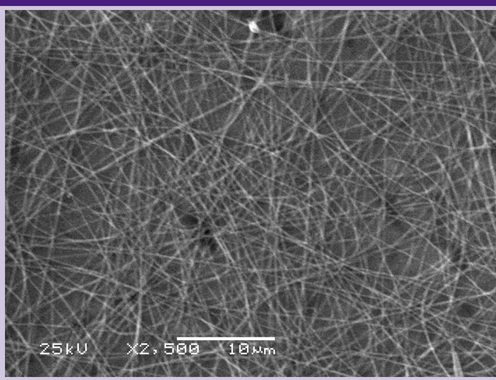
Robust electronics



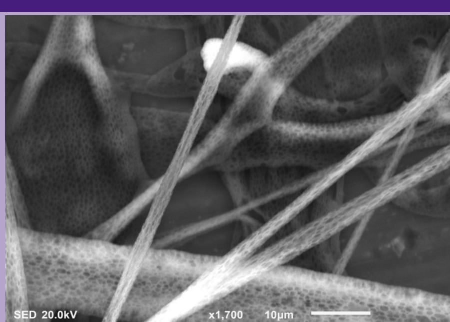


Small, Light weight, Low power consumption, Sensitive, Reusable

Electro-spun nanofibers



E-spun fibers with surface nanopores



Research at a glance

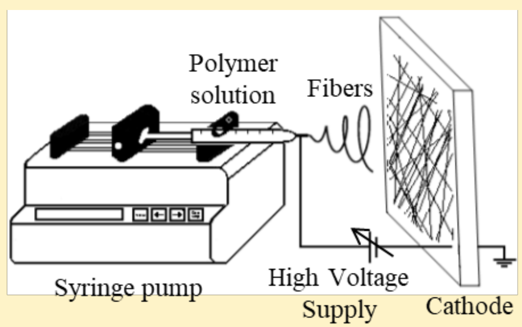
Laboratory Activities

Materials
- Conducting polymers
- Graphene
- Carbon nanotubes
- Ionic liquids

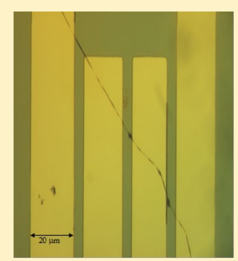
Material shapes
- Nanofibers
- Thin films
- Pressed pellets
- Gels

Results
- Binary switches
- Logic gates
- UV/Gas sensors
- Read/Write Memory Chips

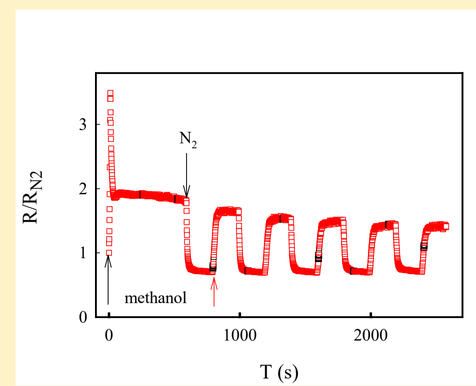
Electrospinning



Single polymer nanofiber

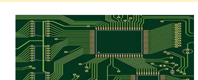


Gas sensing



Department of Physics and Electronics

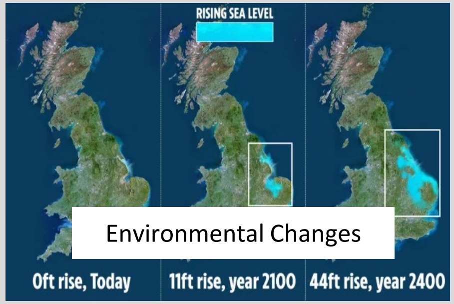
Dr. Nicholas J Pinto

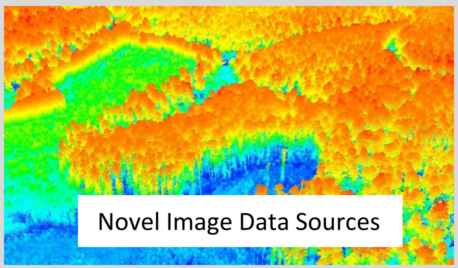


UPR HUMACAO

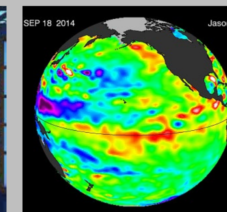
Big Data & Multi-Source Data Fusion/Integration & Analysis of Global Land Use/Cover Change in the Pacific Islands

Motivation





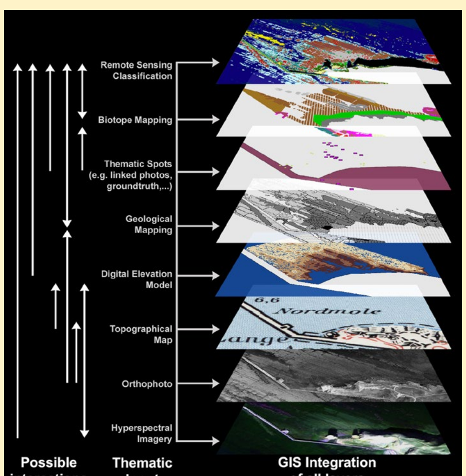
Proposed Research:



- Sourcing of Image data from different sources and platforms
- Integration of historical and contemporary *in situ* environmental data
- Data mining for nascent, novel and hidden environmental phenomenon(a)
- Big Data Analysis of multi-temporal, multi-point, multi-source, multi-level digital/image and environmental data
- Development of novel techniques of digital data processing and analysis
- Visualization of these phenomena

Our Research

Geospatial Data Integration & Processing



Visualization, Analysis & Interpretation

Dr. Jose Edgardo Aban

UNIVERSITY OF GUAM
UNIBETSEDÅT GUÅHAN

GEOGRAPHY PROGRAM
UNIVERSITY OF GUAM

Methane Dynamics of Vegetation-Soil Interactions in Bald Cypress and Other Bottomland Hardwood Forests

MURRAY STATE UNIVERSITY

Dr. Bassil El Masri

ARC Research Topic:
Topic 7: Space and Earth Science

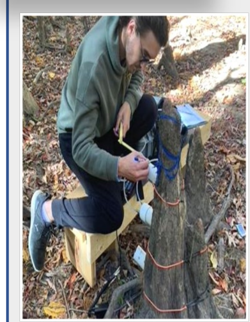
ARC Anticipated Research:
Linking Satellite GHGs with in-situ data

Current Research

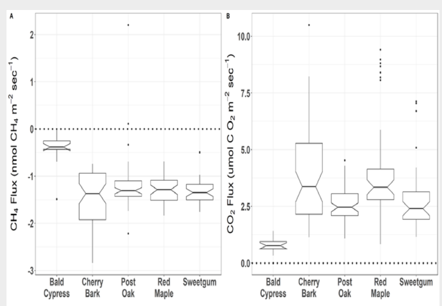
Tools:
- ❑ LICOR gas analyzer
- ❑ Eddy Covariance Tower
- ❑ Process-based modeling

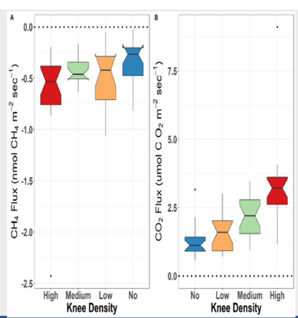
Applications:
- ❑ Soil vegetation interactions
- ❑ Woody structure CH_4 fluxes
- ❑ Soil CH_4 fluxes

Site measurements



Results:





Site measurements

↓

Novel Hyperspectral Camera

↓

Satellite-based CH_4

↓

Process-based model

Upscaling

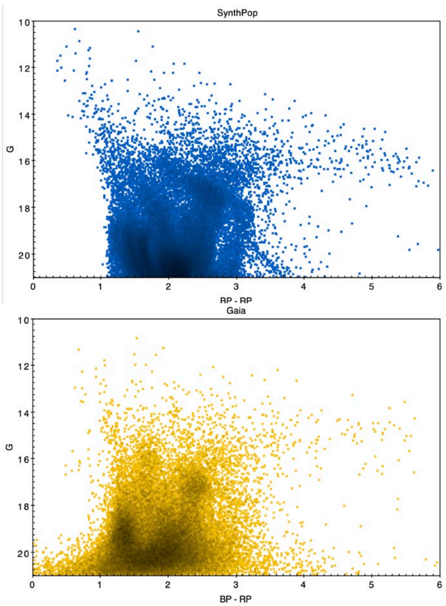
Exoplanets: Finding worlds beyond our own

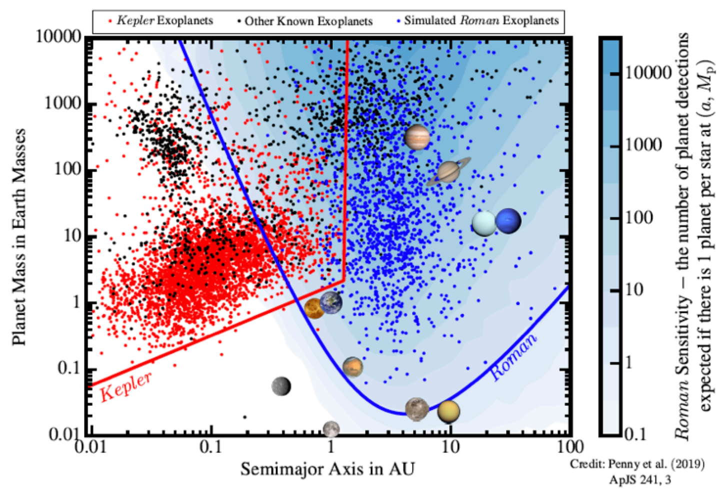
SynthPop + gulls + K2 Campaign 9

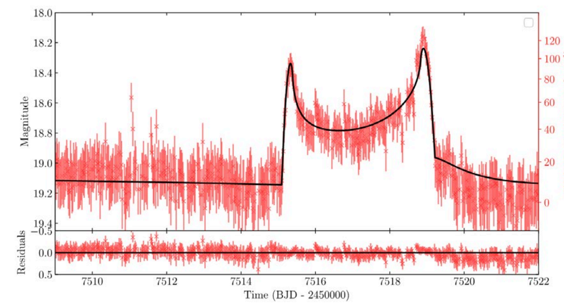
SynthPop: Galactic stellar population synthesis

gulls: Microlensing simulations

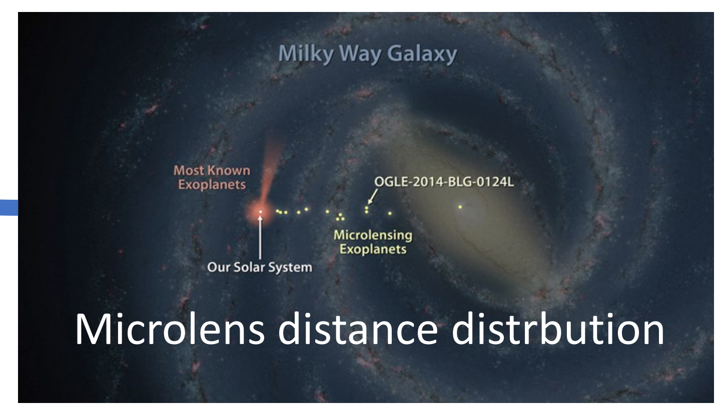
K2 Campaign 9: Microlensing parallax campaign data







Improved Galaxy models for Roman Microlensing survey



Dr. Matthew Penny

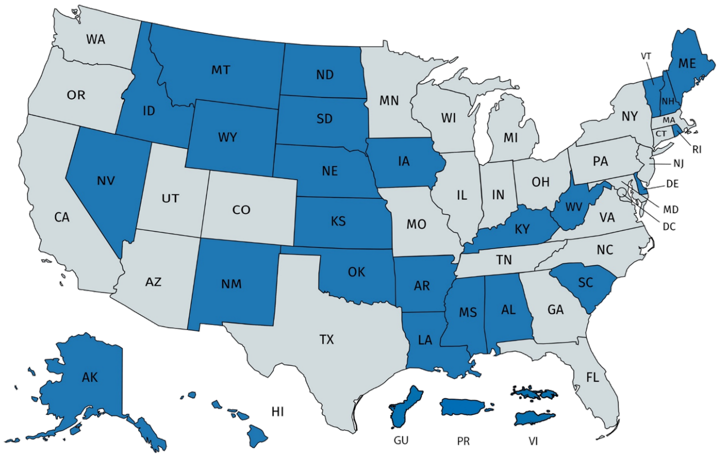
LSU
Department of Physics & Astronomy

Part 2

Q&A

Topics:

4. Astrobiology and Life Science
5. Cost-Effective Space Missions
6. Intelligent/Adaptive Systems
7. Space and Earth Science
8. Exoplanets



EPSCoR Jurisdiction Research Programs

aligned with

Ames Research Center Priorities

Full Researcher Booklet

https://lanasaepscor.lsu.edu/wp-content/uploads/2023/06/EPSCoR-ARC2023Researchers-v20230608.pdf