



HISTORICALLY BLACK COLLEGES AND UNIVERSITIES

# **NASA TECHNOLOGY INFUSION** **ROAD TOUR**



AND MINORITY-SERVING INSTITUTIONS

## **California State University, Los Angeles**



Jeffrey Underwood, Ph.D., CRA  
AVP for Research



Office of  
**Small Business**  
Mentor-Protégé Program

# University Curriculum

- The Cal State LA curriculum has three components: a major, general education (GE) requirements, and electives.

## University Programs and Degrees

- Biology (B.S., M.S.); Microbiology (B.S.)
- Biochemistry (B.S.)
- Chemistry (B.S., M.S.) also M.S. with a Biochemistry option
- Civil Engineering (B.S., M.S.)
- Computer Science (B.S., M.S.)
- Electrical Engineering (B.S., M.S.)
- Environmental Sciences (M.S.)
- Food Science and Technology (B.S.)
- Geology (B.S., M.S. in Geological Sciences)
- Kinesiology (B.S., M.S.)
- Mathematics (B.S., M.S., and minor)
- Nutritional Science (B.S., M.S.)
- Mechanical Engineering (B.S., M.S.)
- Physics and Astronomy (B.A., B.S., M.S., and minor)



# Research Capabilities

- **Mathematics/Computer Science:** Probability theory, topology, computer networks, software engineering and operating systems, computer system architecture, data mining, large-scale machine learning, high performance computing, cloud computing, network security, augmented reality
- **Engineering:** Additive manufacturing, computational materials science, thermal and fluid sciences, machine design, biomechanics, robotics and autonomous systems, bio-/nano-mechanics, multibody dynamics, image processing, propulsion systems, power systems, neural networks, computer architecture, fuel cells, hydrogen infrastructure and energy storage, sustainability, electric and hybrid vehicles, combustion, renewable energy, control systems, geotechnical engineering; earthquake engineering, hydrology and water resources engineering, air quality and climate modeling.
- **Physics:** Multiferroic materials and characterization, nuclear magnetic resonance, theoretical physics of materials, superconducting materials, photovoltaics

# Research Capabilities

- **Biomedical Research:** Cell fate and differentiation in early tissue development, contributions of mitochondrial biology and cellular metabolism to disease, craniofacial development, fungal pathogenesis, innate mucosal immunity, physical activity and antidepressant treatment interactions in the brain, mechanisms of antibiotic resistance, cardiovascular metabolism, developmental neurobiology, RNA metabolism, p53, drug-protein interaction, protein modification, microfluidic platforms for point-of-care diagnostics.
- **Chemistry:** Microfluidics, point-of-care (POC) diagnostic devices, fuel cells, chip fabrication, electro- and photocatalysis, nuclear magnetic resonance, nanoparticles and hydrogels for drug-delivery, protein methylation, function, photovoltaics, chemometrics, structure-function relationships in proteins, photochemistry, signal transduction pathway determination.
- **Forensic Science:** Trauma and traumatic stress, community policing, miRNA markers for detection of wound cells in bloodstains, modeling of bloodstain pattern, time-of-death determination, mtDNA, trace evidence, sexual assault, pharmacology and toxicology of controlled substances, neurocriminology.



# Research Capabilities

- ***Health Disparities:*** Drug abuse, dietary and strength training intervention for overweight minority youth, risk factors in overweight Latino youth, HIV, health communication, risk factors influencing sex and drug related behaviors of transgender women and gay men, STI prevention in at-risk youth and young adults, dementia, hypertension among Arab Americans, adherence issues, behavioral health, adherence and type 1 and type 2 diabetes, mental health disparities
- ***Environmental Science:*** Environmental geochemistry, igneous petrology, volcanology, hydrogeology, groundwater modeling, air pollution, hydrologic modeling, remote sensing, GIS, computer cartography, sedimentary petrology, climatology, meteorology, global environmental changes, environmental microbiology, strength properties of soils, air quality control and modeling climate change, hydrology and water resource
- ***Supply Chain and Logistics:*** Support decision making, operations, supply chain management, risk management in supply chain, supply chain innovations, leadership development, labor conditions, relations and negotiations, entrepreneurship, operations/finance interface, cost and managerial accounting.

# Past Performance

- Department of Defense

Studies include the development of non-contact geophysical methods to determine seabed geotechnical properties through controlled laboratory and field trials and, the development of new sensor application technologies to detect agents found in chemical warfare agents and explosives using non-imaging techniques.

- Economic Development Agency

Developed three components for the proof-of-concept Center, LABioStart: a boot camp for bioscience entrepreneurs:

- (1) Regional Innovation Showcases; Created The BioSpace LA Incubator to serve as an economic development hub for bioscience start-up companies and engaging industry partners, students, and faculty.
- (2) Bioscience Entrepreneur's Bootcamp;
- (3) Networking Sessions



# Past Performance

- National Aeronautics and Space Administration

The **NASA DIRECT-STEM Program** recruits highly competitive, historically underrepresented students, giving them NASA research experience in scientific computing and data analysis, inspiring them to become future leaders in STEM-related professions. Research and training is collaborative with the University of California, Irvine and Jet Propulsion Laboratory in areas of hydrology and climate change, computational physics, and cloud computing directly contributing to NASA's mission goals.



# Past Performance

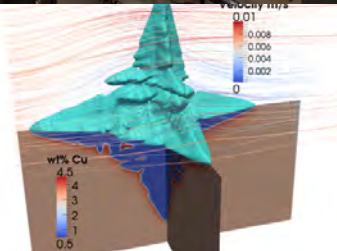
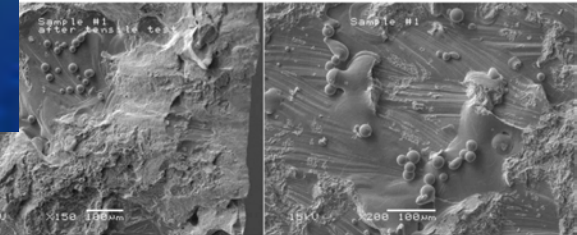
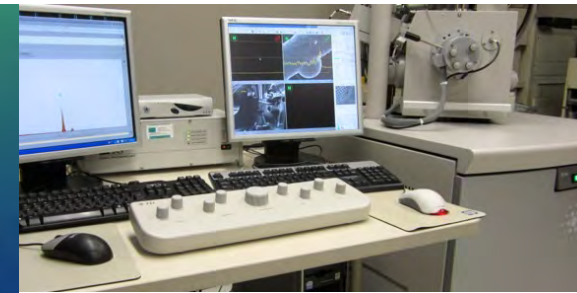
- National Aeronautics and Space Administration

Physical Science Informatics (PSI)

## Pore Formation and Mobility Investigation (PFMI):

### Modeling Solidification Microstructure

Purpose of this research is to develop a numerical model which can quantitatively simulate directional solidification on the International Space Station in the absence of gravity and during terrestrial directional solidification.

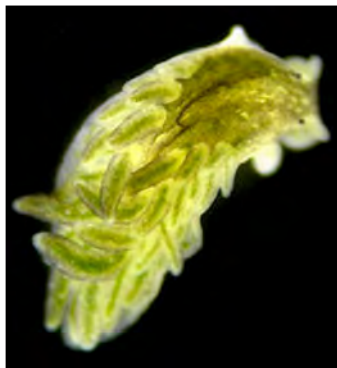


<https://www.youtube.com/watch?v=nEmOKIIRzmU>

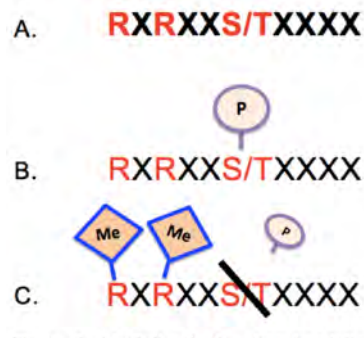


# Past Performance

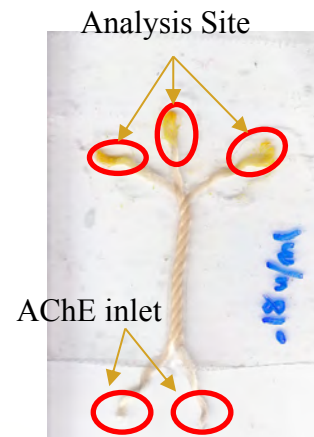
- National Institutes of Health
- Research includes examining how chemical factors affect antifreeze protein activity, the mechanism of arginine methylation and its role in preventing aberrant gene activation, signal transduction of proteins, development of novel biosensors for neurotransmitters, and development of new molecular dynamics simulation methodologies for DNA structure analysis.



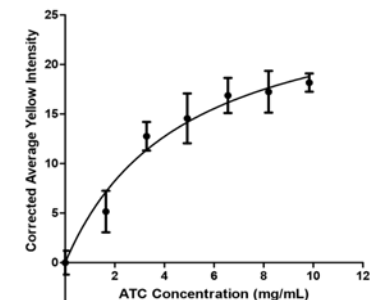
Solar-powered slugs.



Arginine methylation.



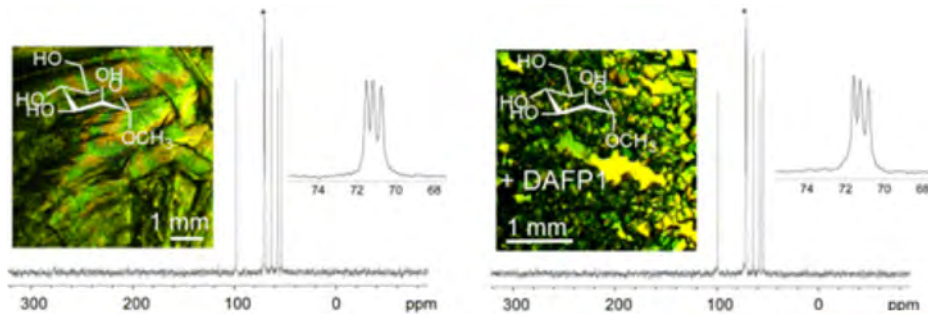
Assay for acetylcholinesterase.



# Past Performance

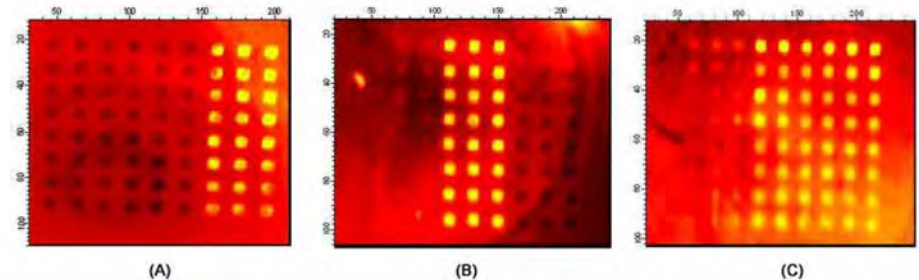
- National Institutes of Health

Training programs for students interested in developing research careers in biomedical and behavioral research include the **Minority Opportunities in Research (MORE)** office funded by grants from the National Institute of General Medical Sciences (NIGMS).



The crystal morphology of methyl  $\alpha$ -D-mannopyranoside (MDM) crystals can be effectively controlled by antifreeze proteins.

Hybridization using a microarray assembly.



# Past Performance

- National Science Foundation

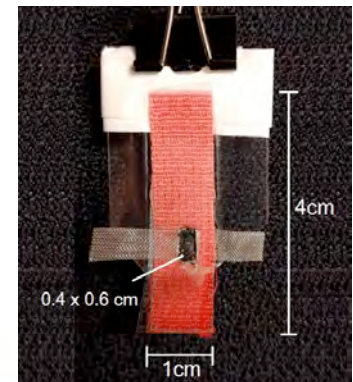
*Center for Energy and Sustainability (CEaS):* microfluidic fuel cells, advanced materials for photovoltaics, and applications of high-temperature superconductors.

*Partnership for Research and Education in Materials (PREM):* magnetic and ferroelectric properties of manganites, photoelectrocatalysis on perovskite metal oxides, development of catalytic nanopumps on microfluidic platforms, development of CSULA's Master of Science Degree in Materials Science and Engineering.



Student  
conference  
research  
presentation.

Microfluidic  
fuel cell.



# University Points-of-Contact

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