

*Setting a standard for multidisciplinary research, workforce development and STEM education*



Acting as a catalyst, EPSCoR has brought together a diverse and geographically distributed group of campuses that serve a population of 4.5 million. Almost all of the public and private universities, colleges and community colleges in Louisiana have taken advantage of EPSCoR programs.

One of our current projects, the Consortium for Innovation in Manufacturing and Materials (CIMM), brings over 170 faculty, post-docs, and students together to make transformative advances in advanced manufacturing and materials research and education.

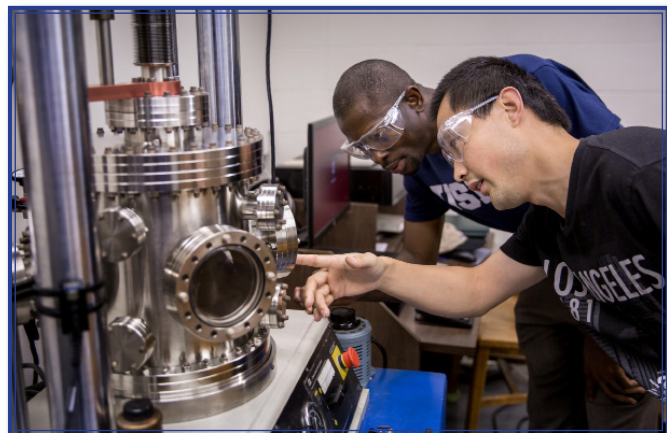
## **CONSORTIUM FOR INNOVATION IN MANUFACTURING AND MATERIALS (CIMM)**

A highly competitive \$20 million 5-year Research Infrastructure Improvement (RII) Track-1 award from the NSF helped to establish CIMM in August 2015.

CIMM is a collaboration of five Louisiana universities who are researching how to use nature's building blocks to manufacture high technology products, like 3D printed aerospace parts made out of exotic metals and tiny components for microdevices. The resulting computer modeling and materials research will guide the development of technologies for mass production. CIMM researchers will also help to educate and train a skilled and diversified workforce to support manufacturing industries.

### ***Multiscale Metal Forming***

Over time, technology has miniaturized and there is increasing demand for tiny metal components, like microchannel heat exchangers and miniature gas chromatographs. Microforming components in smaller dimensions bring scientific challenges due to changes in material behavior, friction and accuracy at that scale. CIMM researchers will experiment with new coatings on microforming tools and study the effects on the atoms of the metal as it interfaces with the tools.



STUDENTS IN FRONT OF A HIGH-TEMPERATURE HIGH-VACUUM MOLDING SYSTEM USED FOR REPLICATION OF METAL-BASED MICROSCALE STRUCTURES. PHOTO BY EDDY PEREZ, LSU.

### ***Laser-Based 3D Printing***

Highly specialized parts, such as rocket fuel injectors, can be printed with powders made out of exotic metals that are melted into layers with a laser. The metal object is built in one manufacturing step, drastically cutting time, labor, and materials when compared to current manufacturing technology which uses alloy metal sheets that are cut, hot pressed, punched, welded, and hand-brazed into shape.

### **SMART POLYMERS**

The SmartMATERIAL Design, Analysis, and Processing (SMATDAP) team is developing the next generation of smart polymers and the tools to accelerate cost-effective commercial production. The results from this \$6 million NSF consortium between Louisiana and Mississippi have the potential to transform medical and sustainable materials applications.

### **STEM DISCOVERY**

The STEM Discovery program is engaging teachers and students from Louisiana high schools that have a high enrollment of underrepresented minority students in project-driven experiences in the fields of Science, Technology, Engineering, and Mathematics (STEM). The goal of this \$750,000 project is to increase Louisiana's capacity and innovation in STEM fields and develop a sustainable program that can be adopted broadly across the nation.

# NASA EPSCoR Louisiana



The goal of the Louisiana NASA EPSCoR program is to foster the development of an academic research enterprise in the State of Louisiana directed toward long-term, self-sustaining, nationally-competitive capabilities in aerospace and aerospace related research.

**NASA EPSCoR Research Infrastructure funding supports the following active projects:**

## ENERGY SCAVENGER

This spacecraft device will convert vibrations into useful electric power for onboard systems as well as dampen unwanted, damaging micro-vibrations.

## METAL FATIGUE

Researchers are studying the physics of fatigue and crack growth in high-strength aluminum and composites to develop prognostics for these materials which are widely used in aircraft and space vehicles.

## ROCKET COOLING SYSTEM

An experimental cooling water spray system is being developed to maximize cooling of rocket exhaust plumes with the least amount of water while keeping the deflector plate at a reasonable temperature.

## MARTIAN SOIL ANALYSIS

The geochemical and physical processes affecting the soil on Mars is poorly understood. Photoanalyses software is being developed for state-of-art terrain image classification for in situ robotic missions.

## ULTRASONIC WELDING

Lightweight materials, such as fiber-reinforced polymer composites, are critical for weight reduction in future space missions. High-speed ultrasonic structural repair and bonding techniques are being researched for these new materials.

## NEXTGEN AVIATION NOZZLES

Engine injector nozzle spray research is critical to the development of new aero engines that are highly efficient, with high fuel flexibility and low emissions.

**NASA EPSCoR Research Implementation funding supports the following active projects:**

## CARBON EXPORT TO COASTAL OCEANS THROUGH DELTAIC SYSTEMS

Researchers are investigating the transport of carbon through the land-sea interface by examining two contrasting Mississippi River Delta sites.



MISSISSIPPI RIVER DELTA PLAIN SHOWING REGIONAL STUDY SITES: LEFT: WAX LAKE DELTA (GROWING); RIGHT: BARATARIA BAY (ACUTE LAND LOSS).

## SPACE-BASED BIOCHEMICAL CONVERSION

This project will develop a waste management system, BIOSYS, that is energy- and oxygen-use neutral and is capable treating wastewater while producing additional life support resources in space.

## SELF-HEALING POLYMERS

New polymer composite panels are being developed that are self-healing when damaged. Materials research will focus on the design, synthesis, characterization, and manufacturing of two-way shape memory polymers; multiscale modeling; and additive manufacturing.

## HIGH ENERGY ASTROPHYSICS

The TETRA-II project team is developing a large array of terrestrial gamma flash ray detectors to operate in concert with local lightning detectors and weather radar systems. The new data will support the NASA mission of observing high energy gamma rays, and will complement their space-based observations.

# NIH IDeA Louisiana

Through NIH funding, COBRE/INBRE researchers are making significant progress in the following biomedical areas in Louisiana:

## **MENTORING NEUROSCIENCE**

This COBRE has led to a remarkable expansion in neuroscience research in the New Orleans region. Research in the Center has resulted in exciting discoveries in experimental stroke, active dendritic processing, and Alzheimer's disease. (LSU Health Sciences Center - New Orleans)

## **TRANSLATIONAL RESEARCH IN HYPERTENSION AND RENAL BIOLOGY**

Hypertension and kidney & cardiovascular diseases are highly prevalent in Louisiana and researchers are discovering new ways to combat these diseases. (Tulane School of Medicine)

## **CLINICAL & TRANSLATIONAL SCIENCE**

This COBRE-CTR supports and expands clinical and translational research in Louisiana capitalizing on the network of COBRE and INBRE NIH-funded programs. The Center emphasizes research on nutrition and chronic disease, health disparities, and preventative approaches to health, including vaccine development. (LSU Pennington Biomedical Research Center)

## **EXPERIMENTAL INFECTIOUS DISEASE RESEARCH**

This COBRE strategic alliance focuses on finding new ways to understand and combat infectious diseases including AIDS, Lyme disease, Tuberculosis and mosquito borne diseases. (LSU School of Veterinary Medicine and Tulane National Primate Research Center)

## **MOLECULAR & TUMOR VIROLOGY**

This COBRE focuses on viruses as important agents of infectious diseases as well as cancer. The Center emphasizes research toward understanding the molecular biology of a variety of viruses as well as aiming to provide new ways to combat infectious diseases and cancer. (LSU Health Sciences Center - Shreveport)

## **MENTORING IN CARDIOVASCULAR BIOLOGY**

Understanding the molecular mechanisms that underlie cardiovascular pathophysiology will help to find new ways to combat cardiovascular disease. (LSU Health Sciences Center - New Orleans)



STUDENTS PRESENTING AT THE SUMMER INBRE SYMPOSIUM.

## **LOUISIANA BIOMEDICAL RESEARCH NETWORK**

The LBRN enhances the biomedical research capacity of primarily undergraduate institutions by providing a state-wide network for expanded collaboration with the research community. (LSU A&M)

## **MENTORING TRANSLATIONAL RESEARCHERS**

This COBRE focuses on the genetic and immunologic mechanisms that promote chronic inflammation associated with cancer, chronic infection and cardiovascular disease. (LSU Health Sciences Center - New Orleans)

## **CANCER GENETICS PROGRAM**

This COBRE focuses on cancer genetics with specific emphasis on understanding of genetic instability, cellular inflammation, and the cell's responses to these factors. The Center provides support for outstanding and highly translational projects aimed at combating cancer. (Tulane School of Medicine)

## **OBESITY AND DIABETES RESEARCH**

This COBRE focuses on obesity and diabetes. Researchers are working toward discovering the cellular mechanisms of metabolic disease, and translating these discoveries into more effective treatments for chronic diseases to improve the quality of life. (LSU Pennington Biomedical Research Center)

## **RESEARCH EXCELLENCE IN AGING AND REGENERATIVE MEDICINE**

This COBRE focuses on the understanding of aging, from basic genetic and epigenetic contributions through cardiovascular and neurocognitive mechanisms. (Tulane University)