MATRIX IX: Campus STEM Research Priorities Report
Categories Aligned with FIRST Louisiana High Growth Target Industries
Bioengineered Solutions - DRAFT

	Research Priorities Aligned with High Growth Target Industries	Specific Research Foci/Strengths
LSU AG	• Nanoparticle Delivery & Encapsulation Systems	• Nanoparticle delivery and encapsulation systems – encapsulated Vitamin E for atherosclerosis therapy

LSUBR	• Core Computing/High Performance Computing	• Enable breakthroughs in computational science and its applications in various areas in science, engineering & arts
		• Appointment of a new director of CCT
		• CCT is the focal point for research in core computing/high performance computing cluster and interacts with other clusters
		• Hiring plan to recruit 4 computational modelers to LSU to strengthen modeling expertise and revise strength in preparing for and analyzing disaster-related phenomena
		• Substantial investment in new Supercomputer with ongoing funds for upgrades
		• Louisiana Digital Media Center – new building on the LSU campus to jointly house CCT and EA Sports
		• Success Stories:
		  • Partnership with LED to grow workforce and support IBM Services Center in Baton Rouge
		  • SuperMike II supercomputer
		  • Louisiana Digital Media Center as home to CCT and resource for private-sector companies involved in digital media
		  • Partnership with EA for a global quality assurance center

	• Materials Science & Engineering	• Leadership of Dr. Ward Plummer
		• New 85,000 SF Chemistry and Materials building
		• Plan to facilitate a self-sustaining instrumentation facility
		• Working toward establishment of an Institute for Advanced Materials
		• Success Stories
		  • Center for Advanced Microstructures and Devices (CAMD) $1.26 million research equipment award to purchase and install a superconducting multi-pole wiggler at the CAMD synchrotron ring
		  • Renology, a solar-solution start-up company, founded by Yi Li, a PhD student in Physics & Astronomy

	• Biological, Biotechnology & Biomedical Research	• Important basic and applied problems in specific areas of biology are addressed by interacting groups in the sciences, engineering and agriculture, as well as those in the humanities and social sciences
		• New research group being formed in bioinformatics to support the strong genomics/evolutionary biology focus as well as other areas of biology which utilize large sets of data. CCT, the Office of Research & Development and the director of PBRC convened a panel of experts to developed a report outlining a path forward in this area
		• Development of strategic hiring plan for a director of the Bioinformatics Core
		• Center for Infectious Disease emerging cluster, founded on nearly 10 years of NIH COBRE funding. A core grant for this group is being developed for NIH submission
		• Success Stories
		  • Dr. Daniel Hayes and his research team have developed a novel way to allow surgeons to reduce the risk of antibiotic resistance during radical reconstructive surgery while still curing the infection
		  • LSU researchers developed Cyloset, a diabetes drug currently on the market
		  • Dr. Zhiqiang Deng uses satellite data to develop better tools for predicting and preventing seafood contamination

LA Tech	• Science & Engineering for Health & Quality of Life	• Application of fundamentals from engineering, basic sciences, medical sciences, and mathematics to solve problems in medicine and biology and to understand, modify or control biological systems
		• Center for Biomedical Engineering and Rehabilitation Science
		• School of Biological Sciences
		• LA Tech Speech and Hearing Center
		• Professional Development and Research Institute on Blindness
		• Success Stories:
		  • NIH Award for brain imaging studies
		  • Zero-gravity flight test for experimental prototype

	• Matter, Materials & Multiscale Systems	• Disciplines of engineering, computer science, chemistry, physics & mathematics
		• Research topics include micro/nanotechnology for energy, security, and sustainability applications, microfabrication and materials characterization, nuclear and high energy physics, computational electromagnetics and metamaterials, computational materials science & advanced materials and manufacturing
		• Institute for Micromanufacturing
		• Center for Applied Physics Studies
		• Louisiana Alliance for Simulation-Guided Materials Applications (LA-SiGMA)
		• Success Stories:
		  • NSF CAREER Award (Dr. Leland Weiss: new methods to capture and use solar thermal energy using small-scale devices
		  • Particle Physics image (a summary figure of "inclusive jet production") selected as international standard

	• STEM Education, Entrepreneurship & Innovation	• Support FIRST LA framework as a whole by educating post-secondary and post-graduate students in all foundational sciences
		• Facilitate innovations in core domains, and ultimately contribute to all target industries
		• Integrated STEM Education Research Center
		• Science and Technology Education Center
		• Center for Entrepreneurship and Information Technology
		• Proof of Concept Center
		• Success Stories
		  • US Department of Homeland Security funding for Cyber Discovery Camp
		  • US Economic Development Administration funding for "i6 green energy challenge"

Loyola	• Molecular Genetics & Disease	• Includes studies of limb regeneration, arthritis, and Chagas Disease
		• Success Stories:
		  • Dr. Rosalie Anderson and undergraduate research group: groundbreaking method of joint regeneration
		  • Dr. Kimberlee Mix developed a molecular genetics course focusing on innovation and commercialization

	• Advanced Nursing Education	• Doctor of Nursing Practice degree
		• Success Stories
		  • MS-DNP program named as one of the 10 best online nursing programs in the country by US News and World Report
		  • Dr. Ann Cary: awarded a $700,000 grant from HRSA Advanced Education Nursing training program to support students who will practice in underserved communities

PBRC		

SUBR	• Health & Biological Sciences	• Vision: To advance public health research, policy, practices and education by fostering collaboration across disciplines for the improvement of the public's health and wellbeing; to strengthen the University's capacity to address strategically and effectively complex public health issues
		• Nurse-managed clinic
		• Center for Social Research
		• Success Stories
		  • School of Nursing's Family Health Care Center
		  • Louisiana Biomedical Research Network (LBRN) collaboration with LSUBR

	• Energy, Ecosystems & the Environment	• Vision: To build on current sustainable energy-oriented research strengths and to develop new, technically significant research programs; to understand mechanisms driving, and to develop potential solutions for, alternative energy materials, carbon emissions and climate change problems
		• Success Stories
		  • Next Generations CREST Composite Center
		  • Research Project: Developing Biofuels from Sustainable Alternative Non-Food Feedstocks in Louisiana

Tulane	• Materials Science	• Internationally recognized programs in nanotechnology, polymer science and engineering, electronic materials, energy storage & materials simulations • Major focus areas of microemulsion systems, polymer physics, polymeric drug carriers, thin films and coating & nanomanufacturing • Center for Computational Science • Coordinated Instrumentation Facility • Polymer Reaction Monitoring & Characterization (PolyRMC) • Louisiana Alliance for Simulation-Guided Materials (LASiGMA) • Success Stories: Dr. Vijay John (materials/nanomaterials); Dr. Wayne Reed (polymer physics & biophysics); Dr. Doug Chrisey (advanced materials); Dr. Scott Grayson (polymers)
	• Health-Related Research	• Internationally recognized programs in gene and drug delivery, tissue regeneration • Major focus areas of tissue engineering & protein folding • Center for Computational Science • Coordinated Instrumentation Facility • Louisiana Alliance for Simulation-Guided Materials (LASiGMA) • Success Stories: Dr. Don Gaver (biomedical engineering/biofluid mechanics); Dr. Ken Muneoka (limb regeneration); Dr. Anne Robinson (fundamental interactions between molecules)
	• Water Remediation, Management & Coastal Studies	• Internationally recognized programs in wetlands restoration, disaster resilience, water resource policy, and dispersant technology • Major focus areas: river processes (hydrology, water law); Delta processes (wetland ecology); ecosystem services (fisheries management); and human dimensions (disaster resilience, public health) • Tulane Institute on Water Resources & Policy • Tulane Xavier Center for Bioenvironmental Research • Collaborative role in the 22-institution Consortium for the Molecular Engineering of Dispersants (CMEDS) funded by the Gulf of Mexico Research Initiative (GOMRI) • Success Stories: Dr. Mark Davis (law and policy); Dr. Mike Blum (hybridization and adaptive evolution); Dr. Vijay John (microemulsion systems & thermodynamics)
	• Energy & Environmental Science	• Internationally recognized programs in energy sources, energy management & environmental sciences • Major focus areas of biofuels, sedimentology, sea-level change & energy supply chain economics • Tulane Energy Institute • Tulane University Biodiversity Research Center • Clean Power and Energy Research Consortium (multi-institutional collaboration) • DOE National Institute for Climate Change Research (multi-institutional collaboration) • Success Stories: Dr. Geoff Parker (markets and supply chains); Dr. Tor Tornqvist (evolution of rivers, oceans and shallow oceans); Dr. David Mullin (alternative fuels/liquid fuels); Dr. Henry Bart (taxonomic/ecological diversity and environmental adaptation)

TUHSC	• Cancer Biology & Treatment	• Internationally recognized programs in cancer genetics, virus-induced cancers, tumor biology, novel cancer therapeutics, and cancer epidemiology • Significant translational research through novel therapeutics – four in clinical trials with many more in development • Tulane Cancer Center • Tulane Center for STEM Biology and Regenerative Medicine • COBRE in Cancer Genetics • Cancer Crusaders Next Generation Sequence Analysis Core • Collaborations through the Louisiana Cancer Research Consortium • Success Stories: Dr. Prescott Deininger (Epidemiology – Oncology); Dr. Asim Abdel-Mageed (Urology – Cancer Research); Dr. Erik Flemington (Pathology – Cancer Research); Dr. Hua Lu (Biochemistry – Cancer Research)
	• Environmental Health	• Domestic and international programs in health disparities research, environmental epidemiology, water and air quality, nutriceuticals, sustainable hazardous waste management, molecular toxicology and biomarkers, carcinogenesis, health and public policy, disaster preparedness, and management • Significant translational research through direct impact of research programs on human health with specific endpoints of cancer, respiratory disease, asthma, gastrointestinal disorders, workplace health, and reproductive health • Tulane Xavier Center for Bioenvironmental Research • Center for Applied Environmental Public Health • NIH-funded Transdisiplinary Research Consortium for Gulf Resilience on Women's Health (GROWH) • Baton Rouge Area Foundation-funded project on environmental disaster resilience • Collaborations with Xavier through CBR and all LA research universities through the Louisiana Universities Gulf Research Consortium (LUGRC) • Major source of translational research & commercialization, with on product on the commercial market and others in the pipeline • Success Stories: Dr. Maureen Lichtveld (Global Environmental Health Sciences); Dr. Roy Rando (Global Environmental Health Sciences); Dr. LuAnn White (Global Environmental Health Sciences)
	• Infectious Disease Prevention & Treatment	• Internationally recognized programs in vaccine development, diagnostics and therapeutics • Major focus areas: vector-borne diseases, biodefense agents, emerging pathogens, and other viral, bacterial and parasitic diseases of major global health impact, including malaria, AIDS, diarrheal diseases, influenza and others • Significant translational research through clinical trials, licensing and commercialization of diagnostics and vaccine platforms; many developments in the product pipeline • Collaborations in the South Louisiana Institute for Infectious Disease Research (SLIIDR) and the Louisiana Vaccine Center (LVC) • Success Stories: Dr. John Clements (Microbiology & Immunology – vaccines); Dr. Mario Philipp (Microbiology & Immunology – bacterial infectious diseases); Dr. Ronald Veazey (Pathology – SIV and HIV infection and pathogenesis); Dr. Nirbhay Kumar (Tropical Medicine – vaccines)
	• Chronic Disease & Novel Therapeutic Approaches	• Internationally recognized programs in hypertension, cardiovascular disease, pulmonary disease, diabetes, kidney development, and osteoporosis • Significant translational research through product development, licensing and start-up companies • Tulane Hypertension and Renal Center of Excellence • Tulane Center for Stem Cell Biology and Regenerative Medicine • Tulane Heart and Vascular Institute • NIH-funded "Building Interdisciplinary Research Careers in Women's Health (BIRCWH)" focused on gender differences in cardiovascular disease • COBRE in Hypertension and Renal Biology • Tulane Xavier National Center of Excellence in Women's Health and Mary Amelia Douglas-Whited Community Women's Education Center • Success Stories • Dr. Aline Betancourt (Medicine – stem cell-based therapies); Dr. David Coy (Medicine – peptide therapeutics); Dr. M.A. Krousel-Wood (Medicine and Epidemiology – cardiovascular disease); Dr. Matthew Burow (Medicine – obesity and diabetics)

ULL	• Life Science, Healthcare & Wellness	• Research agenda: pharmaceuticals; health information technology; biomedical sciences; nursing & allied health; physical health; mental health; school health infrastructure
		• New Iberia Research Center
		• Center for Business & Information Technologies (CBIT)
		• Picard Center for Child Development and Lifelong Learning
		• Success Stories
		  • New Iberia Research Center – primate research and industrial partnerships
		  • Picard Center – research focused on informing policy
		  • CBIT support for economic development related to applied research
		  • Lafayette's designation as a "Living Lab for Health Innovation" by the US Ignite Partnership provides a community-scale testbed for healthcare innovations
		  • Lafayette as a regional medical "hub city"

	• Energy & Sustainability	• Research agenda: alternative energy, geological research, sustainable design, petroleum research, unconventional natural gas & energy efficiency
		• Energy Institute
		• Marine Survival Training Center (MSTC)
		• Success Stories
		  • ULL/CLECO Partnership for Alternative Energy Research
		  • Architecture leader in sustainable design (faculty & student activities)
		  • MSTC is a global leader in marine safety
		  • Major collaborations with industrial partners

	• Advanced Materials & Manufacturing	• Interdisciplinary research in structure, process, property & performance of advanced and specialized materials
		• Developing improved manufacturing processes and improving manufacturing production through the use of lean and agile engineering, design, and production supply chains
		• Performing applied research through materials development, demonstration, training, prototyping and innovation engineering efforts with manufacturing companies
		• Working with industry to perform feasibility studies of proposed and existing production models, systems and processes
		• Institute for Materials Research & Innovation
		• Manufacturing Extension Partnership of Louisiana (MEPoL)
		• Success Stories
		  • MEPoL's impact on manufacturing in Louisiana
		  • Development of hybrid luminescent tracer ammunition
		  • Developments in preparation magnetic nanostructures

Xavier	• Nanomedicine & Drug Delivery	• Center for Nanomedicine and Drug Delivery: $1.8 million RC/EEP grant with a focus on understanding and overcoming barriers to efficient oral, colonic, parenteral, pulmonary and vaginal delivery of drugs for development of new treatments
		• Core Facilities: Vaccine and Nanotechnology Core ($1.2 million RC/EEP grant in collaboration with Tulane and LSUHSCNO) and Formulation Core in Design, Delivery and Development of Therapeutic Peptides ($5.8 million RC/EEP grant with LSUHSCNO)
		• Success Stories
		  • NIH SBIR: $3.2 million grant with AutoImmune Technologies, Inc. on development of an influenza drug for both prevention and early treatment
		  • Development of fenretinide nanoparticle – collaboration among pharmaceutics and pharmacology faculty with NIH funding
		  • Development of lipid-based nanoparticles – collaboration among two faculty members with AFRRI intramural funding
		  • Pending patents for nanoparticle discoveries (three provided as examples)
		  • Collaborations with Tufts and Howard Universities in nanomedicine and drug delivery