MATRIX VIII: Campus STEM Research Priorities Report
Categories Aligned with FIRST Louisiana High Growth Target Industries
Biomedical - DRAFT

	Research Priorities Aligned with High Growth Target Industries	Specific Research Foci/Strengths
LSU AG	• Commercially Available Biomedical Products	• Vaccines for use in animal biomedical applications • Targeted cancer therapeutics (Esperance Pharmaceuticals, Inc.) • Protein-based pharmaceuticals (TransGeneRx) • Solubility technique – solubilize pharmaceuticals, food additives (OmniSol, LLC) • Nanoparticle delivery and encapsulation systems – encapsulated Vitamin E for atherosclerosis therapy • Success Story • University Products, LLC vaccine effective against anaplasmosis invented at LSU Ag Center (Dr. Donald Gene Luther)

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

	• Individual Behavior & Community Context	• Research on individual behavior and cognitive aspects of varied social phenomena such as health, crime, developmental trajectories over the life course, and socioeconomic attainment, and how historical and community contexts produce differential outcomes
		• Baton Rouge Area Violence Elimination Program (BRAVE) and resulting grant to study the Group Violence Reduction Strategy in Baton Rouge
		• Several research groups, with one focused on health behaviors and health communication
		• Supportive research infrastructure includes the Office of Social Service Research and Development and the Public Policy Research Lab
		• Success Stories
		  • BRAVE partnership
		  • Division of Economic Development partnership with/contract work for LED and other State agencies

	• 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

LSUHSCNO	• Alcohol & Drug Abuse	• Has been a focus for more than two decades
		• Comprehensive Alcohol Research Center (CARC) has received nearly $2 million per year since 1993
		• Alcohol and Drug Abuse Center stimulates interdisciplinary collaborative efforts in research & teaching and dissemination of information in areas of drug and alcohol abuse
		• Focus on promoting discovery in the field of alcohol and drugs of abuse and their impact on HIV disease prevention, progression and treatment
		• Success Stories
		  • The Alcohol Research Center is the only Comprehensive Research Center in LA and has been continuously funded for 21 years, netting $35 million in research dollars
		  • The Alcohol Research Center has developed a nationally acclaimed and highly successful training program for graduate students and post-docs

	• Neuroscience	• Neuroscience Center of Excellences studies of the fundamental principles of brain, retina and nerve function and contributes to the understanding and conquering of diseases of the nervous system
		• All Center faculty have joint appointments in clinical and basic science departments
		• Projects focus on discovering novel mechanisms for: stroke, brain injury, blinding eye diseases, Alzheimer's and Parkinson's diseases, epilepsy, traumatic brain injury and other disorders of the nervous system
		• Translational research programs include those sponsored by the LSUHSC Translational Research Initiative and have resulted in more than 20 patents/patent applications
		• Success Stories
		  • Dr. Nicolas Bazan contributed to the discovery of Neuroprotectin D1 and has several patents, patent applications, and new intellectual property disclosures related to Alzheimer's Disease
		  • Based on Dr. Bazan's research, Dr. Haydee Bazan and colleagues have developed a new therapeutic approach to regenerate corneal nerves after refractive surgery, aging and in several diseases
		  • Dr. Nicolas Bazan continues to develop fundamental underpinnings of non-toxic, non-addictive analgesics, which lay the foundation for start-up company St. Charles Pharmaceuticals

	• Cancer	• Cancer Center has grown into a multidisciplinary matrix organization drawing expertise from virtually every department in the Schools of Medicine, Nursing and Dentistry • Primary Mission: conduct basic and clinical research with a focus on prevention, treatment, and eventual eradication of cancer, particularly among underserved populations • Research foci: molecular signaling; population studies; molecular genetics; immunology; infection and inflammation; and clinical sciences • Core facilities (genomics, proteomics, immunology, imaging, biostatistics/bioinformatics) as well as dedicated clinical trials and grants and development offices assist the faculty • The Cancer Center is actively enhancing translational and clinical research programs to complement its strong basic science component

		• Success Stories
		  • Chosen Diagnostics, a start-up company founded by LSUHSCNO faculty member Dr. Sunyoung Kim, is developing a novel platform capable of predicting drug resistance and regiments for targeted treatments, particularly in oncology
		  • Cancer Center faculty have been continually successful in obtaining federal grants and LSUHSCNO leads the State in funding for cancer research activities. Major grants include COBRE "Mentoring Translational Researchers in Louisiana"; Clinical Trials Program "Minority Based Community Clinical Oncology Program"; and Center for Minority Health and Health Disparities Center partnership with Dillard University

	• Infectious Diseases	• International reputation for research and training in infectious disease, particularly in the areas of microbial pathogenesis, host immunity, and vaccine development • Louisiana Vaccine Center develops and focuses local interdisciplinary strengths to foster development of novel approaches to infectious disease research and vaccine development, and appropriate training for local students • Strong partnerships with LSU-BR, Tulane and Xavier facilitates access to core research equipment and services and enriches the training environment • LSUHSCNO investigators affiliated with LVC currently hold $21+ million from NIK for research in HIV/AIDS; sexually transmitted diseases; tuberculosis; bacterial, parasitic and fungal infections; antifungal and antiviral drug development; and infections caused by herpesviruses and respiratory syncytial virus (RSV) • Establishment of major collaborative programs in HIV/AIDS and sexually transmitted disease prompted by $25 million NIH funding • Success Stories • Louisiana Vaccine Center has consolidated and strengthened world-class local research in vaccines, infectious diseases, and immunology with excellent facilities and support services • Major federal program and center funding for translational research in HIV/AIDS and sexually transmitted disease • Minivax, an LSUHSCNO spinoff company, was recently awarded an STTR grant for development of therapeutic and preventive vaccines for HIV/AIDS-related lung diseases
LSUHSCS	• Cardiovascular Diseases	• Institute of Cardiovascular Disease and Imaging (ICVDI) initiated and developed from the Malcolm Feist endowment • ICVDI supports intramural projects, including student/postdoctoral fellowships to faculty involved in cardiovascular research; ICVDI has also purchased major clinical equipment that supports care for patients • Success Stories • Dr. Chris Kevil: research indicating nitrite anion could act as a selective prodrug for nitric oxide delivery to ischemic tissues to stimulate new blood vessel growth and repair; TheraVasc Inc, a faculty-formed company to develop this research for market, has already shown success in providing research funding, completing clinical trials, establishing a patent portfolio (8 to date), and completing sponsored research projects identifying new therapeutic uses and pharmacological/chemical compositions of nitrite-based compounds
	• Neuroscience	• Two Endowed Chairs in neuroscience, both in neurosurgery • Dr. Nicholas Goeders' research for developing a new treatment for cocaine addiction funded by a $3.9 million NIH award; Embera Pharmaceuticals, a start-up company based on this research, is developing formulations of the drug to be used to treat patients

	• Cancer/Virology	• Louisiana Center for Excellence in Cancer Research and the Carroll Feist endowment provide funds
		• Feist-Weiler Cancer Center provides support for cancer research through purchase of major equipment, research grants to faculty, predoctoral awards to students, and seed packages for new faculty
		• Center for Molecular and Tumor Virology (CMTV) initiated from NIH COBRE grant of $18.2 million
		• Success Stories
		  • Feist-Weiler Cancer Center's Innovative North Louisiana Experimental Therapeutics Program (INLET) is a multi-institutional partnership with 5 other Louisiana universities; INLET also partners with the Southern Research Institute, a non-profit with a history of the development, patenting and use of a variety of drugs
		  • Focus of INLET on drug repurposing, to find other uses for drugs already developed to treat diseases such as cancer, diabetes, fungal infection and neurological disorders
		  • INLET also provides support for faculty seeking federal funding for drug discovery; discovering, developing and commercializing drugs; and increasing economic development in the I-20 corridor

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

	• Cellular Biophysics	• Mathematical modeling and experimental investigations including: protein folding studies to determine the effect of environmental factors on membrane-active antimicrobial peptides; remote stimulation of mammalian cells using nanoscale electrofields; dispersal of fatty structures and their effect on membrane properties; and ion channels and transport properties
		• Success Stories
		  • Dr. Armin Kogol: NSF EAGER (exploratory research) award to develop a remote stimulation technique for mammalian cells
		  • Dr. Jai Shanata: BoRSF RCS award for study of the impact of dietary fatty acids and cholesterol on lipid bilayer physical properties

	• 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		

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)
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)
	• Sustaining Health & Wellness	• Highly regarded domestic and international programs related to maintaining and assessing health, including programs in genetic services, health screening, maternal and child health, psychological trauma, nutrition and obesity, program evaluation and assessment, and training programs offered throughout the world • Significant translational research through direct and high-impact engagement with improvements to public health • Mary Amelia Douglas-Whited Community Women's Health Center • Maternal Child Health Leadership Training Program • Tulane Center for Evidence-Based Global Health

		• National Children's Health Study • Tulane Prevention Research Center • South Central Public Health Leadership Institute; South Central Public Health Training Center • Tulane Health Office of Latin America • Success Stories: Dr. Carolyn Johnson (Community Health Sciences); Dr. Pierre Buekens (Epidemilogy – Public Health); Dr. Larry Webber (Biostatistics – data collection)
	• 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"

ULM	• Biomedical & Health Care Advancements	• Research to enhance health, lifespan, and rehabilitation and to prevent or reduce illness and disability
		• Several partnerships with higher education institutions and private industry (pharmaceutical focus)
		• Success stories
		  • Recent NIH funding to study regulation of organ morphogenesis and breast cancer research
		  • Faculty received a patent for new and potent anticancer agents
		  • Faculty developed a new anti-cancer derived from the Red Sea sponge, with possible uses to control prostate cancer

UNO	• Advanced Materials	• Advanced Materials Research Institute • Success Stories • Dr. Gabriel Caruntu NSF CAREER Award • AMRI Summer Research Program

Xavier	• Cancer Research	• Louisiana Cancer Consortium – one of four institutions working to achieve NIH NIC Designated Cancer Center status
		• LCC new research facility and core labs
		• Louisiana Biomedical Research Network (LBRN): $16.6 million statewide NIH INBRE grant
		• Xavier Research Centers in Minority Institutions: Major Instrumentation Core, Cell and Molecular Biology Core, Molecular Structure and Modeling Core
		• Success Stories
		  ◦ Research Centers in Minority Institutions: $10.1 million NIH grant to advance Xavier's prominence in cancer research
		  ◦ DoD Breast Cancer: $1.2 million cancer drug discovery grant
		  ◦ 2 NIH R15 grants to support cancer research

	• 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

	• Health Disparities	• Center for Minority Health & Health Disparities Research (CMHDRE)
		• Areas of interest: diabetes research and education, cancer research and prevention/early detection education, asthma education and prevention, and cultural competence
		• Success Stories
		  ◦ Over $36 million from NIH for work in this area
		  ◦ Head off Environmental Asthma in Louisiana (HEAL) Phase II: $1.8 million grant from Merck Childhood Asthma Network, Inc. to improve pediatric asthma management in the New Orleans area
		  ◦ Louisiana Clincal and Translational Sciences Center (LA CaTS) led by PBRC: focus on prevention, care and research of chronic diseases in underserved populations