

Strategic Research Priorities Report

Louisiana State University and A&M College

Submitted to

Louisiana Board of Regents

Master Plan Research Advisory Committee

June 30th, 2013

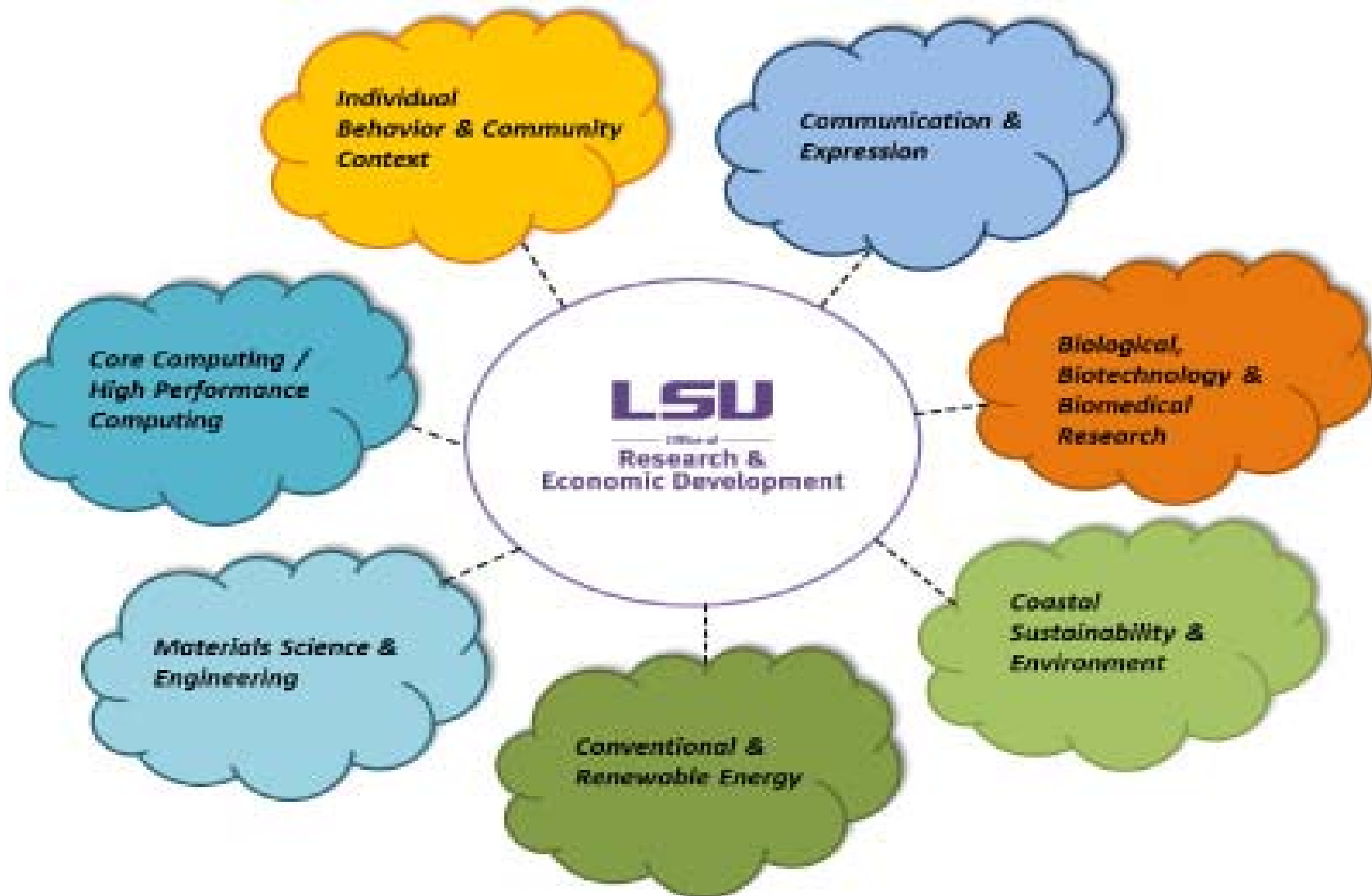
Section 1.A: Identification and Definition of Research Priority Areas

- Through a year long asset inventory and strategic planning process, the LSU A&M Office of Research & Economic Development (ORED) identified focal research priority areas beginning in mid 2012.
- There were numerous criteria used to identify these areas, including:
 - existing funding and scholarship production patterns
 - potential for growth based on anticipated federal priorities
 - faculty depth and extent of research infrastructure
 - Multi-, inter-, and trans-disciplinarity or potential for such
 - Relevance to state economic development priorities, culture, and history

Section 1.A: Identification and Definition of Research Priority Areas

- As a comprehensive institution, LSU A&M has significant depth of expertise in both the STEM areas and the social sciences, arts, and humanities.
- It is critical to note that the social sciences, arts and humanities have many connections or potential connections to the primarily STEM priority areas, especially in the areas of Coast & the Environment and Conventional & Renewable Energy. LSU's commitment to further enhancing non-STEM scholarship and creative activities is reflected in the fact that 2 of the priority research areas delineated below are non-STEM.
- Each of the 7 priority areas discussed below has several sub-themes or strands of research strength, and the main priority areas should be considered umbrella terms.

Section 1.A: Identification and Definition of Research Priority Areas



Section 1.A: Identification and Definition of Research Priority Areas

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.



Section 1.A: Identification and Definition of Research Priority Areas

Coastal Sustainability & Environment:

- Environmental, social and economic sustainability in coastal landscapes of the Mississippi River and deltaic coasts around the world.



Section 1.A: Identification and Definition of Research Priority Areas

Conventional & Renewable Energy:

- Exploration of efficient extraction of conventional energy and renewable energy in a sustainable fashion for various applications.



Section 1.A: Identification and Definition of Research Priority Areas

Materials Science & Engineering:

- The science and engineering of the fabrication and characterization of advanced materials and their applications in various sectors of our economy and daily life.



Section 1.A: Identification and Definition of Research Priority Areas

Core Computing/High Performance Computing:

- Enable breakthroughs in computational science and its applications in various areas in science, engineering and arts.



Section 1.A: Identification and Definition of Research Priority Areas

Individual Behavior & Community Context

- Research on the 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 cultural community contexts produce differential outcomes.



Section 1.A: Identification and Definition of Research Priority Areas

Communication & Expression

- The scientific, humanistic and artistic dimension of the human communicative experience and how they intersect with and augment in novel ways the process of discovery.



Section 1.A: Alignment with FIRST Louisiana

LSU Priority Research Areas	Core Industry S&T Sectors	High Growth Target Industries
Core Computing/High Performance Computing	Health Care; Arts and Media; Info. And Tech. Services; Energy and Environment	Digital Media; Coastal Resilience; Cyber Security; Biomedical; Bioengineered Solutions
Materials Science & Engineering	Energy and Environment; Health Care; Aerospace	Materials and Chemicals; Energy Production; Coastal Resilience; Bioengineered Solutions
Coastal Sustainability & Environment	Energy & Environment; Agricultural and Biological Production	Coastal Resilience
Conventional & Renewable Energy	Petrochemical; Energy & Environment; Transportation, Construction and Manufacturing	Energy Production; Materials and Chemicals
Biological, Biotechnology & Biomedical Research	Agricultural and Biological Production; Health Care	Biomedical; Bioengineered Solutions
Individual Behavior & Community Context	Energy and Environment; Info Technology and Services; Arts and Media; Specialty Health Care	Energy Production; Coastal Resilience; Digital Media; Biomedical
Communication & Expression	Energy and Environment; Arts and Media	Energy Production; Coastal Resilience; Digital Media

Section 1.A: Alignment with FIRST Louisiana

- According to data provided by LSU A&M in the GRAD Act Report of 2013, 47.6% of faculty held active research grants in 2011-12, and 44% of faculty held active research grants that were classified as being aligned with Louisiana's key economic development industries. **This means that 93% of grant activity during this time period involved research that was aligned with the state's key economic development industries.** Nearly all of the funded research taking place at LSU A&M relates to the state economic development priority areas.

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

- Narrative descriptions for each focal area as well as a mapping of investment across levels of FIRST LA are provided in the following section.
- As the Flagship University with approximately 1,000 active faculty members, it is not feasible to provide an exhaustive narrative of faculty scholarship in each focal area. The narrative therefore focuses on New or Emergent research activities, and how they support or extend existing priority area strengths.
- This approach is designed to demonstrate that ORED has been actively planning for future growth with the goal of aggressively building each of the priority research areas.

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Biological, Biotechnology & Biomedical Research:

New Research Areas: A new research group is being formed in the area of bioinformatics to support the strong genomics/evolutionary biology focus which exists, but also to support other areas of biology which utilize large sets of data. CCT worked closely with the director of Pennington Biomedical Research Center and ORED to convene a panel of 8 experts in the field from across the U.S. that came to LSU and developed a report providing a path forward in this area. The leadership in this area is currently assessing the feasibility of the recommendations and moving forward on a strategic hiring plan for a director of the Bioinformatics Core. An additional emerging cluster is the Center for Infectious Disease which is founded on nearly 10 years of NIH COBRE funding and involves faculty in the SVM, College of Science, College of Agriculture and the Tulane National Primate Research Center. A Core grant for this group is being developed for submission to NIH.

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Biological, Biotechnology & Biomedical Research:

Investment Across Levels of FIRST LA:

- Blue Ocean Target: Specialty Health Care
- High Growth Target: Biomedical; Bioengineered Solutions
- Core Industry S&T Sectors: Agricultural and Biological Production; Health Care
- Translational Research Domains: Biomedical; Digital; Agricultural
- Core Enabling S&T Research: Bioscience; Biotechnology; Computational Science
- 21st Century Building Blocks: Atoms and Molecules; Bits and Bytes; Nucleic and Amino Acids
- Foundational Sciences: Biological Sciences; Biomedical Sciences; Physics; Chemistry; Engineering; Computer Science; Economics and Social Sciences

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Coastal Sustainability & Environment:

New Research Areas: Coastal Sustainability & Environment has a faculty leadership committee that has developed an MOU with ORED to restructure the Coastal Studies Institute and organize it as a research unit that will have resources invested from both ORED and the Graduate School with the goal of significant growth. Members of this group also took leadership on an NSF IGERT submission on sustainable deltaic coasts that is currently under review. In addition, ORED leadership has been working with the Coastal Sustainability Studio to facilitate collaborations with social scientists and humanists from across campus to consolidate non-STEM research strengths on coastal communities into a more cohesive portfolio, and to help bridge the STEM and non-STEM faculties. The goal of this effort is to establish LSU as the epicenter of community-level research on coastal issues in the region. ORED also led a search to hire a new Director for the Louisiana Sea Grant College Program (Dr. Robert Twilley), a core unit that lies at the intersection of research and outreach for the entire Coastal Sustainability & Environment focal area that is critical to future success and growth in this area. This unit is also taking the lead on submitting a Coastal SEES (Science, Engineering and Education for Sustainability) proposal to NSF, a major step forward in this area.

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Coastal Sustainability & Environment:

Investment Across Levels of FIRST LA:

- Blue Ocean Target: Water Management
- High Growth Target: Coastal Resilience
- Core Industry S&T Sectors: Energy and Environment; Agricultural and Biological Production
- Translational Research Domains: Coastal; Environmental; Agricultural
- Core Enabling S&T Research: Computational Science; Bioscience
- 21st Century Building Blocks: Atoms and Molecules; Bits and Bytes
- Foundational Sciences: Chemistry, Engineering; Computer Science; Earth Science; Agricultural Science; Economics and Social Sciences

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Conventional & Renewable Energy:

New Research Areas: A concerted effort to bring together the various scientific, engineering, economic and social dimensions is underway. We have already succeeded in attracting a new \$12.5 million Energy Frontier Research Center (EFRC) from the Department of Energy that is headed by a chemical engineer, Prof. Jerry Spivey. Similarly, the Turbine Innovation Energy Research (TIER) unit is another important research center on campus headed by a mechanical engineer, Prof. Sumanta Acharya. LSU also has significant assets in the areas of energy and policy analysis via the Center for Energy Studies on campus. Exploration issues with respect to both on-shore and off-shore activities form the core of several high profile research programs in engineering and the sciences. For example, LSU has the only University-based Petroleum Engineering Research & Technology Transfer, or PERTT, Laboratory - also commonly referred to as the "Well Facility" – in the country. This is an industrial-scale facility with full-scale equipment and instrumentation for conducting training and research related to borehole technology.

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Conventional & Renewable Energy:

Investment Across Levels of FIRST LA:

- Blue Ocean Target: Next Generation Auto; Renewables and Efficiency; Next Wave Oil and Gas
- High Growth Target: Energy Production; Materials and Chemicals
- Core Industry S&T Sectors: Petrochemical; Energy and Environment; Transportation, Construction and Manufacturing
- Translational Research Domains: Energy; Environmental
- Core Enabling S&T Research: Materials Science; Nanotechnology
- 21st Century Building Blocks: Atoms and Molecules
- Foundational Sciences: Chemistry; Engineering; Earth Science; Agricultural Science; Biological Sciences; Economics and Social Sciences

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Materials Science & Engineering:

New Research Areas: The hiring of a National Academy of Sciences member, Prof. Ward Plummer and several others has provided the essential leadership to make this focal area a particularly effective one to pursue for LSU. An instrumentation committee and an educational initiatives committee have been established and are providing leadership and direction to faculty on these fronts. A new, 85,000 sq.ft., Chemistry and Materials building was recently dedicated to this effort on campus. A shared instrumentation facility to support this area is now dedicated in the new building and a new graduate degree certification program is now ongoing. ORED has also invested heavily in new instrumentation acquisition for furthering this research area, and is currently drafting an MOU detailing a plan to facilitate a self-sustaining shared instrumentation facility. Faculty leaders are also engaged in drafting the requisite materials to try and establish an Institute for Advanced Materials as a Board of Regents approved center.

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Materials Science & Engineering:

Investment Across Levels of FIRST LA:

- Blue Ocean Target: Renewables and Energy Efficiency; Specialty Healthcare; Next Generation Auto; Digital Media/Software Development; Next Wave Oil and Gas
- High Growth Target: Materials and Chemicals; Energy Production; Coastal Resilience; Bioengineered Solutions
- Core Industry S&T Sectors: Energy and Environment; Health Care; Aerospace
- Translational Research Domains: Energy; Environmental; Digital; Biomedical
- Core Enabling S&T Research: Materials Science; Nanotechnology; Computational Science; Bioscience; Biotechnology
- 21st Century Building Blocks: Atoms and Molecules; Bits and Bytes
- Foundational Sciences: Physics; Chemistry; Engineering; Computer Science; Biomedical Sciences

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Core Computing/High Performance Computing:

New Research Areas: ORED negotiated the appointment of a new Director for the Center for Computational Technology (CCT) in December of 2010 (Dr. Joel Tohline). CCT is the focal point for research in the Core Computing/High Performance Computing cluster and interacts with all other clusters. CCT, in collaboration with the Coastal Sustainability & Environment focal area, has established a hiring plan to recruit four computational modelers to LSU with the goal of both strengthening our computational modeling expertise and reviving our strength in preparing for and analyzing disaster related phenomena, especially with respect to hurricanes and modeling coastal land-loss and restoration processes . LSU also has made a substantial investment (several million dollars) in obtaining the new Super Computer on campus with funds allocated for further upgrades every three to four years. The new High Performance Computing (HPC) system, SuperMike II, provides 10 times the computing capacity of the system it replaces. Finally, under the leadership of Governor Bobby Jindal, the Louisiana Department of Economic Development (LED) partnered with the LSU Research Foundation to fund the construction of a new building – the Louisiana Digital Media Center (LDMC) – on the LSU campus. Recently completed, the LDMC will jointly house the CCT and EA Sports, a private company whose principal focus is video game design. This project developed as a result of the growing realization that research, workforce training, and economic development in the rapidly developing digital media arena can benefit from a strong partnership between the state, private industry, and CCT’s AVATAR (Arts, Visualization, Advanced Technologies, and Research) program.

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Core Computing/High Performance Computing:

Investment Across Levels of FIRST LA:

- Blue Ocean Target: Digital Media/Software Development; Specialty Healthcare; Water Management
- High Growth Target: Digital Media; Coastal Resilience; Cyber Security; Biomedical; Bioengineered Solutions
- Core Industry S&T Sectors: Health Care; Arts and Media; Information Technology and Services; Energy and Environment
- Translational Research Domains: Energy; Coastal; Environmental; Digital; Biomedical
- Core Enabling S&T Research: Computational Science; Information Technology
- 21st Century Building Blocks: Bits and Bytes
- Foundational Sciences: Physics; Math; Engineering; Computer Science

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Individual Behavior & Community Context

New Research Areas: A research group has been established that has partnered with the Office of the Mayor-President and the East Baton Rouge Parish District Attorneys Office to establish the Baton Rouge Area Violence Elimination Program (BRAVE). This effort immediately resulted in a \$1.5 million dollar grant to implement the Group Violence Reduction Strategy – a nationally acclaimed community crime reduction model – in specific neighborhoods in Baton Rouge. Several other research groups are in development in this area as well, including one focused on health behaviors and health communication. The entire focal area is supported by significant research infrastructure, including the Office of Social Service Research and Development and the Public Policy Research Lab, a state of the art survey research lab with a 46 station computer assisted telephone interviewing system which conducts surveys year around.

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Individual Behavior & Community Context

Investment Across Levels of FIRST LA:

- Blue Ocean Target: Renewables and Energy Efficiency; Water Management; Digital Media; Specialty Healthcare
- High Growth Target: Energy Production; Coastal Resilience; Digital Media; Biomedical
- Core Industry S&T Sectors: Energy and Environment; Information Technology and Services; Arts and Media; Health Care; Agricultural and Biological Production
- Translational Research Domains: Energy; Coastal; Environmental; Digital; Biomedical; Agricultural
- Core Enabling S&T Research:
- 21st Century Building Blocks:
- Foundational Sciences: Economics and Social Sciences; Humanities and Arts

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Communication & Expression

New Research Areas: A key cluster within this focal area is the political communication collaboration between the department of political science and the Manship School of Mass Communication. ORED provided funding to help host a pre-conference workshop on Political Communication in August 2012 that was planned to take place just prior to the American Political Science Association Annual meeting. Unfortunately, Hurricane Isaac forced the cancelling of both events, but momentum still exists and ORED is working with the faculty leadership driving this effort to ensure that it gains additional traction. Political communication research is facilitated by the Media Effects lab, a 16 station experimental lab that allows the collection of data on physiological responses to media messages. The Deans of the Colleges of Engineering and Music and Dramatic Arts have joined forces to link LSU with a group of national research institutions on the A2RU initiative (Alliance for the Arts in Research Universities), the local version of which is termed 'enOvation'. In addition, A digital humanities effort is being spearheaded by Dr. Jerry Kennedy in the dept. of English, which has potential for national collaborations as well. ORED leadership recently convened a series of meeting with the Deans and research Deans of the non-STEM colleges in order to discern additional focal areas and formulate an action plan to foster faculty leadership. A primary focal area to emerge from these discussions is Cultural Computing – a research cluster intersecting the expressive arts with the high performance computing capacity of LSU's CCT. Faculty leaders for this cluster are currently being recruited.

Section 1.B.1: Narrative Justification for Each Priority Research Area and Investment Across Levels of FIRST Louisiana

Communication & Expression

Investment Across Levels of FIRST LA:

- Blue Ocean Target: Renewables and Energy Efficiency; Water Management; Digital Media
- High Growth Target: Energy Production; Coastal Resilience; Digital Media
- Core Industry S&T Sectors: Energy and Environment; Arts and Media
- Translational Research Domains: Energy; Coastal; Environmental; Digital
- Core Enabling S&T Research:
- 21st Century Building Blocks:
- Foundational Sciences: Economics and Social Sciences; Humanities and Arts

Section 1.B.3.ii: Active Awards and External Funding

- The data reported in the following slide are drawn from a listing of all active accounts having a function code for research (as opposed to instruction, public service, etc.).
- The source of funds is broken out by State and Local sponsored agreements, Federal sponsored agreements, and Private sponsored agreements, including foundation accounts and gifts. Only external sponsored agreements are tabulated.
- The data are updated as of May 31st, 2013.
- Classification of more than 1900 active accounts with associated PI, title, granting agency, department or research unit, and so forth was done manually.
- The data are classified by the 7 priority research areas, as well as an 8th area, 'Other' for those cases that did not clearly fit into a priority research area. Given the labor intensive classification process and its necessarily subjective nature, obvious caveats in the interpretation of these data apply.

Section 1.B.3.ii: Active Awards and External Funding

External Sponsored Agreements			
	State and Local	Federal	Private
Biological, Biotechnology and Biomedical	\$2,536,563	\$54,823,358	\$7,460,837
Coastal Sustainability and Environment	\$14,945,729	\$14,724,606	\$13,119,202
Conventional and Renewable Energy	\$3,010,808	\$13,481,074	\$6,867,775
Materials Science and Engineering	\$18,691,966	\$19,744,136	\$3,136,475
Core Computing/High Performance Computing	\$12,994,171	\$13,059,591	\$1,239,151
Individual Behavior and Community Context	\$2,586,205	\$4,086,885	\$1,125,515
Communication and Expression	\$1,437,553	\$1,773,705	\$584,532
Other	\$57,405,404	\$41,088,089	\$11,303,184

Section 1.B.3.iii: Active Awards and External Funding

Selected Awards, Editorships, and Recognitions: 2012-13

- Robert Carney, Dept. of Oceanography and Coastal Studies, named to National Academy of Sciences' Gulf of Mexico Program Advisory Group.
- Lauren Pharr, PhD candidate, Dept. of Geography and Anthropology, selected as Visiting Scientist with Forensic Anthropology Unit of Office of Chief Medical Examiner in NYC.
- Coastal Sustainability Studio, College of Art and Design, awarded Association of Collegiate Schools of Architecture Collaborative Practice Award.
- Gabriela Gonzalez, Dept. of Physics and Astronomy, elected spokesperson for Laser-Interferometer Gravitational-Wave Observatory Scientific Collaboration (more than 900 worldwide members)
- Omowumi Iledare, Center for Energy Studies, named President-Elect of International Association for Energy Economics
- Margaret Reams and Nina Lam, Dept. of Environmental Sciences, Keynote Speakers at International Conference on Flood Awareness and Community Resilience.

Section 1.B.3.iii: Active Awards and External Funding

Selected Awards, Editorships, and Recognitions: 2012-13

- Susanne Brenner, Rongying Jin, Marcia Newcomer, and Kenneth Schafer named Fellows of the American Association for the Advancement of Science
- Susanne Brenner and James Oxley named Fellows of the American Mathematical Society
- Jeffrey Blackmon named Fellow of the American Physical Society
- Bradley Cantrell, Landscape Architecture, winner of 2013 Garden Club of America Rome Prize in Landscape Architecture
- Cara Blue Adams, Southern Review, awarded Virginia Center for the Creative Arts Fellowship
- Dennis Parker, School of Music, performance at Carnegie Hall
- James Honeycutt, Dept. of Communication Studies, Outstanding Scholar in Communication Theory from the Southern States Communication Association

Section 1.B.3.iii: Active Awards and External Funding

Selected Awards, Editorships, and Recognitions: 2012-13

- Katherine Kemler, College of Music and Dramatic Arts, 2013 SEC Faculty Achievement Award
- Pamela Pike, School of Music, Article of the Year by American Music Teacher
- John Finley, Dept. of Food Science, Harris Award for Excellence in Food Science and Technology
- Samuel Robison, LSU School of Social Work and Office of Social Service Research and Development, named Fellow of Center for Juvenile Justice Reform
- Cristina Caminita, LSU Libraries, selected as Emerging Leader by American Library Association
- Graham Bodie, Dept. of Communication Studies, ranked in top 1% of most prolific scholars publishing in communication journals
- Graham Bodie, Dept. of Communication Studies, 2012 Early Career Award from Interpersonal Communication Division of National Communication Association

Section 1.B.3.iii: Active Awards and External Funding

Selected Awards, Editorships, and Recognitions: 2012-13

- Rudy Hirschheim, Dept. of Information Systems and Decision Sciences, Honorary Doctorate awarded by University of Bern
- Keena Arbuthnot, School of Education, Fellow at Teachers College, Columbia University
- Gary Sanger, Dept. of Finance, 2012 best paper in investments from Southern Finance Association
- Michellyn McKnight, School of Library and Information Science, Keynote Speaker, Dutch Association of Librarian and Information Professionals
- Craig Colten, Dept. of Geography and Anthropology, Keynote Speaker, Disaster and Risk Management in Columbia
- Sudipta Sarangi, Dept. of Economics, Guest Editor, Mathematical Social Sciences
- Nancy Rabalais, Adjunct Professor in School of Coast and Environment and Director of Louisiana Universities Marine Consortium, named MacArthur Fellow

Section 1.B.3.iii: Active Awards and External Funding

Selected Awards, Editorships, and Recognitions: 2012-13

- Isiah Warner, Dept. of Chemistry and Office of Strategic Initiatives, American Chemical Society's Award in Analytic Chemistry
- Brad Cantrell and Wes Michaels, School of Landscape Architecture, Award of Excellence in Communications by American Society of Landscape Architects
- Keith Sandiford, Dept. of English, 2012 Frantz Fanon Prize for Lifetime Achievement by the Caribbean Philosophical Association
- Areendam Chandra, Dept. of Economics, Associate Editor, Southern Economic Journal
- Craig Colten, Dept. of Geography and Anthropology, Fellow at the Rachel Carson Center for Environment and Society
- Eugene Turner, Dept. of Coastal Studies, Wetland Lifetime Achievement Award at the International Wetland Conference
- Archival Education Collaborative, founded by Elizabeth Dow, School of Library and Information Sciences, Distinguished Service Award from Society of American Archivists

Section 1.B.3.iii: Active Awards and External Funding

Selected Awards, Editorships, and Recognitions: 2012-13

- Ursula Emery McClure, School of Architecture, Charles E. Peterson Prize, American Institute of Architects (and others)
- Arjen Boin, adjunct Professor in Public Administration Institute, Keynote Speech, OECD conference on Interagency Crisis Management
- Mary Beth Lima, Dept. of Biological and Agricultural Engineering, named Fellow of American Society of Engineering Education
- Charles D’Agnostino, Louisiana Business & Technology Center, Outstanding Leadership in Technology Award
- Bulent Unel, Dept. of Economics, named Associate Editor of Southern Economic Journal

Section 1.C: Success Stories

Biological, Biotechnology & Biomedical Research:

- Daniel Hayes, assistant professor of biological and agricultural engineering at LSU, and his research team developed a novel and so far effective way to allow surgeons to reduce the risk of antibiotic resistance during radical reconstructive surgery (like knee/hip replacements) while still curing the infection. They created a “theranostic” particle – an element both therapeutic and diagnostic – which can be injected into the body and coded to identify the precise location of an infection, avoiding wasteful use of antibiotics and ensuring rapid recovery with less chance of resistance. Pennington Biomedical Research Center and the LSU Health Sciences Center are involved in Hayes’ work. Currently, the CDC estimates approximately 1 million such surgeries occur each year, with 15-20 percent resulting in amputations due to antibiotic resistance. There is significant potential for the commercialization of this work.

Section 1.C: Success Stories

Biological, Biotechnology & Biomedical Research:

- LSU researchers developed Cycloset, a diabetes drug currently on the market that works by delivering a rapid pulse of dopamine activity to the brain to offset insulin resistance stimulated when the natural peak of dopamine at the biological clock (suprachiasmatic nuclei of the hypothalamus) is disrupted and reduced. The researcher started a small company called Ergo Science (now Veroscience LLC), and LSU subsequently negotiated an exclusive license to the technology granting Ergo the rights to develop and market the new drug. Approximately 10% of Louisiana residents have been diagnosed with diabetes by a physician, and in 2006, the total cost of diabetes to Louisiana was approximately \$2,431,000,000. LSU currently receives royalty income from this license.

Section 1.C: Success Stories

Biological, Biotechnology & Biomedical Research:

- Zhiqiang Deng, associate professor of Water Resources and Coastal Engineering in the Department of Civil & Environmental Engineering, uses satellite data from NASA to develop better tools for predicting and preventing seafood contamination. In 2013, Deng and his research group became the first group of scientists in the world to predict oyster norovirus outbreaks in advance when they correctly predicted the outbreak in Cameron Parish Oyster Harvesting Area 30 weeks before it occurred. The total economic impact of the commercial oyster industry annually is \$317 million dollars and 3,565 jobs, and each day 1.3 million Louisiana-produced oysters are consumed somewhere in the U.S. Deng's research, conducted in collaboration with the Louisiana Department of Health and Hospitals (LDHH), is a major breakthrough in protecting public health, and in mitigating potentially harmful economic impacts to Louisiana's oyster industry.

Section 1.C: Success Stories

Coastal Sustainability & Environment

- LSU researchers recently received a \$1.5 million NSF grant to investigate the sustainability of coastal communities where land loss, subsidence, sea-level rise, flooding, hurricanes and oil spills have had a major impact for years. Research will focus on the Lower Mississippi River Basin in Louisiana, one of the most vulnerable coastlines in the world. Dr. Nina Lam's, professor of environmental science, group will look at areas north of Lake Pontchartrain and compare to portions south of the lake. During the past decade significant population and economic growth has occurred in the northern part of the study area, while the southern part surrounding New Orleans has experienced population and economic decline. The findings from this project will inform policy makers and the public on how to increase resilience of the region and provide scenarios for a sustainable community & economic growth plan.

Section 1.C: Success Stories

Coastal Sustainability & Environment

- LSU engineer Joshua Kent has been funded by the Gulf Coast Evacuation & Transportation Resiliency Program and the U.S. Department of Transportation to assess the vulnerability of hurricane evacuation routes in coastal Louisiana to flooding and storm surge events, given current and future rates of land loss. Kent has harnessed the accurate measurement capabilities of the Center for Geoinformatics' network of continuously operating GPS stations to assess the consequences of relative sea-level rise on roads and communities in Louisiana. Kent found that storm surge events and land subsidence combine to increase vulnerability of roadways, and that nearly 60 miles of roadways that serve as important transportation and evacuation routes will be vulnerable by 2100. This is critical information for the state to have as it makes emergency planning decisions and makes significant economic investment in developing new roadways.

Section 1.C: Success Stories

Conventional & Renewable Energy

- Multiphase Flow in Chemical Process Modeling - Led by Gordon A & Mary Cain Endowed Chair Professor, Dr. K. Nandakumar, in the Cain Department of Chemical Engineering; a team of seven LSU Engineering faculty, along with one LSU Ag Center faculty member have established a research cluster to support the growing needs of the Energy and Chemical industries of Louisiana. This public-private research initiative aims to understand current industrial applications and work to improve the equipment design and process operations in chemical, energy, environmental, petroleum, and mineral industries involving complex flows spanning across multiphase reactors, turbulent and non-Newtonian flow regimes in real process systems using advanced simulations coupled with proper pilot/field scale validation studies. Participation and support from companies with Louisiana operations such as Dow Chemical, Shell, and Total have been involved with Dr. Nandakumar's team to address challenges in understanding multiphase flow processes to achieve process innovation in chemical, oil and gas, petroleum and bio-process industries. The group has also made it a priority to ensure goals and metrics of the consortia align with the Louisiana Chemical Association's Eight-Point Plan.
- This group of researchers will engage the local process industries in a variety of ways to bring economic value by bringing innovations to traditional process operations using advanced computer based simulation tools; providing key support to the energy sector as their rapid growth in the State of Louisiana continues.

Section 1.C: Success Stories

Conventional & Renewable Energy

- Center for Atomic Level Catalyst Design - Led by McLaurin-Shivers Professor, Dr. James Spivey, the Center for Atomic Level Catalyst design is supported by a \$12.5M Department of Energy research grant. Catalysts are critical to the development of virtually every energy resource such as: solar photolysis, syngas conversion, methane activation, and CO₂ reduction. LSU's Center for Atomic Level Catalyst Design brings together a team of researchers whose goal is to advance the tools of computational catalysis, materials synthesis, and characterization far beyond the status quo. The mission of the Center is to advance the ability of computational methods to accurately model catalytic reactions on solid surfaces over time and length scales far more representative of realistic conditions than is possible at present; and to advance the tools of materials synthesis/characterization, so that atomically precise catalysts identified by computation can be prepared and characterized unambiguously.
- The six projects that comprise the Center's research efforts have the common objective of advancing the tools of computational catalysis, atomically precise synthesis, and atomic-level characterization; they are: wet chemical synthesis of atomically precise nanocatalysts, control of structures on complex catalyst supports, electrocatalytic reduction of CO₂, activation of CO on metal clusters, nano-structured catalysts for CO activation, and modeling and synthesis of rare earth oxides. The potential for such technology results in energy independence using domestic natural gas, or the ability to use CO₂ in solar-driven reactions to make clean fuels, or directed conversion of methane to valuable intermediates in a single step. With Louisiana's position in the energy-sector as a natural gas production hub, Dr. Spivey's team of 23 researchers are leading the efforts for the state to achieve energy independence.

Section 1.C: Success Stories

Core Computing/High Performance Computing

- LSU's College of Engineering has partnered with Louisiana Economic Development to rapidly grow the state's technology workforce and support the new IBM Services Center in Baton Rouge. The center is the result of an innovative, public/private partnership that will include expanded higher-education programs related to computer science. The center will employ a broad range of college graduates and experienced professionals with backgrounds in computer science and other quantitative-intense fields, such as engineering, mathematics, and science to provide software development and software maintenance services to clients in the United States. In addition to the 800 jobs that will be created at the center over the next four years, LSU estimates the project will result in approximately 542 new indirect jobs, for a total of approximately 1,342 new, permanent jobs in the Capital Region. The local economic impact resulting from this partnership will be substantial.

Section 1.C: Success Stories

Core Computing/High Performance Computing

- LSU's SuperMike II has the capacity of 440 desktop computers with the capability of running 7,000 different programs simultaneously. It has the capability of providing immeasurable value to the state and society at large. For instance, smaller computers are capable of simulating within 10 to 50 miles where a storm surge will come on land. SuperMike II has the capability of possibly projecting within a few meters where the same surge will come ashore. It also holds great appeal for industries ranging from oil and gas to healthcare, and everything in between, increasing the likelihood of significant partnerships between LSU and industry in the near future.

Section 1.C: Success Stories

Core Computing/High Performance Computing

- The Louisiana Digital Media Center on LSU's Campus, built with funds from the Louisiana Department of Economic Development and the LSU Research Foundation, serves as a unique resource for both private sector companies involved in digital media — with EA Sports as the anchor private tenant — and the new home for LSU's Center for Computation and Technology (CCT). This center will create an innovative research environment, advancing computational sciences and technologies, including digital media. It is the anchor building of the campus' research quadrant, serving as a sister facility to the Louisiana Emerging Technology Center, a wet-lab business incubator. It is anticipated that this state of the art facility will attract other industrial & commercial partners.

Section 1.C: Success Stories

Core Computing/High Performance Computing

- LSU partnered with Electronic Arts Inc. for a global quality assurance center – the first of its kind in the United States – located on campus. It currently employs more than 250 video game developers, designers, and testers. EA's decision to locate in Baton Rouge and partner with LSU made the region even more attractive to game developers and film studios by demonstrating the benefits of LSU's research capacity and student employment pool.

Section 1.C: Success Stories

Materials Science & Engineering

- LSU's Center for Advanced Microstructures and Devices, or CAMD, recently received a \$1.26 million grant to purchase and install a new superconducting multi-pole wiggler, or MPW, at the CAMD synchrotron ring. The wiggler allows a 1990's synchrotron to perform at the level of a 2013 synchrotron, allowing CAMD and LSU to facilitate important testing by companies such as Albemarle, a global company headquartered locally with \$2.363 billion annual earnings. CAMD instrumentation can analyze physical and chemical changes in Albemarle's flame retardant polymer blends while samples are burned. Albemarle is a significant contributor to the local economy, employing approximately 280 people with average salary of \$88,000, giving Louisiana residents and LSU graduates a reason to stay in-state once they've received a degree. The new wiggler at CAMD also holds additional potential for drug discovery and development, and will likely attract additional industrial and commercial collaborations.

Section 1.C: Success Stories

Materials Science & Engineering

- Yi Li, Physics & Astronomy PhD Materials Science Student, started Renogy, a solar solution start-up company and supplier of improved solar energy modules, or solar cells. Using knowledge developed in the laboratory, Li has created silicon solar cells with improved material surface texturing that improves the output and efficiency of her company's solar panels. Renogy is housed in the Louisiana Business & Technology Center on LSU's South Campus. Renogy collaborates with Shangpin Solar, a solar panel factory in Shanghai, China, to create solid state electrical devices that convert the energy of sunlight directly into electricity. On the manufacturing side, Renogy has been able to help Shangpin Solar apply atomic-level characterization to their solar panel surfaces, in order to check the quality of the surfaces. This process is a specialty of materials science research at LSU by which Li has been able to update Shangpin Solar's factory equipment in order to visualize the surfaces of their products to improve the quality of the panels. The LSU Materials Science program at LSU enabled Li's research experiences to make her company possible.

Section 1.C: Success Stories

Individual Behavior & Community Context

- The Baton Rouge Area Violence Elimination Program (BRAVE) is a partnership between LSU, the Baton Rouge Mayor's and District Attorney's offices, local law enforcement, social service providers, and community organizations and stakeholders. It focuses on reducing violence in the 70805 zip code of north Baton Rouge by implementation of the nationally acclaimed Group Violence Reduction Strategy. This project received \$1.5 million in joint funding between the university and the municipal agencies for the program. Low crime rates are a pre-requisite for economic development in North Baton Rouge, and it is expected that the successful implementation of this program will pave the way for establishing economic growth and localized prosperity.

Section 1.C: Success Stories

Individual Behavior & Community Context

- The Division of Economic Development, housed in the Economics Department and the E.J. Ourso College of Business, works extensively with a number of agencies on Louisiana economic development initiatives. Under a standing contract with the Louisiana Department of Economic Development, the Division provides impact studies to evaluate the economic impact and tax revenue streams associated with proposed economic development projects. The Division also provides one time studies on specific topics such as the export content of various business sectors for the Department of Economic Development. The Division also works extensively with the Louisiana Workforce Commission on a variety of projects related to evaluating the needs of employers in Louisiana and better educating or training workers to take advantage of opportunities in Louisiana. The Division also provides regular reports to the Department of Health and Hospitals on the number of uninsured children and adults. Likewise, the Division provides an annual Tourism Satellite Account report to the Louisiana Department of Culture, Recreation and Tourism measuring the number of jobs and tax dollars attributable to tourism. The Division is also currently working on a project to quantify the economic value and potential economic impact of coastal erosion in Louisiana on the State and Nation as a whole. In summary, this unit is clearly integrated with key state agencies in the economic development process.

Section 1.C: Success Stories

Communication & Expression

- Founded in 1992, Swine Palace is a non-profit, professional company supporting the educational mission of the Louisiana State University Department of Theatre. Since its inception, Swine Palace has produced over 68 productions including many regional and world premieres. Recent productions such as KING HEDLEY II, SPEAK TRUTH TO POWER, THE EXONERATED and THE LARAMIE PROJECT have all contributed to Swine Palace's mission to produce plays of social relevance. In 2007, Swine Palace produced the world premiere of COCKTAIL, written by Vince LiCata and Obie award-winning theatre artist Ping Chong. Also in 2007, Swine Palace toured Wendy Wassersteins THE HEIDI CHRONICLES to the Shanghai Dramatic Arts Centre and the Beijing Central Academy of Drama becoming one of only a handful of American companies to perform at either of these prestigious institutions and the first to bring a professional production of a Wendy Wasserstein play to China.
- Since 1999, *Swine Palace's* estimated *economic impact* on Louisiana's economy is \$4 million. Swine Palace operates with a dual mission to provide South Louisiana with high quality, professional productions of classical and contemporary theater with an emphasis on plays exploring issues of social equity while also serving as a training ground for students in Louisiana State University's M.F.A. Professional Actor and Technical/Design Training Programs.

Section 1.C: Success Stories

Communication & Expression

- The Language Development and Disorders Lab in the Department of Communication Sciences and Disorders fosters research in child language development and disorders. The disorder that is primarily studied is **Specific Language Impairment (SLI)**. Although all aspects of the SLI condition can be studied within this lab, the work often focuses on these children's difficulties with vocabulary and grammar. Many who work in this lab are also interested in children's acquisition of different Louisiana dialects of English and the impact of these dialects on theoretical models of language development and disorders, language testing, and academic achievement. Language development of children reared in poverty and the role of prevention services for low-income families are other areas of research that we actively pursue.
- Lab researchers are currently working on a five-year project funded by NIH. The Co-PIs on the grant are: Janna Oetting, Michael Hegarty, and Janet McDonald. The work seeks to learn more about children who speak nonstandard English and who present specific language impairment. To do this work, they compare children with and without impairments who speak different Louisiana dialects of English.

Section 1.D: Key* Institutional Collaborations

Biological, Biotechnology & Biomedical Research

- The LSU School of Veterinary Medicine Division of Biotechnology & Molecular Medicine (BIOMMED) administers the Center for Experimental Infectious Disease Research (CEIDR), which is funded by the National Institutes of Health (NIH) Center for Biomedical Research Excellence (COBRE) mechanism. CEIDR is a strategic collaboration between LSU Baton Rouge and the Tulane National Primate Research Center located in Covington, LA.
- BIOMMED/CEIDR operates Centralized Core Laboratories that collaborate and provide support and services to scientists throughout Louisiana. Specifically, the GeneLab Core laboratory provides Next Generation Sequencing (NGS) and bioinformatics support (in collaboration with the LSU Center for Computation and Technology) to scientists at Tulane, LSUHSC-NO, Tulane, ULM, and others. BIOMMED/CEIDR's Protein Core located in the LSU main campus collaborates with the Public Health Service NIH-supported Hansen's Disease Center and the LSUHSC-NO-based vaccine center in the production of proteins and vaccines for various pathogens.
- BIOMMED administers the Molecular and Cellular Biology Core (MCBC) of the Louisiana Biomedical Research Network (LBRN), which is supported by the NIH Idea Network for Biomedical Research Excellence (INBRE) mechanism. MCBC collaborates and provides training and services with multiple institutions in Louisiana including, La-Tech, LSU-S, LSUHSC-NO, Tulane, Xavier, ULM, LSUHSC-S and others.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Biological, Biotechnology & Biomedical Research

- CosmoPHOS, international collaboration on novel therapeutic nanotechnology-enabled systems for the diagnosis and treatment of atherosclerosis (VetMed School).
- Development of a recombinant protein vaccine against Onchocerciasis. This is a 5 year \$5M NIH funded project to investigate the production of a vaccine against the nematode parasite *Onchocerca volvulus* the causative agent of river blindness. Over 120 million people are infected with this worm, primarily in west Africa. Three universities and one research institute are involved in this collaborative project. The project is in its fourth year of funding. Thomas R. Klei at the LSU School of Veterinary Medicine is the LSU PI. Other institutions in the group are the New York Blood Center in Manhattan NY, the Thomas Jefferson Medical School in Philadelphia PA and the National School of Tropical Medicine at the Baylor College of Medicine. The group also is developing collaborations with the University of Edinburgh, University of Glasgow, Imperial College and the University of Liverpool in the United Kingdom and University Hospital of Bonn, and Eberhard Karls University Tuebingen in Germany.
- The NIEHS funded Superfund project involves collaborations among LSU A&M, LSU HSC-NO and LSU HSC-S.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Biological, Biotechnology & Biomedical Research

- Batzer and Konkel labs: Collaboration with Dr. Prescott Deininger Tulane Cancer Center.
 - Actively collaborating with renowned scientists from the Tulane Cancer Center. The focus of this collaboration is the impact of mobile elements on human genomes in health and disease such as cancer. In the process of establishing a Center of Excellence in Genomic Science. Scientists from the University of Michigan and the Johns Hopkins University School of Medicine are also major partners of this collaboration.
- Collaboration with Dr. Lynn Jorde, University of Utah Health Sciences Center (Batzer and Konkel)
 - The collaboration between University of Utah and LSU is ongoing for more than 15 years. This collaboration centers upon mobile elements and their impact on population genetics as well as evolution.
- 1000 Genomes Consortium/Structural variation analysis group (Konkel, Ullmer and Batzer)
 - As part of the 1000 Genomes Consortium, we are collaborating with an international team from key universities around the globe. We are part of the Structural Variation analysis group and have submitted a U41 proposal with scientists from institutions such as Brigham and Women's/Harvard, the Broad Institute, University of Washington, Yale, Boston College, etc.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Biological, Biotechnology & Biomedical Research

- International genome consortia (Konkel, Ullmer and Batzer)
 - LSU is involved in a number of international genome consortia. Examples include the rhesus macaque genome consortium, the platypus genome consortium, the orangutan genome consortium, and the 1000 genomes consortium, among others. These collaborations have resulted in publications in leading journals such as Nature and Science. As a further consequence, collaborations between LSU and leading scientific institutions such as Baylor College of Medicine, Washington University, the University of Washington, Boston College, or Harvard have been established.
- NIH INBRE (the Louisiana Biomedical Research Network, LBRN) Ullmer
 - The NIH INBRE-supported Louisiana Biomedical Research Network (LBRN) is led by LSU (PI Tom Klei), with participation from numerous institutions across Louisiana. In more than a decade of continuous funding, it has brought \$50-60M research funding to Louisiana. LBRN's three functional cores are also lead by LSU faculty: Administrative Core (Bill Wischusen); Molecular and Cell Biology (Gus Kousoulas); and Bioinformatics, Biostatistics, and Computational Biology (Brygg Ullmer).
- LA CaTS (NIH IDeA-CTR) (Ullmer)
 - LA CaTS was funded as an NIH IDeA-CTR at \$20 million/five years. Lead by Pennington Biomedical Research Center, Tom Klei is on the advisory board; Brygg Ullmer serves as LSU + LBRN's Biomedical Informatics (BMI) Core liaison.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Coastal Sustainability & Environment

The LSU School of Coast & the Environment maintains substantial inter-institutional collaborations with a variety of partners. These include:

- Louisiana Universities Marine Consortium
- Louisiana Universities Gulf Research Collaborative
- Gulf of Mexico Universities Research Collaborative
- Southeastern Universities Research Association
- The Water Institute of the Gulf
- Northern Gulf Institute
- The National Council for Science and the Environment
- Consortium for Ocean Leadership

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Coastal Sustainability & Environment

- Louisiana Sea Grant manages or participates in more than 50 research, extension, education and communication projects across the coastal landscape. Sea Grant activities are focused on the challenges of sustaining fisheries, deltaic ecosystems, coastal communities, and advancing workforce development. To achieve these goals, Louisiana Sea Grant embraces 14 academic institutions, 19 coastal zone parishes, and numerous partners in state and federal agencies and the private sector.

Examples of collaborations include:

- Aiding local policy makers in St. Tammany Parish prepare for natural hazards through a series of workshops to educate leaders about sea level rise, the use of GIS data to evaluate community storm surge and sea level rise risk, as well as best practices in preparing for future hazards which included the legal liability of local governments that fail to act or act without consideration of pending hazards.
- Connecting leaders in the Town of Delcambre, LA – which had been devastated by recent hurricanes – with architecture students who worked with town officials and developed design concepts for redevelopment of the town’s waterfront. This port town has also been the site where innovative approaches to direct marketing have expanded the opportunity for shrimpers to sell their products to the public for higher return on their investment.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Coastal Sustainability & Environment

- In coordination with The Office of Community Development – Disaster Recovery Unit, the Louisiana Resiliency Assistance Program is being developed by the LSU Coastal Sustainability Studio to collect, develop, house, and disseminate current planning efforts, resources, and local best practices to promote, assist, and build networks around resiliency planning in Louisiana.
- A recent example of the program’s ability to work multi-institutionally was an opportunity to run a workshop for approximately 150 local, state, and federal planners, political figures, scientists, emergency managers, and others around the complex topic of the National Flood Insurance Program. The CSS through the partnership with OCD-DRU teamed up with LA Seagrant, the Agcenter, and the Southern Climate Impact Planning Program (SCIPP) to produce the workshop, which focused on strategies communities can use to effectively plan, in the short and long term, for changes to the National Flood Insurance Program (NFIP).

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Conventional & Renewable Energy

- DOE Energy Frontiers Research Center: Center for Atomic Level Catalyst Design. Partners include: Clemson University, University of Florida, Georgia Institute of Technology, Grambling University, Oak Ridge National Laboratory, Pennsylvania State University, Texas A&M University, Vienna University of Technology - Institute of Applied Physics, University of Utrecht, The Ohio State University
- Turbine Innovation Energy Research Center: Industry collaborators include General Electric, United Technology, Siemens-Westinghouse, Rolls Royce-Allison, Mitsubishi, Alston Power, Honeywell, Solar Turbines, Nasa-Glenn, Airforce Research Lab.
- Joint program with UTK, ORNL and LSU funded by DOE on emergent behavior under dimensional confinement

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Materials Science & Engineering

- LA-SIGMA: Louisiana Alliance for Simulation Guided Materials Applications. Alliance Institutions include: LSU, Grambling State, Louisiana Tech University, Southern University, Tulane University, University of New Orleans, Xavier University.
- Joint research program at the Institute of Physics funded by the Chinese Academy of Science. At the present it is just LSU and IOP but we will expand it to include other universities in the US. This project is about growing thin films of transition metal oxides with the objective of developing the next generation of electronic devices.
- Since 2012, a collaboration was initiated between Professor Wen Jin Meng's group at LSU, Prof. John W. Hutchinson of Harvard University, and Prof. Christian F. Niordson's group at the Technical University of Denmark (DTU). The goal is to combine the experimental expertise at LSU with micron size plasticity modeling and simulation expertise of Harvard/DTU to 1) arrive at a deeper understanding of materials mechanical response at micro/nano scales, 2) develop new micro/nano manufacturing technologies for metal-based structures, 3) develop simulation tools to guide future manufacturing technology development at micro/nano scales.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Materials Science & Engineering

- A brand-new effort is being developed in summer 2013, in response to a recently announced NSF EPSCoR RFP, in the area of advanced manufacturing in 1) micro/nano systems, 2) advanced composite materials. The EPSCoR collaboration will involve LSU, LaTech, and ULL in Louisiana, as well as Mississippi State University and Jackson State University in Mississippi. We expect to submit a NSF EPSCoR proposal in October 2013.
- The Center for Advanced Microstructures and Devices (CAMD) has standing relationships with several industrial users, including BASF, Sasol North America, Lion Co-Polymer, and NanoTerra.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Core Computing/High Performance Computing

- LSU is working with **11 universities in the states of Louisiana, Mississippi and Alabama** on the **NSF-funded “Northern Gulf Coast Hazards Collaboratory” project (NGCHC)**. The project’s objectives are: (1) to catalyze collaborative research via enhanced cyber-infrastructure that addresses a problem of major national importance – engineering design, coastal system response, and risk management of coastal hazards, as well as (2) to advance economic opportunities for the citizens by reducing risks to coastal vulnerabilities. LSU, as one of the major players in the project, has contributed to developing broad cyber-infrastructure investments using three prototype simulation experiments within NGCHC: (1) ADCIRC (storm surge model) Surge Guidance System; (2) River/Watershed Flood Modeling, and (3) Ecosystem Restoration and Flood Risks Reduction (ERFRR).
- Working with the **National Center for Supercomputing Applications (NCSA) located at the University of Illinois at Urbana-Champaign**, LSU researchers use the power of Blue Waters -- the NSF's largest high-performance computing system -- to study the physics of gamma ray bursts. It is one of the most important current questions in astrophysics because of their association with the most distant known objects in the Universe. The goal of is to optimize numerical codes for the petascale using an approach centered around the **Cactus software framework**. It is an award-winning platform for physics simulations and has served as a benchmark for supercomputers.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Core Computing/High Performance Computing

- In collaboration with **Southern University**, LSU is working on the **NSF-funded “MRI: Development of Melete” project** to extend the paradigm of *interactive* computing to high-performance computing clusters. The developed HPC cluster will enable research in biology, visualization of computational materials, displaying configuration space for computational mathematics, mapping and displaying data from robot mapped locations (e.g. archeology sites, urban environments, etc), and architecture visualization. This project will benefit society by balancing activities between research and research training contexts.
- For a number of years, together with the **Louisiana Optical Network Initiative (LONI) and the Southeastern Universities Research Association (SURA)**, LSU has used NSF funding to enhance and expand the **TeraGrid**, the system that integrates high-performance computers, data resources and experimental facilities across the United States. The project has: (1) contributed major new computational resources, exceeding 27.5 TFLOPS, to the TeraGrid; (2) provided new cyber-infrastructure and services to benefit the existing national community, and (3) brought additional user communities from underrepresented scientific application domains and geographic regions of the US. This new user base, already strong in traditional application areas such as physics, biology, and chemistry, has brought to the TeraGrid application disciplines that have not previously made heavy use of TeraGrid facilities, including arts and humanities, as well as emerging science areas, such as coastal modeling.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Individual Behavior & Community Context

- The Public Policy Research Lab annually partners with the CDC to conduct the Behavioral Risk Factor Surveillance Survey, with the Louisiana Department of Health and Hospitals to conduct the Louisiana Health Insurance Survey, and with the Manship School of Mass Communications to conduct the annual Louisiana Survey.
- The Life Course and Aging Center maintains collaborative programmatic relationships with Our Lady of the Lake College Gerontology Program, Our Lady of the Lake College Long-Term Care Administration Program, LSU-S Institute for Human Services and Public Policy, LSU-Monroe Institute of Gerontology, and others.
- The Louisiana population estimates program is a collaborative effort between the Louisiana Treasurer's Office, the LSU AgCenter, and the LSU Dept of Sociology. The program is responsible for developing parish and municipal population estimates that are used for state budgeting. Program staff utilize data from the Louisiana Department of Education, Louisiana Dept. of Health and Hospitals, and a survey of approximately 300 Louisiana municipalities. The program is a part of the U.S. census bureau federal-state cooperative population estimates program and provides input to census bureau staff on demographic trends in the state.

* Selected examples provided. Not a comprehensive accounting.

Section 1.D: Key* Institutional Collaborations

Communication and Expression

- The College of Engineering and the College of Music and Dramatic Arts are founding members of a group of institutions, including the University of Michigan, MIT, Johns Hopkins, Stanford, Vanderbilt, Penn State, Colorado, Florida and others called **A2RU**, the Alliance for the Arts in Research Universities.
- This alliance has resulted in the establishment at LSU of the enOvation Initiative.
- Sylvie Dubois, Gabrielle Muir Professor in French Studies and Director of the Center for French and Francophone Studies, is engaged in a multi-year, multi-university, multi-country project, sponsored by the Social Sciences Humanities Research Council of Canada, to understand the evolution of the French language in North America. The central goal is to analyze the practices and representations of French speakers and the communities they formed in order to determine how linguistic and identity borders intermesh. Professor Dubois is focusing on Antebellum Louisiana French.

* Selected examples provided. Not a comprehensive accounting.

Section 2.A: Institutional and External Support for Research Areas

- The research priority areas delineated in the ORED strategic plan are aligned with the Discovery goals of Flagship 2020:
 - Increase nationally-recognized research and creative activities.
 - Expand interdisciplinary solutions to significant social, environmental, economic, cultural, and educational problems.
 - Increase partnerships with industry to develop intellectual property and foster commercial applications.
- These research priority areas are also consistent with one of the 6 guiding principles of LSU 2015
 - Collaborative faculty research opportunities should be enhanced and administrative barriers in grant application must be removed. Innovative, entrepreneurial inter-disciplinary activities should be encouraged and enabled.
- The priority areas overlap very closely with the 6 focal areas recommended by the subcommittee on Research and Discovery to the LSU 2015 Transition Advisory Team (Coastal and Environmental Science and Engineering; Biological, Biotechnological and Biomedical Research; Energy; Computation and Digital Media; Arts and Humanities; Agriculture and Natural Resources).
- The priority areas have been ratified by the Executive Vice Chancellor and Provost and the LSU President/Chancellor.

Section 2.A: Institutional and External Support for Research Areas

- In terms of consistency with national issues, core computing is a cross-cutting priority area that feeds into materials science, coastal & environmental modeling, biomedical & bioengineering research, and energy related research of all types. Federal agency funding priorities dovetail with these areas as well, particularly with respect to core computing, materials, biomedical and energy research.
- The Individual Behavior & Community Context and Communication & Expression priority areas align with recommendations from at least 2 recent major national reports:
 - *Arise 2: Unleashing America's Research and Innovation Enterprise*. American Academy of Arts and Sciences. 2013.
 - *The Heart of the Matter: The Humanities and Social Sciences for a Vibrant, Competitive, and Secure Nation*. American Academy of Arts and Sciences. 2013.

Section 2.B: Institutional and External Support for Research Areas

- The Office of Research & Economic Development has several funding mechanisms to support faculty research, including faculty travel programs, summer stipend programs, and equipment repair programs. With the establishment of the Strategic Plan research priority areas, faculty applicants should now make a concrete connection to one of the research priority areas.
- In the following slides, data are provided on several of these programs for the 5 year period 2008-2012.

Section 2.B: Institutional and External Support for Research Areas

Junior Faculty Travel Grants			Faculty Travel Grants		Summer Stipends		Faculty Research Grant Program		Equipment Repair Fund	
Year	#	\$	#	\$	#	\$	#	\$	#	\$
2008	38	\$16,477	221	\$200,000	42	\$210,000	68	\$519,421	10	\$62,229
2009	35	\$16,477	178	\$150,000	34	\$170,000	25	\$275,388	0	0
2010	41	\$20,000	158	\$120,000	33	\$165,000	0	0	10	\$59,750
2011	31	\$15,600	126	\$120,000	20	\$100,000	10	\$99,604.30	20	\$124,351
2012	31	\$16,500	134	\$120,000	17	\$85,000	0	0	16	\$59,456
Total	176	\$54,954	817	\$710,000	146	\$730,000	78	\$894,413	56	\$305,786

Section 2.B: Institutional and External Support for Research Areas

On an ad hoc basis, ORED provides funds for infrastructure in the form of cost-sharing and matching, startup for new faculty, strategic equipment repairs and purchases, critical travel related to infrastructural enhancement, and so forth. Data are available since FY 2011. During this period, more than \$4.5 million was invested in these types of infrastructural enhancements for research. The vast majority of these investments are aligned with the priority research areas.

Infrastructure	
Year	Amount
2011	\$2,496,693
2012	\$2,121,380
Total	\$4,618,073

Section 2.B: Institutional and External Support for Research Areas

- In the Spring of 2012, ORED rolled out a new program, the Equipment Repair and Maintenance Fund for Federally Funded Projects. To date this program has been able to provide funding for 9 unique applications totaling \$36,145.
- In October of 2012, ORED announced the Technology Enhancement for Coastal Science and Engineering (TECSE) program. The purpose of TECSE is to facilitate purchase of new instrumentation or technology that will enhance the technical capability of research teams in the general area of coastal science & engineering. The purpose of TECSE is not to replace or repair existing technology. TECSE funding is intended to be used for relatively quick turn-around, high impact acquisitions to augment existing funding, not as match for future proposals external to LSU (i.e., BoR, NOAA, etc.). The total amount of funding available from ORED for this program is approximately \$600,000.

Section 2.B: Institutional and External Support for Research Areas

Economic Development Assistantships – LSU Graduate School

- Economic Development Assistantships in the amount of \$25,000 per student per year may be authorized at the discretion of the Dean of the Graduate School. These assistantships are awarded to incoming doctoral students whose study and/or research will directly affect the economic development of Louisiana and are to be used to attract superior doctoral graduate students. By definition, these research assistantships are consonant with the LSU research priority areas.

Year	# ED Assistantships
2009	12
2010	10
2011	10
2012	15

Section 2.B: Institutional and External Support for Research Areas

- In addition, a memo issued from the Executive Vice Chancellor and Provost to Deans and Directors indicated that faculty hiring plans for the FY 13-14 year should detail how proposed hires articulate with the ORED Strategic Plan research priority areas, among other things.

Section 2.C: Institutional and External Support for Research Areas

- Existing funding patterns are provided in slide 30 of this report. As those data indicate
 - Roughly 75% of currently held federal funding is consistent with 1 of the 7 priority research areas.
 - Approximately 75% of private funding is consistent with 1 of the 7 priority research areas.
 - About 50% of state funding is consistent with 1 of the 7 priority research areas.
- We expect this pattern to continue, if not increase significantly.

Section 3.A: Research & Economic Development Data

Five-year average of R&D Expenditures for FY 2007-08 through 2011-2012*

LSU						
	<u>Federal</u>	<u>State</u>	<u>Industry</u>	<u>Institution</u>	<u>Other</u>	<u>Total</u>
2007-08	\$48,644	\$13,621	\$2,527	\$70,689	\$7,416	\$142,897
2008-09	\$53,401	\$13,403	\$3,142	\$76,313	\$10,345	\$156,604
2009-10**	\$60,569	\$13,124	\$8,542	\$72,286	\$667	\$155,188
2010-11	\$59,515	\$14,808	\$10,991	\$66,093	\$637	\$152,044
2011-12	\$55,721	\$16,362	\$8,528	\$69,011	\$263	\$149,885
5-year Avg.	\$55,570	\$14,264	\$6,746	\$70,878	\$3,866	\$151,324

*Figures in millions

**NSF modified its survey fields beginning FY 09-10; LSU reclassified R&D funding sources to appropriately reflect these changes

Section 3.B-G: Research and Economic Development Data

	2007-08	2008-09	2009-10	2010-11	2011-12
# of Invention Disclosures	42	40	43	38	39
# of Patents Filed	34	30	22	32	38
# of Patents Issued	16	7	6	6	9
# of Licenses/Options Signed	3	4	3	5	4
Amount of Licensing Income Generated	\$137,030.84	\$123,003.00	\$181,511.49	\$164,791.04	\$481,533.00
# of Start-Up Companies Formed	1	2	1	1	0
# of Industry-Sponsored Research Agreements	59	51	62	90	88

Section 3.H: Other Measures of Research and Economic Development Data

- Economic development activity has largely taken place under the auspices of the LSU Innovation Park. The mission of the Innovation Park is to facilitate technology transfer and commercialization of university research to stimulate and develop the economies of Louisiana and local areas. It serves as a link from the university to the community and industry, resulting in the creation of wealth by developing vibrant businesses that will create high quality jobs. The Innovation Park is home to the Louisiana Business Technology Center (LBTC), a business incubation facility. Until just recently the LBTC reported to the Dean of the College of Business. The LBTC recently had its reporting line changed to ORED. Current activity at the LSU Innovation Park and the LBTC includes the following:
 - LBTC was the 2005 National Incubator of the Year.
 - The Innovation Park is home to the National Center for Biomedical Research and Training (NCBRT).
 - The Innovation Park houses the Louisiana National Guard and Disaster Response Center.
 - EA Sports has 390 game developers and testers on site at the Innovation Park.
 - The Innovation Park houses the Business Emergency Operations Center (BEOC) in the Stephenson Disaster Management Institute.
 - On site there are 600 jobs, \$32+ million in payroll, and \$70+ million in purchase power.

Section 3.H: Other Measures of Research and Economic Development Data

- The Louisiana Business & Technology Center (LBTC) and the LSU Innovation Park operate as the economic development arm of the university and are active with Louisiana Economic Development, Louisiana Industrial Development Executives Association (LIDEA) and other state, local and regional economic development groups. The LBTC has assisted 62 Louisiana businesses win \$23,150,000 in SBIR grant funding since 2008. Many LBTC incubator clients have won these research grants including Mezzo, Electrochemical Materials, Enervana, and Invertherm. Since 1999, 188 LBTC clients have won over \$55.8 million in awards which are spent in Louisiana on payroll and purchases.

Section 3.H: Other Measures of Research and Economic Development Data

- The LBTC works with 34 incubator companies, 39 student incubator companies, 5 research park companies and over 200 affiliate companies annually on developing technologies, business plans and commercialization of technologies. Currently, there are over 300 high paying jobs at the LSU Innovation Park/LBTC averaging \$60,000 each. The LBTC has documented the creation or saving of nearly 10,000 jobs since its inception. The 39 student incubator companies and the 30 student incubator graduates have created over 120 jobs, thus stopping the exodus of LSU graduates from Louisiana. The LBTC documents about 6 company graduations and 8-10 incubator startups annually and has assisted 200 + companies as affiliated companies start up or expand. Finally, LED, US Department of Commerce and other agencies are providing funding to the LBTC to develop an international trade and export assistance program to assist Louisiana businesses develop export programs and to stimulate direct foreign investment in Louisiana. The LBTC is also designated by the NBIA as a "Soft Landing Incubator" to provide space and services to foreign companies interested in establishing a US presence. The LBTC has two international companies that have documented in excess of \$5 million in annual sales.

Section 3.H: Other Measures of Research and Economic Development Data

- LBTC staff serve on the boards and committees of many economic development entities in the region and serve on committees statewide. The LBTC provides leadership to the Louisiana Business Incubation Association and has assisted most incubators in the state to get started. The LBTC offers services to Louisiana Tech University, the NO BioInnovation Center and the Pennington Biomedical Research Foundation assisting in business formation and job creation.

Section 3.H: Other Measures of Research and Economic Development Data

Although the summary above provides useful information on recent activities, it is enlightening to contextualize the impact of the LBTC with a longer range view. Data provided below by the LBTC demonstrate the enduring impact on economic activity this branch of LSU exhibits. Specifically,

- **LBTC Overall Impact [Jan 1999 – Sept 2012]**
- \$163,657,649 in equity, grants and loans
- 6,418 businesses & entrepreneurs received technical and management assistance
- 4,034 projects completed
- 2,214 companies received Small Business Innovative Research (SBIR) support
- 554 businesses started after receiving assistance; creating or saving at least 9,690 jobs
- 489 training events for 21,424 participants
- 28 Incubator Tenant Companies creating 140 full time jobs in Baton Rouge
- 140 Graduated Tenants with 2,278 jobs created since 1989
- 110 Still in business = 78% success rate

Summary

- LSU A&M has established a Strategic Research Plan with 7 priority research areas.
- The Strategic Plan is consistent with Flagship 2020, the LSU A&M roadmap to future national and international prominence.
- The priority research areas are largely consistent with the focal areas being recommended to the LSU Transition Advisory Team by the Research and Discovery subcommittee.
- The depth and impact of LSU's intellectual capital and research infrastructure are also reflected in the Battelle report to LED on Research and Innovation Assets.
- Approximately 75% of external federal funding is aligned with 1 or more of the priority areas.
- All priority areas articulate with the Louisiana Board of Regents economic development plan, FIRST Louisiana.
- LSU is committed to strategically investing resources in ways that will foster sustained growth of research programs in the priority research areas.
- LSU researchers and scholars have established a wide array of key collaborative relationships with other universities, industrial partners, federal, state, and local agencies.
- LSU researchers and scholars routinely receive accolades for their high impact and innovative work.