Loyola University New Orleans
Strategic Research Priorities Report

Section I

Research Priorities

I. Environmental Biology and Chemistry
II. Molecular Genetics & Disease
III. Materials Science and Spectroscopy
IV. Cellular Biophysics
V. Advanced Nursing Education (not R&D, but aligned with FIRST)

1: Environmental Biology and Chemistry (EBC)

Includes ecology, conservation, natural history, population genetics, mathematical biology, atmospheric chemistry, and green chemistry

- **Animal studies/surveys** include fish responses to restoration of the Mississippi River Delta (MRD); endangered fish species; geographic variation in vertebrates; and an inventory of mammals inhabiting the Barataria Preserve.

- **Plant studies** include responses to adiabatic stress and global environmental change; sediment budgeting; litter decomposition in coastal wetlands; introductions of invasive floating fern in freshwater lakes and coastal waterways; genotypic variation in and growth patterns of marsh reed; and long-term changes i biomass within the Belize Delta.

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1: Environmental Biology and Chemistry (EBC)

- **Microbial studies** include phytoplankton ecology, including responses of brown algae to crude oil contamination and salinity in Lake Pontchartrain and coastal waters; measurement of aquatic properties; parasite ecology and transmission of Chagas disease; and mathematical biology (ODE, PDE) of infectious disease transmission.

- **Atmospheric chemistry** includes water update processes and chemical reactions of atmospheric aerosol; and analytical methodology for aerosol and pollutant detection.

- **Green chemistry** includes MAS and environmentally benign methods for synthesizing metal carbonyl complexes, ferrocene and ionic water-soluble metal complexes& catalysts.

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1: EBC– Alignment w/ FIRST

Building Blocks: Nucleic and Amino Acids; Atoms and Molecules

Translational Domain: Environmental and Coastal

Core S&T Sector: Energy & Environmental

High Growth Target Industries: Coastal Resilience; Materials & Chemicals

1: **EBC - Assets**

- Department of Biological Sciences
  - Environmental Science, Ecology, Conservation Biology, and Natural Science
  - Population and Molecular Genetics (overlap with Priority Area 2)
  - Seven (7) full-time faculty researchers (excluding visiting faculty)
- Department of Chemistry
  - Green Chemistry, Atmospheric Chemistry, and Physical Chemistry (overlap with Priority Area 3)
- Department of Mathematics
  - Mathematical Biology
- Summer Collaborative Outreach and Research Experience (SCORE) (2007-13)
- Center for Environmental Communication (Robert Thomas, PhD, Director)
- Center for Environmental Law and Land Use (Robert Verchick, JD, Director)
- Environmental Science undergraduate degree tracks in Social Science and Liberal Arts

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1: EBC - Research Productivity

Productivity Measures	2012-2013
No. of Active Awards	15
Amount of External Funding	$80,499
Peer-reviewed Publications (CY 2012)	7
Undergraduate Enrollments in key disciplines	273
Undergraduate Completers in key disciplines	40
Graduate Enrollments in key disciplines	0
Graduate Completers in key disciplines	0
Others	

Completers includes graduates in Summer 12, Fall 12, and Spring 13.

1: EBC - Successes

Patricia Dorn, PhD, delivered a keynote address at the Second International Workshop on Chagas Disease at the Universidad Mayor de San Simón in Bolivia. She also organized the Molecular Epidemiology and Evolutionary Genetics of Infectious Diseases (MEEGID) conference, bringing scientists from 40 countries to Loyola in November. Her NSF- and NIH-funded research investigates the epidemiology and control of transmission of Chagas disease, which is transmitted by "kissing bugs" and represents a leading cause of heart disease in Latin America.

Aimee Thomas, PhD, and Kristy Halverson, PhD, (USM) were awarded a $250,000 NSF grant to develop the innovative environmental-science training program "Over, Under and Through: Students Informally Discover the Environment (OUTSIDE)."

2: Molecular Genetics & Disease - Narrative

- Limb regeneration. Use of a novel joint regeneration model to better understand the initial and later stages of chick limb regeneration and the fibroblast growth factor-induced response.

- Arthritis. Determination of the roles of transcription factors in models of inflammatory arthritis and the identification of disease-specific transcriptional targets.

- Chagas disease. Application of gene mapping and additional molecular and population genetics techniques to better understand the underlying the effects of ecosystem alteration on the transmission Chagas disease (overlap with Priority Area 1).

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2: Molecular Genetics– Alignment w/ FIRST

Building Block: Nucleic & amino acids

Translational Domain: Environmental & Biomedical

Core S&T Sector: Bioscience & Biotechnology

High Growth Target Industry: Biomedical

2: Molecular Genetics & Disease – Assets

- Department of Biological Sciences
  - Molecular Genetics
  - Population Genetics

2: Molecular Genetics & Disease - Research Productivity

Productivity Measures	2012-2013
No. of Active Awards	7
Amount of External Funding	$414,105
Peer-reviewed Publications (CY 2012)	4
Undergraduate Enrollments in key disciplines	261
Undergraduate Completers in key disciplines	37
Graduate Enrollments in key disciplines	0
Graduate Completers in key disciplines	0
Others	

2: Molecular Genetics & Disease: Success Stories

- **Rosalie Anderson, PhD**, and her undergraduate research group devised a groundbreaking method of joint regeneration in embryonic chickens. Her article on this subject was featured as a *Science* Editor's Choice in December 2012 (Tulane co-author, Ken Muneoka, PhD). Awarded NIH grant (R15HD060012) for "Regeneration of the Developing Chick Elbow Joint."
- **Kimberlee Mix, PhD**, developed a molecular genetics course focusing on innovation and commercialization. A NOBIC fellow collaborated on course development and provided opportunities for engagement with the center.

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3: Materials Science and Spectroscopic Analysis

Novel systems, novel analysis of systems

- Novel measurement of transport properties, using Dynamic Electron Scattering and other methods
- Fluorescent probes of supramolecular organic chemistry
- Crystallography of isomeric organic cations with extraordinary structures
- Cavity ring-down spectroscopy - development of novel methods for data analysis; detection of minute concentrations of pollutants and toxins (overlap with Priority Area 1)

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3: Materials Science – Alignment w/ FIRST

Building Block: Atoms & Molecules

Core S&T Research Areas: Materials Science & Nanotechnology

Translational Domain: Environmental

High Growth Target Industry: Materials & Chemicals

3: Materials Science - Assets

Department of Chemistry

- Analytical, physical, organic, and computational chemistry

Department of Physics

- Materials science, and solid state physics
- Condensed matter laboratory
- 3-2 dual degree/engineering program (UNO, Tulane)

Department of Mathematics

- Computational mathematics degree program
- Computer science minor
- Computer science laboratory (BOR-funded)

3: Materials Science - Productivity

Productivity Measures	2012-2013
No. of Active Awards	5
Amount of External Funding	$31,083
Peer-reviewed Publications (CY 2012)	10
Undergraduate Enrollments in key disciplines	89
Undergraduate Completers in key disciplines	15
Graduate Enrollments in key disciplines	0
Graduate Completers in key disciplines	0
Others	

3: Materials Science - Success Stories

- **Patrick Garrity, PhD,** discovered a way to decouple heat flow from electrical currents and apply the technique to thermoelectric power generation. Resulting "meta material" displays properties not found in any other naturally occurring material due to the ability to tune the thermal conductivity as desired (patent pending).
- **Lynn Koplitz, PhD,** published five articles on the crystallography of compounds containing isomeric organic cations in the pyridinium and anilinium families, including one with a graphite-like structure (applications to crystal engineering, supramolecular design, and ionic crystals) (Tulane collaborator). One paper was included in the Fall 2012 CUR *Undergraduate Research Highlights*.

4: 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
- Ion channels and transport properties

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4: Cellular BP – Alignment w/ FIRST

Building Blocks: Atoms & Molecules; Nucleic & Amino Acids

Core S&T Research Area: Bioscience & Biotechnology

Translational Domain: Biomedical

Core S&T Sector: Healthcare

High Growth Target Industries: Medical

4: **Cellular BP - Assets**

- Department of Physics
  - Biophysics Lab
- Department of Chemistry
  - Biochemistry, Organic Chemistry, and Physical Chemistry
- Undergraduate Research Committee (applies to all disciplines)
  - All faculty labs open to undergraduate researchers

4: Cellular BP - Research Productivity

Productivity Measures	2012-2013
No. of Active Awards	3
Amount of External Funding	$81,650
Peer-reviewed Publications (CY 2012)	3
Undergraduate Enrollments in key disciplines	303
Undergraduate Completers in key disciplines	46
Graduate Enrollments in key disciplines	0
Graduate Completers in key disciplines	0
Others	

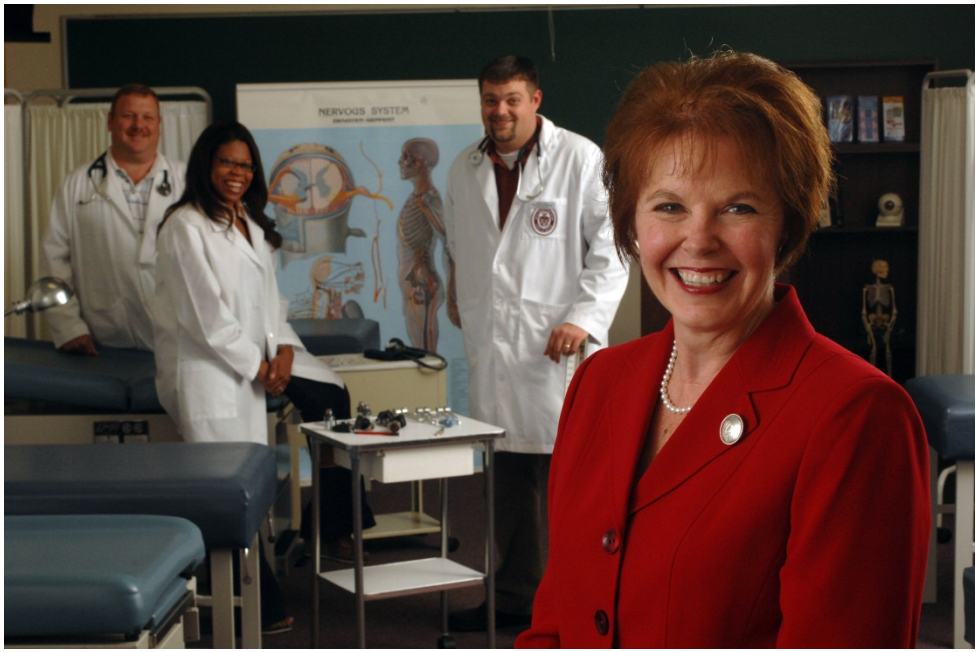
Priority 4: Success Stories

- **Armin Kargol, PhD,** in collaboration with Leszeck Malkinski, PhD, (UNO) received an NSF EAGER (exploratory research) grant to develop a remote stimulation technique for mammalian cells. Project will shed light on feasibility of controlling ion transport with magnetic field impulses. Possible future applications to ion-channel-related diseases such as cystic fibrosis, diabetes, cardiac arrhythmias, and neurologic and psychiatric diseases.
- **Jai Shanata, PhD,** who joined the Loyola faculty in FY12, was awarded $110K in Board of Regents RCS funding for his project "Systematic Determination of the Combined Impact of Dietery Fatty Acids and Cholesterol on Lipid Bilayer Physical Properties."

5: Advanced Nursing Education (ANE)

Not a research program, but a Loyola area of emphasis overlapping strongly with FIRST

- Doctor of Nursing Practice
  - BS to DNP
  - MS to DNP



5: ANE – Overlap w FIRST

Core S&T Sector: Healthcare

Priority 5: Research Productivity

Productivity Measures	2012-2013
No. of Active Awards	4
Amount of External Funding	$1,633,164
Peer-reviewed Publications (CY 2012)	3
Undergraduate Enrollments in key disciplines	25
Undergraduate Completers in key disciplines	11
Graduate Enrollments in key disciplines	490
Graduate Completers in key disciplines	209
Others	

Funding is for degree-program development, traineeships, and educational loans.

Priority 5: Success Stories

- **Loyola's MS-DNP** program was named by *US News and World Report* as one of the 10 best online nursing programs in the country.
- **Ann Cary, PhD**, was awarded a $700K new grant from the HRSA Advanced Education Nursing training program to support students who will practice in underserved communities.

Section II

Institutional and External Support for Priority Research Areas

1. Alignment with Vision & Mission of campus
2. Internal funding structures
3. Overlap with existing and potential external funding

1. Alignment with Loyola's Mission

- Prepare students "to pursue truth, wisdom, and virtue"
  - Priority Areas 1-5. Scientific quest for knowledge consistent with this aspect of our mission and with our primary values of thinking critically and excellence.
- Strive to "educate the whole student and to benefit the larger community"
  - Priority Area 5. School of Nursing's DNP program is consistent with community service as well pursuit of knowledge.

2. Internal funding structures

- Priority Areas 1-4
  - Monroe Hall, which houses the natural sciences, undergoing $93 MM in renovations, including addition of greenhouse
  - $116K a year for internal grants and fellowship programs emphasizing academic and research excellence as well as relevance to Loyola's mission (Internal Grants Committee and dean's office)
  - $79K for travel and technical support to science and mathematics researchers (through deans' office)
- Priority Area 5
  - Over $600K invested for new DNP track (BS-DNP)

3. External Funding Alignment

- Priority Areas (PAs) 1-4
  - STEM Education
    - President requested overall increase of 6.7%
    - NSF Catalyzing Advances in Undergraduate STEM Education (CAUSE) Program ($123 MM requested for FY14), to replace undergraduate programs such as STEP, which now provides $500K over five years per award
  - NSF BIO (PAs 1-2,4) requested 6.8% increase over FY12 actual
  - NSF MPS (PAs 1,3,4) requested 5.9% increase over FY12 actual
  - NIH requested 1.1% increase for Advancing Scientific Knowledge initiatives over FY12 actual (overall NIH budget request reflects 1.5% increase)
- PA 5
  - HRSA Nursing Workforce Development requested 12% increase over FY13 annualized CR budget

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Section III

Research & Economic Development Data

	FY 2007-08	FY 2008-09	FY 2009-10	FY 2010-11	FY 2011-12
R&D Expenditures Total	$828,000	$662,000	$595,000	$779,000	$660,000
Federal	$337,000	$169,000	$260,000	$293,000	$225,000
Industry				$12,000	$9,000
# invention disclosures	*	*	0	0	1
# U.S. patents filed	0	0	0	0	0
# patents issued	0	0	0	0	0
# licenses/options signed	0	0	0	0	0
Licensing income	0	0	0	0	0
# start-ups formed	0	0	0	0	0
# industry research agrmts	*	*	*	*	*

* Data not available

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