

Report to the Louisiana Board of Regents
Review of Research Proposals Submitted for Funding Consideration
in the Board of Regents Support Fund R & D Program
Industrial Ties Research Subprogram

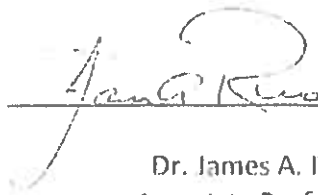
February 12-13, 2015



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REPORT OF THE FINAL PANEL
BOARD OF REGENTS SUPPORT FUND
INDUSTRIAL TIES RESEARCH SUBPROGRAM
FY 2014-15

BACKGROUND INFORMATION

Thirty research proposals requesting a total of \$2,250,936 for the first year of work were submitted for funding consideration during fiscal year (FY) 2014-15 in the Industrial Ties Research Subprogram (ITRS) component of the Board of Regents Support Fund (BORSF). Of the thirty proposals submitted, three contained information of a confidential or proprietary nature. A three-phase evaluation process conducted exclusively by out-of-state experts was used to review these proposals.

REVIEW PROCESS

Phase I: In-Depth Mail Review

The thirty proposals were reviewed for scientific and technical merit, as well as for their potential to contribute to Louisiana's economic development and diversification, by twelve out-of-state experts. The experts included two reviewers in each of the following six subject areas: agriculture, aquaculture, and animal science; biotechnology and health care; chemical materials and petroleum engineering; computer and information sciences; mechanical and materials engineering; and environmental science & technology, and urban design. Each subject-area reviewer independently evaluated and prepared an in-depth evaluation form for each assigned proposal in the subject area.

Phase II: Reviewer Consensus Evaluation

After each reviewer independently assessed each assigned proposal, members of the various subject-area groups communicated with each other to arrive at a consensus ranking of proposals within each subject area. Proposals were placed in one of three categories:

1. Priority One: Highly Meritorious Proposals Recommended for Funding;
2. Priority Two: Meritorious Proposals of a Lower Priority; and
3. Priority Three: Do Not Fund as Submitted.

All evaluation forms from out-of-state experts who participated in Phases I and II of the review process were available for each member of the final panel, along with all proposals submitted. Each member of the final panel read and studied each proposal and each evaluation prior to the final panel's meeting.

Phase III: Final Panel Review

Three out-of-state experts participated in Phase III of the review process and served on the final panel. The panel convened on February 12-13, 2015, to discuss Phase I and II subject-area evaluations, prioritize proposals, and develop funding recommendations. The final panel considered each of the thirty proposals extensively and based its recommendations on the following criteria:

- A. Scientific and technical merit;
- B. Potential to enhance economic development and/or diversification in Louisiana;
- C. Evidence of private-sector involvement; and
- D. Evidence of innovation and ability to advance Louisiana's scientific, engineering, and/or technological bases.

The panel was informed that a maximum of \$585,000 would be available in first-year funds for new research projects in the ITRS in FY 2014-15, and that money to continue the second and/or third years of multi-year projects recommended for funding would be budgeted separately from this amount. As a result of the final panel's deliberations, nine proposals were recommended for funding. These nine Priority One proposals are listed in **Appendix A**, immediately following the narrative section of this report. The final rankings and selections for awards were based upon individual ratings of the external reviewers (Phase I), the consensus rankings of the subject-area reviewer groups (Phase II), and the final panel's consensus evaluation (Phase III), taking into account the economic potential of each project.

Five other highly meritorious proposals considered at the final panel meeting and, for a variety of reasons not recommended for funding, are listed in **Appendix B**. The applicants whose proposals are listed in Appendix B should closely review the panel's comments. The final panel believes that these investigators should be notified of their good work and encouraged to revise and resubmit their proposals in the future, with the prospect that improvements in proposal content could ultimately lead to an award. These proposals, listed in Appendix B, should not be funded this year. The BORSF would be better served by diverting any available funds not awarded to and/or unclaimed by Priority One projects to other R&D program component(s).

Five other proposals were considered meritorious by both the subject-area reviewers and the final panel, but insufficiently developed in one or more areas to be worthy of funding at this time (Priority Two).

Each of the remaining proposals, although meritorious in some respects, was deemed inconsistent with the goals and purposes of the ITRS and/or seriously deficient in one or more areas (Priority Three). The principal investigators who submitted these proposals are encouraged to submit them to other, more appropriate funding programs or to make significant revisions before considering resubmission to the ITRS.

The panel recommends that the Board of Regents commit funding for each new proposal for a maximum of three years, with renewal in the second and third years made contingent upon satisfactory progress as well as reconfirmation of continued external matching funding. External stipulations and institutional matching requirements applicable in general to the nine Priority One proposals are

contained in **Appendix C (C.1)**. The specific levels of outside funding required and detailed stipulations or conditions applicable to each proposal are included in the discussion of the nine Priority One proposals listed in **Appendix C (C.2)**. Summary statements have also been provided in **Appendix C** for: each meritorious ITRS proposal ranked Priority One by the subject-area panels and considered by the final panel, but not recommended for funding **(C.3)**; and also all Priority Two proposals **(C.4)**. These summaries include the following information for each proposal:

1. Proposal number and title;
2. Strengths and weaknesses of the proposal;
3. Potential economic impact on Louisiana; and
4. Recommended BORSF funding level and funding stipulations, as applicable. (**Note:** This information is provided only for the nine proposals recommended for funding and included in Appendix C.2).

A general statement on proposals ranked Priority III by the final panel is included in **Appendix C (C.5)**.

The individuals who participated in Phases I and II of the review process are listed in **Appendix D**.

In-depth mail reviews will be provided as feedback to all applicants in July 2015.

FINAL PANEL RECOMMENDATIONS

To Phase I and Phase II Subject-Area Reviewers:

Reviewers should be commended for their performance in accordance with the guidelines set forth in the FY 2014-15 Request for Proposals.

To the Applicants:

Applicants should be commended for their efforts to obtain industrial support and for proposing research in areas with high economic potential. However, several of the proposals were not supported by strong research plans, which require a testable hypothesis. Improving the quality of this section of the ITRS proposal would help ensure that this program contributes to strengthening the academic mission of the supporting university or institution.

Each proposal submitted should include the following information:

1. A one-page summary describing the research in layman's language and assessing its technology transfer potential;
2. An assessment of the supportive scientific and interdisciplinary expertise needed to enhance the potential success of the research, including joint activities with other researchers or research groups at the same or other institutions;

3. A description of industrial participation representing true collaboration, including past, scheduled, and potential contacts and visits to and from industry, as well as scheduled or potential contributions of funds, equipment, and services by industry; and
4. Identification of an existing industry that will utilize project results or of a new industry to be created through the proposed research.

To the Board of Regents: General Recommendations

Over the years there has been a substantial improvement in ITRS applicants obtaining industry and non-academic support as well as development of solid research plans. It is important to encourage these improvements through the following (5) processes:

1. Continue to provide workshops and seminars for faculty on proposal preparation and requirements; development of consortia and cooperative research centers; patent and licensing procedures; and technology transfer to commerce.
2. Ensure that funded projects obtain the required industrial matching support. Principal investigators should be required to document acquisition of the recommended level and types of industrial matching support by June 30, 2015, for the mandated first-year matching commitment; by March 31, 2016, for the required second-year match; and by March 31, 2017, for the required third-year matching commitment. The staff of the Board's Office of Sponsored Programs should further promote recognition around the State that the ITRS not only encourages but requires industrial and/or federal governmental support as a condition for funding. Significant external funding is often necessary to purchase equipment and to fund salaries.
3. Notify applicants that literature reviews, the development of databases, and the drafting of research protocols should take place prior to submission of a proposal. These activities should not be funded by the ITRS.
4. Notify applicants that the industrial support obtained should be incorporated into the budgets of proposals under the appropriate line items.
5. Where appropriate, request applicants to include more detailed information regarding current and potential intellectual property rights related to their proposals.

APPENDIX A
ITRS PROPOSALS HIGHLY RECOMMENDED FOR FUNDING
(PRIORITY ONE) (9)

Rank	Proposal No.	Institution	Recommended BORSF 1st Year Funds	Recommended BORSF 2nd Year Funds	Recommended BORSF 3rd Year Funds
1	015B	TUHSC	\$ 62,815	\$ 59,711	\$ 58,490
1	027B	ULL	54,083	54,083	54,083
1	014B	SLU	44,226	44,051	44,051
1	003B	LSU-AG	74,255	73,255	0
5	008B	LSU-BR	57,115	55,808	53,308
6	029B	UNO	82,309	74,843	52,114
7	005B	LSU-BR	63,400	59,400	0
8	020B	ULL	60,893	60,893	60,893
9	023B	ULL	<u>59,934</u>	<u>59,934</u>	<u>59,934</u>
TOTAL			\$ 559,030	\$ 541,978	\$ 382,873

APPENDIX B*
MERITORIOUS ITRS PROPOSALS RANKED PRIORITY ONE BY THE SUBJECT-AREA PANELS AND
CONSIDERED BY THE FINAL PANEL BUT NOT RECOMMENDED FOR FUNDING (5)

001B 004B 011B 016B 024B

Note: *The panel's comments on these proposals are provided in **Appendix C.3**. Subject-area panel reviews for each of these proposals will also be provided to the applicant in July 2015.

APPENDIX C
MERITORIOUS ITRS PROPOSALS OF LOWER PRIORITIES

PRIORITY TWO* (5)

002B 022B
010B 028B
019

Note: *These proposals are not listed in rank order of merit and are not recommended for funding as currently submitted. The panel's comments on the proposals ranked Priority Two are provided in **Appendix C.4**. Subject-area panel reviews for each proposal will be provided to the applicant in July 2015.

PRIORITY THREE* (11)

006B	018B
007B	021B
009B	025B
012B	026B
013B	030B
017B	

Note: *These proposals are not listed in rank order of merit and are not recommended for funding as currently submitted. The final panel's general comments on the proposals ranked Priority Three are provided in **Appendix C.5**. Subject-area panel reviews for each proposal will be provided to the applicant in July 2015.

APPENDIX C.1

GENERAL EXTERNAL AND INSTITUTIONAL MATCHING REQUIREMENT STIPULATIONS FOR ITRS AWARD RECIPIENTS

External (i.e., industrial or approved governmental) and institutional funding commitments may not be reduced below levels pledged in the original proposal unless reductions are specifically permitted in the funding stipulations for a grant. In some cases, additional external funding over and above that pledged in the proposal (see Appendix C.2) may be required. The types and amounts of additional required funding are specified in the funding stipulations for the affected awards. **Unless otherwise indicated, all awards are contingent upon receipt by the Board no later than June 30, 2015, of updated documentation from the provider(s) of the external match reconfirming provision of the match pledged in the proposal. Furthermore, second-year funding will be contingent upon receipt by the Board no later than March 31, 2016, of updated documentation from the provider(s) of the external match reconfirming provision of the required second-year external match. Third-year funding will be contingent upon receipt by the Board no later than March 31, 2017, of updated documentation from the provider(s) of the external match reconfirming provision of the required third-year external match. Letters (originals) from the private-sector partner or government agency providing the required match must be furnished to the Board on company or agency letterhead and signed by authorized representatives of the companies or agencies by these same dates.**

Although budget requests from the Board of Regents Support Fund have been reduced significantly in some cases, no budget has been reduced to a degree that would impair execution of the proposed research and accomplishment of the project goals. **Therefore, funding for each recommended Priority One project is made contingent upon full and complete execution of the work plan delineated in the proposal.**

APPENDIX C.2
COMMENTS AND FUNDING STIPULATIONS FOR
PROPOSALS HIGHLY RECOMMENDED FOR FUNDING
(PRIORITY ONE)

Proposal 015B**Rank: 1**

TITLE: *Development of Novel Analgesics with Reduced Side Effects Relative to Morphine*

INSTITUTION: Tulane University Health Sciences Center

PRINCIPAL INVESTIGATOR: James Zadina, Ph.D.

COMMENTS: Currently in the United States 39 million people (19%) have persistent pain and inadequate remedies. In addition, deaths from overdose of currently used pain medications have become an epidemic. The use of opioids for moderate to severe pain relief can be associated with serious side effects, including respiratory depression, abuse liability, tolerance, motor and cognitive impairment, and proinflammatory responses. Activation of the mu opioid receptor (MOR) however, remains the gold standard for pain relief for numerous reasons, including the ability to reduce pain transmission at multiple anatomical sites in pain pathways throughout the nervous system, at pre- and post-synaptic sites, and through multiple cellular mechanisms. Recent studies provide compelling evidence that different agonists for the mu receptor can activate difference patterns of cell signaling, raising the possibility that highly effective pain relief could be produced while reducing or eliminating some of the adverse effects. An analgesic that effectively relieves pain without abuse liability would meet an urgent need and have very large market potential.

The proposed research represents collaboration between Tulane University Health Sciences Center and Endagon Pharmaceuticals, a Louisiana start-up company being developed by a cooperative effort of the Tulane School of Medicine and Technology Transfer Office, external consultants, and The Louisiana Fund. The research supports the development of an analgesic for clinical use that, in animal studies, has been shown to alleviate pain with the effectiveness of morphine but with a substantial reduction in or absence of adverse side effects. Determination of the mechanism of action will provide valuable information at a critical time of development. Success of these studies will circumvent a roadblock to FDA approval of the compound and enhance its value for attracting late-stage clinical trial funding. Endagon Pharmaceuticals' letter of support pledged private sector funding including \$35,727 as a year one match. However, there was no evidence of pledged support in the amount of \$42,405 for year two and \$46,801 for year three, although referenced in the proposed budget. Therefore, prior to funding an updated letter from Endagon Pharmaceuticals must be obtained not only reaffirming the year one commitment but also detailing the level of support for year two and year three as stated in the proposal. BoRSF funding is recommended at the level requested, i.e., \$62,815 for year one, \$59,711 for year two and \$58,490 for year three. The PI is required to maintain support for the medical research specialist at the level proposed in the original budget for each year of the project.

As a condition of funding, the types and amounts of the institutional and external matching commitments stated in the proposal should be maintained in full. Funding is contingent upon receipt by the Board no later than June 30, 2015 of updated documentation showing support at the levels indicated in the original proposal and as required in Appendix C.1.

BUDGET	BORSF	EXTERNAL
1 st Year	\$62,815	\$35,727 as specified in the proposal
2 nd Year	\$59,711	\$42,405 as specified in the proposal
3 rd Year	\$58,490	\$46,801 as specified in the proposal

Appendix C.2 (continued)

Proposal 027B**Rank: 1**TITLE: *Cable-Driven Robots for Inspection, Maintenance, and Rescue*

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Joshua Vaughan, Ph.D.

COMMENTS: By many accounts, the infrastructure of the United States and Louisiana is in dire need of maintenance, repair, and, in many cases, even basic inspection. On the most recent report card of Louisiana's infrastructure, conducted by the American Society of Civil Engineers (ASCE), Louisiana scored a C- (rated on the typical American school system's A-F, best to worst scoring system). The assessment rated 33 dams in the state as high hazard and found that 62% of the state's major roads were of poor or mediocre quality. Of the state's bridges, 13.5% were found to be structurally deficient and 15.4% were considered functionally obsolete. The same study estimated billions of dollars each for drinking water, wastewater, and school infrastructure needs. Additionally, chemical plants, oil refineries, and power plants are vital elements of the global infrastructure. Large storage tanks are a critical piece of these facilities. These plants and refineries, and the oil and gas industry they serve, also comprise a significant portion of the Louisiana economy, including the shipping industry. Improved inspections and maintenance will result in safer and more efficient operations. The path toward improving the Louisiana infrastructure will require a significant investment that begins with inspections that are oftentimes tedious and require significant manpower. Expanding the use of robotics for these tasks can not only save significant money and time, but also improve the fidelity of the results, while reducing the burden on human workers. The primary objective of this proposal is the advancement of robotic inspections via the development of design and control techniques for cable-suspended-and-driven robotic systems. Cable-driven systems are particularly suited to inspection and maintenance of vertical structures. However, because they are both driven by and suspended from cables, they are susceptible to vibration and can be difficult to control in adverse conditions.

The proposal represents a partnership between the Department of Mechanical Engineering at the University of Louisiana at Lafayette and HiBot Corporation, Tokyo, Japan, a worldwide leader in the use of robotics for inspection and rescue. The proposed research will develop methods for both the mechanical design and control of these systems. Through the course of this project, the PI will work closely with HiBot Co. on collaboration activities that will include sharing details of the mechanical design, analysis of simulated results, and experimental verification of the developed method using prototypes of the system. The expertise of HiBot's employees will be a valuable tool in the evaluation of the accuracy of the models developed and the effectiveness of the proposed controllers. This makes HiBot Co. an excellent industrial partner for this project. HiBot Co. pledges personnel support valued at \$30,000 per year in addition to providing an Anchor Climber robot, and software support for 12-months at a rate \$1,000 per month, increasing their total in-kind contribution to \$102,000. It is recommended that the proposed budget be revised to limit BoRSF travel support to \$2,500, resulting in a year one budget of \$54,083. Similar budgets of \$54,083 are recommended for year two and year three. The PI should note that Support Fund money requested for successive years of a research project should not increase. The PI is required to maintain support for undergraduate students and one graduate research assistant (GRA) at the level proposed in the original budget for each year of the project.

As a condition of funding, the types and amounts of the institutional and external matching commitments stated in the proposal should be maintained in full. Funding is contingent upon receipt by the Board no later than June 30, 2015 of updated documentation showing support at the levels indicated in the original proposal and as required in Appendix C.1.

BUDGET	BORSF	EXTERNAL
1 st Year	\$54,083	\$36,000 as specified in the proposal
2 nd Year	\$54,083	\$36,000 as specified in the proposal
3 rd Year	\$54,083	\$30,000 as specified in the proposal

Appendix C.2 (continued)

Proposal 014B**Rank: 1**

TITLE: *Creation of C-O or Si-O Bonds as well as Van der Waals Interactions as Strategies for the Development of a New Generation of Sizing Agents for the Paper Industry*

INSTITUTION: Southeastern Louisiana University

PRINCIPAL INVESTIGATOR: Jean Fotie, Ph.D.

COMMENTS: From the invention of papermaking around 105 A.D., the tendency of inks to bleed when applied to paper surfaces led to the development of tub sizing practices, with animal glue being one of the early materials used for this purpose. Surprisingly, only three major sizing agents have been developed for the paper industry so far: (1) the naturally occurring gummy exudes from softwood known as *oleoresin or gum rosin* discovered in 1876, (2) the synthetic *alkyl ketene dimer* (AKD) developed in 1953, and (3) *alkenyl succinic anhydride* (ASA) first synthesized in 1974. Problems associated with the use of these sizing agents include excessive use of size emulsion, poor size performance, poor retention, and formation of pitch deposits on machinery. More importantly, the mechanism by which these sizing agents anchor to the surface of paper fibers is still a subject of contention. Globally, paper and board production represents an estimated \$200 billion industry annually with over \$70 billion in revenue from the U.S. alone. Because large U.S. demands also imply large U.S. production volumes, and since paper is a direct derivative of wood chips and kraft pulp, it is economically and environmentally essential that the production processes be constantly developed in ways that will decrease production cost and increase gross margins. Furthermore, Louisiana's ample forests have made it a center of paper manufacturing and processing. Therefore, contributions to the development of new and improved paper-processing techniques will have a positive economic impact on the United States and Louisiana.

The proposed research is a synergistic collaboration between Southeastern Louisiana University and Bercen, Inc., a paper chemicals plant based in Denham Springs, LA. The proposed research will explore the creation of new C-O or Si-O bonds as well as ion-dipole or Van der Waals interactions as strategies for the development of a new generation of sizing agents for the paper industry. A carefully designed series of Diels-Alder adducts of anthracene, long chain alkoxysilanes, and long chain ionic liquids will be synthesized and evaluated as potential paper sizing agents. Throughout the research project, these molecules will be used as prototypes in the investigation of the mechanism by which sizing agents in general achieve their attachments to the surface of paper fibers. This is a well presented proposal with a good research plan. The PI is experienced in this area and well qualified to carry out the proposed work. Bercen, Inc. pledges project support of \$10,000 per year in the form of student training, travel, and supplies. BoRSF funding is recommended at the level requested, i.e., \$44,226 for year one and \$44,051 for year two. A budget of \$44,051 is recommended for year three. The PI should note that Support Fund money requested for successive years of a research project should not increase. The PI is required to maintain support for undergraduate students at the level proposed in the original budget for each year of the project.

As a condition of funding, the types and amounts of the institutional and external matching commitments stated in the proposal should be maintained in full. Funding is contingent upon receipt by the Board no later than June 30, 2015 of updated documentation showing support at the levels indicated in the original proposal and as required in Appendix C.1.

BUDGET	BORSF	EXTERNAL
1 st Year	\$44,226	\$10,000 as specified in the proposal
2 nd Year	\$44,051	\$10,000 as specified in the proposal
3 rd Year	\$44,051	\$10,000 as specified in the proposal

Appendix C.2 (continued)

Proposal 003B**Rank: 1**

TITLE: *Using Nanoparticles to Tailor Rheological and Filtration Properties of Drilling Fluids: Industrial Application*

INSTITUTION: Louisiana State University – Agricultural Center

PRINCIPAL INVESTIGATOR: Qinglin Wu, Ph.D.

COMMENTS: Drilling fluids (also known as drilling muds) are used to remove cuttings, lubricate the drill bits, maintain the stability of the hole, and prevent the inflow-outflow of fluids between the borehole and the shale formation. Depending on the characteristics of the base fluid, the drilling muds are classified into three main groups: water-based muds (WBMs), synthetic-based muds (SBMs) and oil-based muds (OBMs). The global market for drilling and completion fluids is projected to grow to \$15.2 billion by 2018 and North America holds the largest market for the fluids due to the presence of half of the world's oil and gas reserves. Most muds contain sufficient quantities of solid particles as part of the mud formulation. It is often impossible to fulfill certain functional tasks using macro/micro solid particles as fluid additives due to their inadequate physical, mechanical, chemical, thermal, and environmental characteristics. As a result, the industry is searching for physically small, chemically and thermally stable, biologically degradable, environmental benign chemicals, polymers, or natural products for designing smart fluids to use in all areas of oil and gas exploration. Nanomaterials, due to their highly enhanced properties, are considered the most promising materials of choice for smart fluid design for oil and gas field operations. The cellulose nanoparticles (CNPs), including rod-like crystals (CNCs) and nanofibers (CNFs), are one of the strongest and stiffest organic molecules, with a modulus of 145GPa and a strength estimated at 7500 MPa. Preliminary work shows the gelling/shear thinning effect of the cellulose nanomaterial in WBMs and emulsion stabilization effect for the OBMs, which opens a significant opportunity to develop next-generation nano-based drilling fluids.

The proposed research is a joint partnership between Louisiana State University – Agricultural Center and Pro-Log, Inc., New Iberia, LA, a Louisiana-based company specializing in developing and supplying equipment for offshore rigs and materials for oil well drilling fluids. The overall goal of the research is to develop industrial applications of nanocellulose-tailored drilling fluids for oil well applications. The research will emphasize nanocellulose manufacturing and size control, and the use of the manufactured materials in drilling muds at both laboratory and production scales. The proposed work could lead to a fundamental understanding of the performance of nanoparticles—tailored drilling fluids and performance optimization of environmentally friendly, highly marketable nanofluids formulations made in Louisiana. This is an excellent proposal with a great chance of success. The PI is well qualified to carry out the proposed work. Pro-Log's pledged cash and in-kind support of \$20,000 per year will help to ensure that project goals are achieved. Funding is recommended at the level requested, i.e., \$74,255 for year one, and \$73,255 for year two. The PI is required to maintain support for one graduate research assistant (GRA) at the level proposed in the original budget for each year of the project.

As a condition of funding, the types and amounts of the institutional and external matching commitments stated in the proposal should be maintained in full. Funding is contingent upon receipt by the Board no later than June 30, 2015 of updated documentation showing support at the levels indicated in the original proposal and as required in Appendix C.1.

BUDGET	BORSF	EXTERNAL
1 st Year	\$74,255	\$20,000 as specified in the proposal
2 nd Year	\$73,255	\$20,000 as specified in the proposal

Appendix C.2 (continued)

Proposal: 008B**Rank: 5**

TITLE: *Conjunctive Management of Baton Rouge Multi-Aquifer System for Saltwater Intrusion Mitigation*

INSTITUTION: Louisiana State University and A & M College – Baton Rouge

PRINCIPAL INVESTIGATOR: Frank Tsai, Ph.D.

COMMENTS: Groundwater resources are vital to Louisiana's socio-economic development and expansion. In spite of being surrounded by abundant surface water, Louisiana relies on high-quality, low-cost groundwater to sustain its economic development. Especially during droughts groundwater is an important source to alleviate water shortage. Groundwater serves more than a half-million Louisiana residents via privately owned individual wells with an estimated 1,377 community ground water systems serving nearly three million people, over half of Louisiana's population. South Louisiana is in the midst of saltwater intrusion owing to excessive groundwater withdrawal. The rate of groundwater withdrawal is approximately 900 million gallons per day from coastal aquifers and has induced saltwater intrusion to many freshwater aquifers along the Gulf Coast, which threatens aquifer sustainability and urban development. One of the major affected aquifer systems is the Southern Hills aquifer system, which includes the Baton Rouge Capital Area. This study focuses on the Southern Hills aquifer system, which was designated as a sole source aquifer for southeastern Louisiana and southwestern Mississippi. Major ground water users are Baton Rouge Water Works Company (including Parish Water Company), Georgia-Pacific, ExxonMobil, and Entergy, which are responsible for 85% of groundwater consumption.

The proposed work represents a collaborative effort between Louisiana State University and several industrial partners (Baton Rouge Water Works Company, ExxonMobil, and Georgia-Pacific) in the Capital Area Ground Water Conservation District (CAGWCD). The Capital Area Ground Water Conservation Commission (CAGWCC) consists of 15 members representing state government, district parishes, industrial users and public suppliers. The proposed research seeks to develop a conjunctive management framework that takes advantage of the Baton Rouge multi-aquifer system to mitigate saltwater intrusion. The conjunctive management framework will utilize several hydraulic control techniques to mitigate saltwater encroachment. These hydraulic control approaches include pumping well relocation; freshwater injection; and saltwater scavenging. The project will utilize optimization techniques and high performance computing to derive solutions. The conjunctive management framework will serve as a scientific tool to assist policy makers in solving the urgent saltwater encroachment issue in the Baton Rouge area. This research would help stabilize water companies as well as industries in East Baton Rouge and neighboring parishes by reducing their saltwater intrusion threats, which in turn would sustain Capital Area economic development. The CAGWCC (funds provided entirely from industrial contributions) pledged to continue providing groundwater pumping data for the project, in addition to \$20,000 per year in cash support. Funding is recommended at the level requested, i.e., \$57,115 for year one, \$55,808 for year two and \$53,308 for year three. The PI is required to maintain support (less fringe benefits, which are disallowed) for two graduate research assistants (GRAs) at the level proposed in the original budget for each year of the project.

As a condition of funding, the types and amounts of the institutional and external matching commitments as stated in the proposal should be maintained in full. Funding is contingent upon receipt by the Board no later than June 30, 2015 of updated documentation showing support at the levels indicated in the original proposal and as required in Appendix C.1.

BUDGET	BORSF	EXTERNAL
1 st Year	\$57,115	\$20,000 as specified in the proposal
2 nd Year	\$55,808	\$20,000 as specified in the proposal
3 rd Year	\$53,308	\$20,000 as specified in the proposal

Appendix C.2 (continued)

Proposal 029B**Rank: 6**TITLE: *Hull Deflection on Planing and Semi-Planing Ships*

INSTITUTION: University of New Orleans

PRINCIPAL INVESTIGATOR: Christine Ikeda, Ph.D.

COMMENTS: High-speed planing craft are subjected to repeated slamming events in waves that can often times be very extreme depending on the wave topography, impact angle of the ship, forward speed of the ship, encounter angle, height out of the water, etc. With these many variables that are important to a slamming event, wave load predictions are often very difficult. The PI's previous studies on the physics of wave slamming on planing craft was conducted through the use of computational codes, LAMP and NFA, and experiments. These experiments and simulations were focused on the fluid dynamics side of this complex fluid-structure interaction problem and consisted of detailed measurements of the body motion of the ship as well as accelerations, encounter wave height versus time, and detailed pressure measurements along the bottom of the hull assuming the hull to be a rigid body. However, as the materials of ship hulls have shifted to aluminum alloys and composite materials, the problem changes. The use of composite materials allows for the structure to be stronger while at the same time weighing less. However, fiber composites have material properties that are not isotropic. These composite sheets have very low bending strength in the direction perpendicular to the orientation of the fibers. Developments from the proposed work could lead to a better understanding of the structural loading of these high-speed vessels, which could possibly allow high-speed craft designers to optimize the structure.

The proposed research represents a partnership between the University of New Orleans School of Naval Architecture and Marine Engineering (NAME) and Metal Shark Aluminum Boats, a Louisiana-based shipyard. Developments from the proposed work will lead to a better understanding of the structural loading of high-speed vessels. Research deliverables will help local ship building companies and classification societies to develop a deterministic approach to ship design through use of predictions from theoretical and data-driven models. These predictions of the wave load and its impact on the ship structure are key components in cutting production costs. Metal Shark Aluminum Boats pledged in-kind support in the form of materials as well as aid in the design and construction of panels for testing valued at \$6,200 per panel, although the proposed budget indicates two panels at a cost of \$12,400 per year. Therefore, prior to funding a revised letter of support from industrial partner, Metal Shark Aluminum Boats, must be obtained clearly specifying their commitment to provide (2) test panels per year including the material and labor that are essential to this project. Additionally, salary support for co-PIs Dr. Brandon Taravella and Dr. Nikolas Xiros was not adequately justified and therefore is disallowed. Funding is recommended at a level of \$82,309 for year one, the level requested for year two, i.e., \$74,843, and \$52,114 for year three. The PI is required to maintain support for graduate research assistants (GRAs) at the level proposed in the original budget for each year of the project.

As a condition of funding, the types and amounts of the institutional and external matching commitments as stated in the proposal should be maintained in full. Funding is contingent upon receipt by the Board no later than June 30, 2015 of updated documentation showing support at the levels indicated in the original proposal and as required in Appendix C.1.

BUDGET	BORSF	EXTERNAL
1 st Year	\$82,309	\$12,400 as specified in the proposal
2 nd Year	\$74,843	\$12,400 as specified in the proposal
3 rd Year	\$52,114	\$12,400 as specified in the proposal

Appendix C.2 (continued)

Proposal 005B**Rank: 7**TITLE: *Electrical Stimulation Device for Targeted Osmotic Lysis of Cancer Cells*

INSTITUTION: Louisiana State University and A & M College – Baton Rouge

PRINCIPAL INVESTIGATOR: William Monroe, Ph.D.

COMMENTS: In addition to being a global healthcare threat, cancer strikes Louisiana residents with particularly devastating outcomes, as the state has one of the highest cancer mortality rates in the nation. The proposed research seeks to develop a device and method to electrically stimulate and selectively kill cancer cells. Targeted Osmotic Lysis (TOL), the stimulated blockade of sodium pumps and stimulation of voltage-gated sodium channels (VGSCs,) has been shown by Oleander Medical Technologies, LLC, to selectively kill cancer cells which overexpress VGSCs. Targeted Osmotic Lysis (TOL) is the process of stimulating sodium channel opening in combination with the blocking of Na⁺/K⁺, ATPase (sodium pumps) with a cardiac glycoside drug to induce the osmotic lysis of malignant carcinomas. Because cancer cells overexpress VGSCs, stimulation of their opening, along with delivery of the adjuvant to block the cell's ability to re-establish intracellular sodium concentrations, creates an osmotic imbalance in these cells leading to cell death. The project proposes a non-contact electrical device for generating a whole-body electromagnetic field to stimulate cells *in vivo* for killing cancer cells.

This project further strengthens a collaborative partnership between Louisiana State University and industry partner Oleander Medical Technologies, LLC. While some aspects of a more simple, contact-based TOL stimulation approach are supported by an existing contract, the delivery and optimization of electromagnetic fields (EMFs) for optimal TOL have not been realized. This project seeks to develop an EMF source and non-contact transducers capable of a range of pulsed EMFs at varying amplitudes, waveforms and duration to optimize TOL for laboratory animals and eventually clinical use as a cancer therapy. Although the focus of the research is a TOL-optimized device, it could also find application and economic impact in medical fields outside of cancer therapy, including treatment of muscle strains and joint stiffness, in addition to potential applications in wound healing and reduction of scarring. Oleander Medical pledged in-kind support for this project in the form of consulting time for Dr. Dennis Paul, Ph.D., Oleander Chief Scientific Officer, and Dr. Harry Gould, M.D., Ph.D., Oleander Chief Medical Officer, valued at \$12,000 per year. It should be noted that Oleander Medical Technologies' letter of support dated October 30, 2014, did not include the company's contact information or physical address. Therefore, prior to BoRSF funding a revised letter from Oleander Medical Technologies must be obtained that includes the company's physical address and contact information. Furthermore, given the complexity of the proposed research it is recommended that two years of BoRSF support be provided rather than the three years requested, with early reporting of project results encouraged. Funding is recommended at the level requested for year one and year two, i.e., \$63,400 and \$59,400, respectively, and \$0 funding for year three. The PI is required to maintain support for one graduate research assistant (GRA) at the level proposed in the original budget for each year of the project.

As a condition of funding, the types and amounts of the institutional and external matching commitments as stated in the proposal should be maintained in full. Funding is contingent upon receipt by the Board no later than June 30, 2015 of updated documentation showing support at the levels indicated in the original proposal and as required in Appendix C.1.

BUDGET	BORSF	EXTERNAL
1 st Year	\$63,400	\$12,000 as specified in the proposal
2 nd Year	\$59,400	\$12,000 as specified in the proposal

Appendix C.2 (continued)

Proposal 020B**Rank: 8**

TITLE: *Development of an Algorithm and a Tool for Accurate Comparison of Protein and Chemical 3-D Structures*

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Vijay Raghavan, Ph.D.

COMMENTS: Determining and understanding the three-dimensional (3-D) structures of inorganic and organic molecules are the essential foundation for understanding molecular functions and also for understanding mechanisms of chemical and biochemical reactions. Biology and chemistry are the traditional and fundamental fields. We can address the challenges facing the world in combating diseases, providing clean water and safe food, developing new sources of energy, developing new materials, and confronting climate changes through the interdisciplinary application of biology and chemistry. All applications require fundamental knowledge and understanding of the exact function of each molecule; this requires molecular 3-D structures and tools for analyzing 3-D structures.

The proposed research represents a collaboration between the University of Louisiana at Lafayette and R3 Sciences, Lafayette, LA, to develop a new algorithm and a tool for accurate protein and chemical 3-D structure comparisons. The current protein 3-D comparison algorithms are based on the distance between two atoms. The algorithm proposed is based on mapping triples of atoms into spatial triangles, and converts atom types and the geometry of a triangle into features. This represents a completely different approach for protein 3-D comparison. Success of the proposed research activities will add intellectual properties that are the foundation for a patent. R3 Sciences agrees to provide an in-kind match valued at \$10,000 per year in the form of technical and intellectual consulting. It is recommended that the project be funded at the level requested for year one, i.e., \$60,893. Similar budgets of \$60,893 are recommended for year two and year three. The PI should note that Support Fund money requested for successive years of a research project should not increase. The PI is required to maintain support for two graduate research assistants (GRAs) at the level proposed in the original budget for each year of the project.

As a condition of funding, the types and amounts of the institutional and external matching commitments as stated in the proposal should be maintained in full. Funding is contingent upon receipt by the Board no later than June 30, 2015 of updated documentation showing support at the levels indicated in the original proposal and as required in Appendix C.1.

BUDGET	BORSF	EXTERNAL
1 st Year	\$60,893	\$10,000 as specified in the proposal
2 nd Year	\$60,893	\$10,000 as specified in the proposal
3 rd Year	\$60,893	\$10,000 as specified in the proposal

Appendix C.2 (continued)

Proposal 023B**Rank: 9**

TITLE: *Laboratory Investigation and Field Case Study for Casing while Drilling: An Integrated Approach*

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Saeed Salehi, Ph.D.

COMMENTS: Casing while Drilling (CwD) is a drilling method that entails the simultaneous drilling and casing of a well. Although this technology is not commonly used as compared to conventional drilling, recent advances in mitigating lost circulation and success in drilling depleted zones has made it a potential for future drilling operation. The main objective of this project is to investigate a useful drilling technology from a scientific point of view. The project is associated with applications of advanced finite elements and CFD models, as well as the use of extensive laboratory experiments under high pressure and temperature to study CwD. Many of the findings in this study can also be extended to conventional drilling since many similarities exist in terms of strengthening and filtration effects.

The University of Louisiana at Lafayette (ULL) and Weatherford International, a leading service company in using casing/liner drilling, will partner to study various aspects of CwD technology. The specific objectives of this project include: (1) Case studies, i.e., several field cases of Casing/Liner drilling will be studied and a comprehensive integrated database prepared; (2) Laboratory study of plastering effects; (3) Fluid dynamic and numerical stress simulations; and (4) Field applications of the studies outcome. Weatherford pledged in-kind support valued at \$75,000 per year in the form of consulting, laboratory materials, shared field data, and student interaction to help to ensure project goals are achieved. It should be noted that the PI has a pending RCS proposal entitled "Investigation of Environmental Aspects in Well Construction and Integrity" in the amount of \$182,733 for the period of June 1, 2015 through May 30, 2018. ***Therefore, prior to funding the PI must provide BoR assurance that the ITRS project does not potentially overlap with the RCS project, if funded. In the event that overlap exists between the two projects, the PI must identify those areas and the ITRS year one, year two, and year three awards should be adjusted to reflect this change.** Funding is recommended at the level requested for year one, i.e., *\$59,934. A similar budget of *\$59,934 is recommend for year two and year three. The PI should further note that Support Fund money requested for successive years of a research project should not increase. The PI is required to maintain support for undergraduate students and two graduate research assistants (GRAs) at the level proposed in the original budget for each year of the project.

As a condition of funding, the types and amounts of the institutional and external matching commitments as stated in the proposal should be maintained in full. Funding is contingent upon receipt by the Board no later than June 30, 2015 of updated documentation showing support at the levels indicated in the original proposal and as required in Appendix C.1.

BUDGET	BORSF	EXTERNAL
1 st Year	*\$59,934	\$75,000 as specified in the proposal
2 nd Year	*\$59,934	\$75,000 as specified in the proposal
3 rd Year	*\$59,934	\$75,000 as specified in the proposal

APPENDIX C.3
COMMENTS ON PROPOSALS RANKED PRIORITY I BY THE
SUBJECT-AREA PANEL AND CONSIDERED BY THE FINAL PANEL
BUT NOT RECOMMENDED FOR FUNDING

Proposal 001B

TITLE: *Electromagnetic-Based Production of Pyrolysis Bio-Oil and Bio-Diesel from Tallow Trees as a Strategy to Control its Invasiveness*

INSTITUTION: Louisiana State University – Agricultural Center

PRINCIPAL INVESTIGATOR: Dorin Boldor, Ph.D.

COMMENTS: Increasing costs of transportation fuels and continuous volatility in petroleum markets make biofuels a viable, renewable energy source. Low-costs, non-food lipid and biomass feedstocks grown on marginal lands are desirable to mitigate costs and competition with food markets. Tallow trees, an oilseed producing species currently naturalized throughout Louisiana, can be used not only as a source of low-cost lipids, but also as an abundant feedstock supply for pyrolysis bio-oil. Its utilization for biofuel production would assist in eliminating it from the ecosystem where it exerts a significant propagule pressure leading to invasiveness.

The overall goal of this research project is to foster and accelerate the development of a biofuel industry using non-food, alternative resources with high yields of not only biomass but also of high-lipid content seeds (tallow trees) specific to Louisiana. Prior research by the PI indicates that microwave technology can be used to extract oil from soybeans and rice bran and is feasible in both batch and continuous microwave systems. The proposed research adds a pyrolysis system using an inductive heating technique to produce “bio-char, bio-oil and syngas”. The proposed research did not include plans for the residual products, or suggestions for use as a soil amendment. The proposal is essentially an extension of prior work with scale-up being an important component. It is unclear why scale-up has not been pursued by industry. Issues related to a sustainable tree source for harvesting still require clarification. This is a very large and complex project that involves five PIs with varying degrees of funding support and productivity in terms of publications. Industry partners Golden Leaf Energy, Inc., and Industrial Microwave Systems (IMS), LLC, pledged contributions of \$76,000 and \$45,000, respectively, which is a strong indication of industrial interest.

Appendix C.3 (continued)

Proposal 004BTITLE: *Flexible and Printed Sensors*

INSTITUTION: Louisiana State University and A & M College – Baton Rouge

PRINCIPAL INVESTIGATOR: Jin-Woo Choi, Ph.D.

COMMENTS: Nanotechnology has become a well-established field of study in recent years. Various nanomaterials are being used in spectacular ways in order to further enhance nearly any kind of device or product. In particular, both nanotubes and nanowires have been used in numerous applications including mechanical, electrical, chemical, and even biological applications. Although the use of nanomaterials involves a number of issues and considerations, the deposition method for such materials is of great importance. The objective of the proposed research is to study and develop a functional nanomaterial printing technology for various flexible and printed electronics and sensor applications. The proposed technology can be used for applications that require patterned nanomaterials on a flexible substrate, e.g., environmental sensing, biomedical micro-devices, pathogen identification, flexible electronics, and wearable sensors.

Although this proposal was ranked Priority I, the final panel did not view the work as particularly innovative since very little information was provided detailing how problems would be approached, e.g., the types of surfactants to be studied, targeted level of resistance, whether the optimized ink will be close to the low stated value of a highly conductive ink (which cannot be used due to clogging of the printing heads), or the optimization criteria for “fully optimized” ink. The PI describes extensively prior experiences in developing carbon nanomaterial ink-jet printing and/or sensor development. However, simply studying a new approach is not sufficient for a scientific project. The panel further noted that the PI is well funded but with only a small amount of support in this research area, although there are recent publications. Industrial partner Lab 177, Chatham, Ontario, provided a very modest cash and in-kind contribution that is viewed more as a symbolic gesture, rather than an industrial partnership. Lastly, the PI provided no compelling case for an impact on Louisiana’s economy.

Appendix C.3 (continued)

Proposal 011B

TITLE: *Micro-Aerial Vehicles Formation Control and Data Analysis for Precision Agriculture and Forestry Applications*

INSTITUTION: Louisiana Tech University

PRINCIPAL INVESTIGATOR: Rastko Selmic, Ph.D.

COMMENTS: The 2013 Bureau of Labor Statistics projection for the next decade shows that forestry jobs will increase 6% and the number of farmers will decrease by almost 20%. Forestry and agriculture have a significant impact on Louisiana's economy. One common area that is predicted to exhibit a significant demand for personnel is remote sensing. The most promising technology within remote sensing is the development and usage of drones.

The overall objective of this project is to develop a Micro-Aerial Vehicle (MAV)-based system, called *OrcharDrone*, with precision agriculture capability that can monitor, sense, collect, and execute various operations required in the management of orchards and forests. The PI suggests that the *OrcharDrone* system use aerial vehicles capable of flying in a formation, below canopy, with precise agricultural dusting capabilities. The proposed drones will be capable of carrying a payload of five pounds including wireless video camera for high-resolution aerial photography and data collection. The panel viewed the suggestion of formation control software and implementation of multi-agent systems within the proposed time frame with a bit of skepticism. Issues of formation control in a complex environment (a forest) do not appear to be considered. Drones with agricultural dusting capabilities would have to be large to support the weight. This would mean a more complex and expensive aerial vehicle. The proposed budget does not support development of large drones and there were no details given on how this would be realized. There are other concerns over the use of drones and their ability to sustain a reasonable life span. The PI would be better served focusing on the planning stage of the proposal and partnering with industry for the implementation activities. Providing an accurate picture on the ground of an orchard/forest is a worthy goal. Finally, the proposal did not provide enough information related to data reduction or enhancement strategies. The PI's laboratory supports research in this area and appears to be well equipped. It should be note that the PI has reasonable funding from various sources, including the Air Force Research Laboratory.

Appendix C.3 (continued)

Proposal 016B

TITLE: *Microbial Lipids from Hydrolyzates of Agricultural Residues for Production of Biofuels*

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Rakesh Bajpai, Ph.D.

COMMENTS: Agriculture and forestry are Louisiana's largest and most economically significant industries. In agricultural productions, Louisiana's national rank is second in aquaculture and sugarcane, third in rice production and milling, fourth in sweet potato crops, and sixth in sorghum, resulting in considerable amounts of agricultural residue being available in the state.

The proposed research seeks to develop the processes for production of microbial oils from lignocellulosic materials. Prior research indicates that the oleaginous yeast, *Lipomyces starkeyi*, can be cultivated on different carbohydrates for production of over 75% of cell dry weight as lipids. The PI's claim that high density cultivation in a biorefinery (a facility producing multiple products that take advantage of all the components in a raw material source) can result in fuel production costs that are comparable with those for fossilized crude oil. The investigators further indicate that their yeast cultures can achieve > 65% intracellular lipids, with a slower rate of re-metabolization under the given culture conditions. It is the panel's opinion that many of the novel aspects of the work, e.g., low-cost fermentation medium, high-density cultivations, and scale-up activities, should have been discussed in more detail, as well as the time needed to convert lignocellulosic raw material into biofuel. Much of the first year work appears to rely on simulations and bench scale studies with pure primary sugars. It is unclear that hydrolyzates from agricultural waste will achieve similar efficiency. The proposal is preliminary to any realistic bioreactor design and it was not clear how this would be translated into a high efficiency on-site bioreactor. The use of sweet potatoes as a feedstock was mentioned but the proposal did not include the potential impact on Louisiana's economy. The proposed research did not appear to be an exciting new thrust for either of the researchers. The proposed budget included a considerable amount of supplies, although summer salary was limited to ½ month for the PIs.

Appendix C.3 (continued)

Proposal 024B

TITLE: *Transition Metal-Catalyzed C-H Functionalization for the Synthesis of Heterocycles and Value-Added Chemicals*

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Radhey Srivastava, Ph.D.

COMMENTS: Development of economically useful and industrially viable selective synthetic routes to convert inexpensive petroleum-derived hydrocarbons to useful products remains a major thrust of research in both industry and academia. The objective of this research is to develop catalytic C-H functionalization methods to access heterocyclic compounds and the related organo-nitrogen compounds that are of industrial importance. The proposed chemical products are versatile and would be of great interest to fine chemicals, pharmaceuticals and agrochemical industries. The specific objectives of the proposed research include: (i) development of novel catalytic C-H functionalization methods for the synthesis of heterocycles such as 2-acylindolines, spirocyclic indolines, quinolines and naphthyridines; (ii) development of catalytic asymmetric α C-H amination to access chiral amino alcohols and 3-amino oxindoles; (iii) synthesis of N-aryl-4-allyl oxazolidines and corresponding amino alcohols via allylic C-H amination; and (iv) exploring the scope, reactivity, functional group tolerance, mechanistic aspects and synthetic applications of the developed reactions.

Although the proposal was ranked priority I, the final panel viewed this proposal with less enthusiasm given that the overall objective appears to perform basic chemistry research with far-reaching goals that were not adequately described in the proposal. Consequently, this proposal was not recommended for funding. Industrial partner R3 Science pledged in-kind support valued at \$25,000 per year in the form of technical and intellectual consulting and states the importance of the technology for the future development of the petroleum industry, but documents no near-term economic benefit to Louisiana. The proposed budget is considerably high in salaries and supplies (year one) without providing adequate justification and the PI's biographical sketch did not include a strong publication record. It should be noted that Dr. Srivastava is currently the PI of an ITRS grant entitled "Copper-Catalyzed Asymmetric Allylic Amination: Method Development, Mechanistic Studies and its Synthetic Applications" in the amount of \$225,000 for the period June 1, 2013 through June 30, 2016. The final panel further noted that a vast majority of the PI's support has historically come from the BoRSF with a second ITRS proposal (025B-15) submitted during this competition for funding consideration.

APPENDIX C.4**GENERAL STATEMENT ON MERITORIOUS PROPOSALS
NOT RECOMMENDED FOR FUNDING AT THIS TIME
(PRIORITY TWO)**

Proposals included in this category are those applications the panel believes to be meritorious, although of a lower order than those rated Priority One. Individual subject-area commentaries on proposals ranked Priority Two are not included in this report. Proposals so ranked were not recommended for funding.

Proposal 002B

TITLE: *Value-Added Products and Energy from Duckweed [Lemnoideae]-based CO₂ Sequestration and Wastewater Treatment Systems*

INSTITUTION: Louisiana State University – Agricultural Center

PRINCIPAL INVESTIGATOR: Chandra Theegala, Ph.D.

COMMENTS: The Environmental Protection Agency (EPA) strongly believes that the present rate of climate change poses a serious risk to the nation, with “far-reaching harmful consequences and real economic costs”. On June 2, 2014, the EPA proposed a first-ever greenhouse emission standard, which would require existing fossil fuel-fired power plants to reduce the emissions of carbon dioxide by 30% by 2030. Due to this proposed rule and increasing environmental awareness, most power plants and industries with major greenhouse gas emissions are seriously considering reduction in CO₂ emissions, purchase of carbon credits, and sequestration of CO₂.

This project is aimed at using ultra-fast growing Duckweed (Lemnoideae Subfamily) for sequestration of CO₂. The proposed research will focus on quantification and maximization of CO₂ sequestration by Duckweeds (for Louisiana conditions). The PI’s previous experience on microalgal biofuels has provided some limited expertise in aquaculture. However, the use of “Bench Scale Experimental Systems” to test the usefulness of a new technology notoriously overestimates potential yields. The high levels of nitrogen in Duckweed may cause a problem with NO_x, in addition to the problem with heavy metal contamination. There are many questions that were not addressed, e.g., how long does a Duckweed pond last; where does the accumulated CO₂ eventually go; how can transmission of contaminants be measured in a lab scale; and what kind of mathematical models are being developed? Hence, this proposal is premature and needs the support of solid data generated and published by the PI. The proposed travel and supplies requests appear inflated. The industrial support (\$10,000 in-kind) does not appear to be specifically targeted for this project.

Appendix C.4 (continued)

Proposal 010B

TITLE: *Remediation of Produced Water with High Efficiency On-Site Generation of Mixed Oxidants Using Ultrananocrystalline Diamond Electrodes*

INSTITUTION: Louisiana Tech University

PRINCIPAL INVESTIGATOR: Prabhu Arumugam, Ph.D.

COMMENTS: Water plays a crucial role in energy and food production, affecting the United States economy, security and sustainability. The recent explosive growth of energy production in North America (e.g. 2,432 wells in Louisiana's Haynesville Shale) requires vast quantities of water. Much of this water commonly referred to as "produced water" becomes contaminated with the toxic by-products and its treatment is very challenging with current electrode materials (e.g. dimensionally stable electrodes).

The goal of this project is to develop a large surface area diamond electrode technology for onsite generation of mixed oxidants and Electrochemical Advanced Oxidation Processes (EAOPs) with the highest efficiency and lowest cost. More specifically, the project plans to (1) develop methods to fabricate three dimensional (3D) diamond electrodes, and (2) demonstrate unique advantages of 3D electrodes in terms of destruction rates of pollutants. The PI makes a case for many different applications of the technology, but the proposal focuses on one use that can be demonstrated. The costs of fabrication with large diamond structures will always be a problem for this concept. The oxidants in and of themselves are toxic and will generate additional toxic components, in addition to heavy metals that are not removed. Lastly, these are not well defined pharmaceutical waste streams but mixed sources containing undefined organic and inorganic substances. The 3D design is thought to better deal with the low pollutant concentration, but little supportive detail was provided and only the following is stated: *"It is well known that 3D electrodes greatly enhance the mass-transport, a critical issue"*. The PI lists two industrial partners, Advanced Diamond Technologies (ADT), Inc., and ElectroCell North America. ADT pledged in-kind support for the project valued at \$32,250, although the proposed budget reflects a contribution of \$37,150 which includes a cash match of \$5,650 for equipment. ElectroCell North America provided a letter of support, but provided no cash or in-kind contribution.

Appendix C.4 (continued)

Proposal 019B

TITLE: *Computational Assessment and Optimization of the Wave Suppressor Sediment Collection [WSSC] System*

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Daniel Gang, Ph.D.

COMMENTS: Land and wetland loss occurs along the edges of wetlands, and shorelines across coastal Louisiana. Conventional shoreline protective structures are expensive to construct in these environments. Pierce Industries, LLC, of Cutoff, LA recently invented the WSSC System that could become a preferred alternative. The ongoing ITRS project (LEQSF(2013-16)-RD-B-04) has shown that the performance of the WSSC is strongly affected by many environmental factors, such as wave height and sediment concentration. In order to address these issues, a proposal was submitted to the National Oceanic and Atmospheric Administration (NOAA) Small Business Innovation Research (SBIR) program but was not funded due to lack of information. Further investigation/assessments are needed to optimize the design and to address the issues that, without further study, will result in a terminated project. The proposed investigation will include developing computational models, modifying the simulation model based on the experimental data, and predicting the performance under different environmental conditions.

This is the second submission of the above-referenced proposal. It should be further noted that the PI is the past recipient of an ITRS grant for the period June 1, 2011 – May 30, 2014, related to the same research, as well as the PI of a current ITRS grant for the period June 1, 2013 – May 30, 2016, again related to the same work. It is the panel's opinion that the current proposal offers very few, if any, new approaches. Industry partner Pierce Industries pledged cash and in-kind contributions valued at \$50,000 for the manufacturing of three "lab scale" WSSC units, in addition to personnel and travel support. The proposed budget lists Pierce Industries' support as \$50,000 cash and in-kind including a \$5,000 cash contribution (year one only) for the manufacturing of three "field scale" WSSC units, in addition to personnel and travel support.

Appendix C.4 (continued)

Proposal 022B

TITLE: *Aqueous Surfactant Two-Phase Extraction of Soluble Metabolites Coupled with Hydrogen Production from Anaerobic Digestion of Wastes*

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Emmanuel Revellame, Ph.D.

COMMENTS: The volume of municipal, agricultural and industrial wastes is proportional to industrialization and population increases. In Louisiana, food processing facilities, confined animal raising operations, slaughter houses, breweries, and food preparation operations produce tremendous volumes of waste and wastewaters. With the growing environmental concern and the need for alternative fuel sources and domestic and renewable fuels and chemicals, it is necessary to convert these wastes into useful products or precursors.

Digestion is a mature technology that uses microorganisms to anaerobically degrade organic and inorganic materials with CH_4 and CO_2 as ultimate products. The process, however, can be directed to production of hydrogen and volatile organic acids (VOAs) at lower pH. The accumulation of VOAs decreases the pH further and eventually shuts down the process. Continuous extraction of VOAs from the mixture could maintain system operation and transform anaerobic digestion into a source of sustainable fuels and chemicals. Application of surfactants could create a bi-phasic system for VOA extraction and pH stabilization.

The main goal of this project is to develop a surfactant-based extraction strategy for a process-stable production of hydrogen, VOAs and lipids from industrial wastes. The reviewers see the basic research concept as valid, but there is no assurance that the proposed method involving two phase fermentation and separation is feasible physically. The effect of surfactants and non-ionic detergents on the anaerobic bacteria should be considered. The team of researchers is well qualified to carry out the proposed work. However, Dr. Revellame, PI for the project, is listed as a Research Scientist in the Department of Chemical Engineering and therefore ineligible to serve as PI. The RFP specifically states "Only tenured or tenured-track faculty employed on a full-time basis by an eligible Louisiana institution of higher education may act as principal or co-principal investigators."

Appendix C.4 (continued)

Proposal 028B

TITLE: *Preclinical Investigation of Olive-Based Oleocanthal as a Potential Dietary Supplement*

INSTITUTION: University of Louisiana at Monroe

PRINCIPAL INVESTIGATOR: Khalid El Sayed, Ph.D.

COMMENTS: The Mediterranean diet correlates with lower incidences of cancer and age-related cognitive disease. Computer-assisted and other studies identified several natural phenolic secoiridoids from extra-virgin olive oil (EVOO) as potentially useful for metastatic malignancies and the risk of Alzheimer's disease (AD). Recent studies show that EVOO-derived (-)-oleocanthal selectively inhibited the growth of several human breast cancer cell lines without affecting normal human mammary epithelial cells growth. These results were further supported by *in vivo* activity using an orthotopic mouse model. In addition to its anticancer activity, oleocanthal has demonstrated an anti-AD activity where prior research has shown its ability to enhance the clearance of the AD neurodegenerative hallmark amyloid-beta (A β) from the brain via up-regulation of A β transport proteins *in vitro* and *in vivo*. These findings provide evidence for the potential of oleocanthal to reduce the risk of AD.

The goal of this project is to develop cost-effective EVOO oleocanthal rich fractions (EVOORF) via new extraction methodology, pharmaceutically formulate them as dietary supplement products and test bioactivity and bioavailability *in vitro* and in animal models. The research methods are described in sufficient detail but the panel did not view this project as highly innovative. Oil extraction is hardly innovative and neither are the very basic *in vitro* and *in vivo* bioassays proposed. There are many studies searching for nutraceuticals. Standardization appears premature given that biological activity is still in question. Nevertheless, the team is well equipped to carry out the proposed work. The budget request of \$93,000 for supplies is considered unreasonable. The budget justification was difficult to interpret. Future submissions must include a clear justification for funds requested. The proposed budget reflected a private-sector match of \$25,000 per year, although the letter from LSU Health Sciences Center's Innovative North Louisiana Experimental Therapeutics Program (INLET) only states that all platforms will be available to the researchers, and pledges no cash or in-kind support.

APPENDIX C.5

GENERAL STATEMENT ON PROPOSALS RANKED PRIORITY THREE BY THE FINAL PANEL

Individual commentaries on proposals ranked Priority Three by the final panel are not included in this report. Proposals so ranked were not recommended for funding for at least two of the following reasons (not listed in order of importance):

- Insufficient or inappropriate industrial matching funds were pledged and/or external support documented in the proposal budget was not substantiated by required letters of industrial support
- The industrial partner'(s) role in the research collaboration was not provided and/or detailed in the proposal
- The proposal did not have clear objectives and/or research plans lacked scientific rigor or completeness
- The background of the principal investigator was inconsistent with the proposed research and/or the principal investigator had an unusually poor publication record in the proposed area of research
- The proposal showed little or no potential for contributing to the near-term development and diversification of Louisiana's economy
- The proposal did not contain evidence of future commercialization, or it was not clear what economic benefit would be gained from the research
- Budgets were excessive, inadequately justified, or inconsistent with provided budget justifications
- The need for consultants and/or subcontracts was not adequately justified
- Equipment requests were excessive and/or inappropriate for the research proposed

APPENDIX D

LIST OF SUBJECT-AREA REVIEWERS WHO PARTICIPATED IN PHASES I & II OF THE REVIEW PROCESS

Agriculture, Aquaculture, and Animal Science

Dr. Brian Scott Baldwin, Chair

Department of Plant and Soil Sciences
Mississippi State University

Dr. Sangamesh Angadi

Department of Plant and Environmental Sciences
New Mexico State University

Biotechnology and Health Care

Dr. Radu Marches, Chair

Baylor Institute for Immunology Research

Dr. Leo Herbette

President, Exploria

Chemical Materials and Petroleum Engineering

Dr. Russell D. Ostermann, Chair

Department of Chemical & Petroleum Engineering
University of Kansas

Dr. Roger A. Korus

Department of Chemical Engineering
University of Idaho

Computer and Information Sciences

Dr. John Usher, Chair

Professor, Department of Industrial Engineering
Mississippi State University

Dr. Behrooz A. Shirazi

Director, School of Electrical & Computer Science
Washington State University

Appendix D (continued)

Mechanical and Materials Engineering

Dr. John Berry, Chair

E. P. Coleman Professor, Department of Mechanical Engineering
Mississippi State University

Dr. Mathew Schaefer

Department of Mechanical and Industrial Engineering
Milwaukee School of Engineering

Environmental Science & Technology, and Urban Design

Dr. Trevor H. Boyer, Chair

Department of Environmental Engineering Sciences
University of Florida

Dr. James T. Anderson

Environmental Research Center
West Virginia University

APPENDIX E

**SUMMARY OF PROPOSALS SUBMITTED TO THE
INDUSTRIAL TIES RESEARCH SUBPROGRAM (ITRS)
FY 2014-15**

Proposals Submitted to the Research and Development Program - ITRS
for the FY 2014-15 Review Cycle

Proposal #	PI Name	Category	Institution	Proposal Request	Project Title	Amount Requested				Confidential Info
						Year 1	Year 2	Year 3	Total	
001B-15	Dr. Dorin Boldor	Scientific	Louisiana State University Agricultural Center	New Request	Electromagnetic-based production of pyrolysis bio-oil and bio-diesel from tallow trees as a strategy to control its invasiveness	\$83,835.00	\$81,789.00	\$76,956.00	\$242,580.00	Yes
002B-15	Dr. Chandra Theegala	Scientific	Louisiana State University Agricultural Center	New Request	Value-added Products and Energy from Duckweed [Lemnnoideae]-Based CO2 Sequestration and Wastewater Treatment Systems	\$71,254.00	\$72,354.00	\$73,499.00	\$217,107.00	No
003B-15	Prof. Qinglin Wu	Scientific	Louisiana State University Agricultural Center	New Request	Using nanoparticles to tailor rheological and filtration properties of drilling fluids: industrial application	\$74,255.00	\$73,255.00	\$0.00	\$147,510.00	No
004B-15	Prof. Jin-Woo Choi	Scientific	Louisiana State University and A & M College - Baton Rouge	New Request	Flexible and Printed Sensors	\$65,442.00	\$62,779.00	\$61,779.00	\$190,000.00	No
005B-15	Prof. William Monroe	Scientific	Louisiana State University and A & M College - Baton Rouge	New Request	Electrical Stimulation Device for Targeted Osmotic Lysis of Cancer Cells	\$63,400.00	\$59,400.00	\$58,000.00	\$180,800.00	No
006B-15	Prof. Krishnaswamy Nandakumar	Scientific	Louisiana State University and A & M College - Baton Rouge	New Request	Innovative Bioreactor Designs for Process Intensification in Biological Natural Gas Conversion	\$77,890.00	\$73,765.00	\$0.00	\$151,655.00	No
007B-15	Dr. Dandina Rao	Scientific	Louisiana State University and A & M College - Baton Rouge	New Request	Development of Diffusion-Induced Surfactant Imbibition Process for Enhancing Tight Oil Recovery from Louisiana Shale Formations	\$80,920.00	\$75,920.00	\$68,920.00	\$225,760.00	No
008B-15	Prof. Frank Tsai	Scientific	Louisiana State University and A & M College - Baton Rouge	New Request	Conjunctive Management of Baton Rouge Multi-Aquifer System for Saltwater Intrusion Mitigation	\$57,115.00	\$55,808.00	\$53,308.00	\$166,231.00	No
009B-15	Prof. Hsiao-Chun Wu	Scientific	Louisiana State University and A & M College - Baton Rouge	New Request	Novel Signal Processing Technology for Three-Dimensional Lensless Camera	\$94,471.00	\$93,471.00	\$92,471.00	\$280,413.00	No
010B-15	Dr. Prabhu Arumugam	Scientific	Louisiana Tech University	New Request	Remediation of produced water with high efficiency on-site generation of mixed oxidants using ultrananocrystalline diamond electrodes	\$69,931.00	\$76,060.00	\$70,142.00	\$216,133.00	No
011B-15	Dr. Rastko Selmic	Scientific	Louisiana Tech University	New Request	Micro-Aerial Vehicles Formation Control and Data Analysis for Precision Agriculture and Forestry Applications	\$80,336.00	\$77,889.00	\$75,505.00	\$233,730.00	No
012B-15	Dr. Sanjay Tewari	Scientific	Louisiana Tech University	New Request	Environmental Friendly Recycling of Lead-Acid Batteries	\$29,675.00	\$29,591.00	\$16,682.00	\$75,948.00	No
013B-15	Dr. Frederick LeMieux	Scientific	McNeese State University	New Request	Xenotransplantation Of Irradiated Bovine Menisci in Porcine and Antibody Response	\$58,083.00	\$58,083.00	\$58,083.00	\$174,249.00	No
014B-15	Dr. Jean Fotie	Scientific	Southeastern Louisiana University	New Request	Creation of C-O or Si-O bonds as well as Van der Waals Interactions as Strategies for the Development of a New Generation of Sizing Agents for the Paper Industry	\$44,226.00	\$44,051.00	\$44,908.00	\$133,185.00	Yes
015B-15	Dr. James Zadina	Scientific	Tulane University Health Sciences Center	New Request	Development of Novel Analgesics with Reduced Side Effects Relative to Morphine	\$62,815.00	\$59,711.00	\$58,490.00	\$181,016.00	Yes
016B-15	Prof. Rakesh Bajpai	Scientific	University of Louisiana at Lafayette	New Request	Microbial Lipids from Hydrolyzates of Agricultural Residues for Production of Biofuels	\$75,661.00	\$76,905.00	\$0.00	\$152,566.00	No
017B-15	Dr. William Chirdon	Scientific	University of Louisiana at Lafayette	New Request	Development of Novel Composite Materials using Carbon Black with Algae-Based Binders	\$69,129.00	\$78,708.00	\$77,109.00	\$224,946.00	No
018B-15	Dr. Dilip Depan	Scientific	University of Louisiana at Lafayette	New Request	Development of a Multifunctional Nanovector for Multimodal Imaging and Magnetically Targeted Photothermal Therapy	\$57,668.00	\$58,064.00	\$58,481.00	\$174,213.00	No
019B-15	Dr. Daniel Gang	Scientific	University of Louisiana at Lafayette	New Request	Computational Assessment and Optimization of the Wave Suppressor Sediment Collection [WSSC] System	\$56,793.00	\$55,771.00	\$55,400.00	\$167,964.00	No
020B-15	Prof. Vijay Raghavan	Scientific	University of Louisiana at Lafayette	New Request	Development of an Algorithm and a Tool for Accurate Comparison of Protein and Chemical 3-D Structures	\$60,893.00	\$61,079.00	\$61,265.00	\$183,237.00	No
021B-15	Mr. Jonathan Raush	Scientific	University of Louisiana at Lafayette	New Request	Thermal Energy Storage for Renewable Energy Applications	\$73,305.00	\$62,208.00	\$45,033.00	\$180,546.00	No

Proposals Submitted to the Research and Development Program - ITRS
for the FY 2014-15 Review Cycle

Proposal #	PI Name	Category	Institution	Proposal Request	Project Title	Amount Requested				Confidential Info
						Year 1	Year 2	Year 3	Total	
022B-15	Dr. Emmanuel Revellame	Scientific	University of Louisiana at Lafayette	New Request	Aqueous Surfactant Two-Phase Extraction of Soluble Metabolites coupled with Hydrogen Production from Anaerobic Digestion of Wastes	\$64,445.00	\$66,313.00	\$46,721.00	\$177,479.00	No
023B-15	Dr. Saeed Salehi	Scientific	University of Louisiana at Lafayette	New Request	Laboratory Investigation and Field Case Study for Casing while Drilling: An Integrated Approach	\$59,934.00	\$60,894.00	\$61,900.00	\$182,728.00	No
024B-15	Dr. Radhey Srivastava	Scientific	University of Louisiana at Lafayette	New Request	Transition metal-catalyzed C-H functionalization for the synthesis of heterocycles and value-added chemicals	\$147,800.00	\$99,881.00	\$99,754.00	\$347,435.00	No
025B-15	Dr. Radhey Srivastava	Scientific	University of Louisiana at Lafayette	New Request	Catalytic conversion of cellulose-derived carbohydrates, sugar alcohols to value-added chemicals and fuels	\$149,800.00	\$99,381.00	\$99,754.00	\$348,935.00	No
026B-15	Dr. Ramalingam Subramaniam	Scientific	University of Louisiana at Lafayette	New Request	Characterization and Evaluation of Adsorbents from Waste Biomass for the Potential Treatment of Industrial Waste Waters	\$74,105.00	\$73,854.00	\$74,689.00	\$222,648.00	No
027B-15	Dr. Joshua Vaughan	Scientific	University of Louisiana at Lafayette	New Request	Cable-Driven Robots for Inspection, Maintenance, and Rescue	\$55,883.00	\$72,520.00	\$67,126.00	\$195,529.00	No
028B-15	Prof. Khalid El Sayed	Scientific	University of Louisiana at Monroe	New Request	Preclinical investigation of olive-based oleocanthal as a potential dietary supplement	\$75,000.00	\$75,000.00	\$75,000.00	\$225,000.00	No
029B-15	Prof. Christine Ikeda	Scientific	University of New Orleans	New Request	Hull Deflection on Planing and Semi-Planing Ships	\$101,972.00	\$74,843.00	\$68,400.00	\$245,215.00	No
030B-15	Prof. Mark Trudell	Scientific	University of New Orleans	New Request	Development of Strategic Approaches to Identify and Characterize Illicit Synthetic Psychoactive Drugs	\$114,900.00	\$115,450.00	\$115,450.00	\$345,800.00	No

Total Number of Proposals submitted	30
Total Funds Requested for First Year	\$2,250,936.00
Total Funds Requested for Second Year	\$2,124,797.00
Total Funds Requested for Third Year	\$1,814,825.00
Total Funds Requested	\$6,190,558.00