LOUISIANA BOARD OF REGENTS
BOARD OF REGENTS SUPPORT FUND

RESEARCH & DEVELOPMENT PROGRAM

REVIEW OF COMPETITIVE PROPOSALS SUBMITTED FOR FUNDING CONSIDERATION IN THE RESEARCH COMPETITIVENESS SUBPROGRAM (RCS)

FY 2021-22 COMPETITION

March 2022

REPORT OF THE FINAL PANEL
BOARD OF REGENTS SUPPORT FUND
RESEARCH COMPETITIVENESS SUBPROGRAM
FY 2021-22

BACKGROUND INFORMATION

Ninety-two research proposals requesting a total of $4,620,672 in first-year funds were submitted for funding consideration in fiscal year (FY) 2021-22 to the Research Competitiveness Subprogram (RCS) of the Board of Regents Support Fund (BoRSF) R & D Program. Seven disciplines were eligible, including biological sciences I, biological sciences II, chemistry, computer and information sciences, earth and environmental sciences, engineering "B" (i.e., industrial, materials, mechanical, and other), and health and medical sciences.

THE REVIEW PROCESS

To conduct as thorough, objective, and expert a review as possible on such a large number of applications within the Board's monetary constraints and time frame, a two-phase review process was adopted.

Phase I: In-Depth Review by Subject-Area Panel

In Phase I of the review process the ninety-two proposals were assigned to seven subject-area panels for funding consideration in FY 2021-22. Two biological sciences panels were used because a large number of proposals were submitted in this subject area. The biological sciences I subject-area panel reviewed proposals related (but not limited) to human biology, cell/molecular biology, virology, and immunology; biological sciences II proposals were related (but not limited) to ecology, pharmacognosy, microbiology, genetics and natural biology. Each panel was composed of two to four out-of-state professionals with broad expertise in the disciplines represented by the proposals, as well as familiarity with the goals and tenets of an EPSCoR-type program.[1] Using the criteria set forth in the FY 2021-22 R & D Request for Proposals (RFP), panel members worked individually and then collaboratively by telephone, video conference, and email to decide which proposals in their subject area met all four eligibility requirements (i.e., the applicant and the proposal fit the EPSCoR mold; the proposal contained a significant research component; the proposal had the potential to make fundamental [basic] research contributions; and the research topic fit one of the seven eligible disciplines as defined in the RFP). In this phase of the review process, each subject-area panel member acted as “primary discussant” for an assigned portion of the proposals and completed an in-depth consensus critique form for each of his/her assigned proposals after discussing its relative merits and shortcomings with the other panel members. Through a video or telephone conference, the subject-area panel members jointly ranked the proposals in the order in which they believed that the proposals should be funded. Each panel carefully scrutinized the budgets of those proposals ranked high enough to merit serious consideration for funding and recommended modifications where appropriate.

Phase II: Final Panel Review and Interdigitation of Recommended Proposals

In Phase II of the review process a final panel (hereafter referred to as the “Panel”), composed of three senior out-of-state professionals whose expertise spans the eligible disciplines and who possess

[1]RCS is modeled after the National Science Foundation's Established Program to Stimulate Competitive Research (EPSCoR). NSF EPSCoR programs currently exist in 29 states, the Virgin Islands, Puerto Rico, and Guam.

comprehensive experience with EPSCoR-type programs, convened on March 3, 2022, to discuss and compare the various groups of top-ranked proposals and, ultimately, to interdigitate the rankings of the various proposals across the subject areas. Prior to the group meeting each panelist reviewed proposals, assessments, and rankings from the subject-area panels.

The three principal criteria used by the Panel in making its funding recommendations were (1) the appropriateness of the applicant to this program; (2) the scientific and technical merit of the proposed research, utilizing national standards of excellence; and (3) the proposal's identification of barriers to the principal investigator's national competitiveness and presentation of a convincing plan for overcoming such barriers. Additional factors considered by the Panel included the current national pool of funds available for the type of research being proposed, the appropriateness of the budget request, and the relevance of the proposed research to the State of Louisiana. Forty-two proposals were discussed at length during this meeting.

The Panel was informed that approximately $1.25M had been budgeted to fund the first year of work of the selected RCS projects. Utilizing the criteria described previously, the Panel recommended thirty-five proposals, totaling **$1,580,209** in first-year funds, which it strongly believed were worthy of support, and placed them in the "Priority One" category in **Appendix A**. The first fourteen proposals in Appendix A are ranked "1" (i.e., first). In the Panel's opinion, these proposals are of nearly equal merit, and the order in which these proposals are listed is arbitrary. Proposals ranked fifteen through thirty-five are listed in descending order of merit for funding. It should be noted that although the Panel was informed that $1.25M was available for funding, the Panel recommended additional proposals in the event a recommended applicant became nationally competitive or received stimulus funding comparable to the RCS, resulting in a vacated award.

Note: Funds anticipated to be available will currently support Priority One proposals ranked 1-30. However, should additional funds become available the Panel recommends that the Board of Regents fund in rank order as many additional Priority One proposals as possible.

The budgets for each of the thirty-five proposals rated as Priority One were scrutinized closely and, in most cases, adjusted downward to reflect the minimum amount of funds necessary to accomplish the proposed research. The Panel emphasizes, however, that in no case was a budget reduced to the point where the scientist or engineer could not accomplish the research proposed in the application.

Several other highly meritorious proposals ranked Priority One by the subject-area panels and considered at the Final Panel meeting but, for a variety of reasons, not recommended for Priority One funding, are listed in **Appendix B**. The fact that a proposal considered by the Panel was not recommended for funding should not, in itself, be interpreted to mean that the application fell just below the cutoff for funding. Each applicant whose proposal is listed in Appendix B should closely review the Panel's comments (see Appendix F) before making a decision to resubmit a proposal to this program.

Appendix C lists those proposals that were ranked Priority Two by the subject-area panels and not recommended for funding by the Final Panel. In general, the proposals listed in **Appendix C** were considered scientifically sound but possessed one or more problems that precluded a recommendation for funding, such as poor or unconvincing identification of barriers to national competitiveness; a scope of work either too broad or poorly defined; and/or research proposed in an area in which federal dollars are not currently expended.

The Panel observed that several other proposals, although not recommended for funding, deserve notice. **Appendix D** lists proposals that were considered meritorious (Priority Three) by the subject-area panels, but which were not rated highly enough to be included in the Priority Two list. Applicants whose projects are listed in **Appendices C and D** are encouraged to pay particular attention to the reviewers' comments and, if appropriate, revise their applications and resubmit them when their research topics are again eligible.

Appendix E gives comments and funding stipulations for each of the thirty-five proposals highly recommended for funding.

Appendix F provides specific comments made by the consultants applicable to those proposals listed in Appendix B, as mentioned above.

Appendix G lists the out-of-state experts who served as full members of the final and subject-area panels.

Appendix H summarizes all proposals submitted for funding consideration to the RCS and provides the following information for each proposal: proposal number, title, discipline, institution, principal investigator, and BoRSF funds requested.

FINAL PANEL COMMENTS AND RECOMMENDATIONS

The Research Competitiveness Subprogram of the Board of Regents Support Fund is designed to help those researchers in Louisiana who have strong potential to become nationally competitive for research funding from federal granting agencies. The Panel compliments the Board of Regents and the State of Louisiana on the establishment of such a quality program. It is the consensus of the Panel that this program has helped to establish a number of principal investigators who, in turn, have been able to conduct meaningful research and support graduate students in their scientific and engineering studies through outside funding. It should be noted that through beneficial comments provided in each level of review the process itself enhances the possibilities of success for proposals originating from researchers within Louisiana who submit applications to a wide variety of funding programs. Moreover, the out-of-state scientists who reviewed and provided constructive criticism of this year's proposals are made aware of the scientific and engineering endeavors taking place in Louisiana and are impressed with the State's attempts to improve the research climate for its scientists and engineers through this program.

<u>To the Applicants</u>:

1. <u>Barriers to Competitiveness</u>. Despite the emphasis placed on this criterion in the RFP and the repeated comments of reviewers, <u>some applicants continue to ignore or inadequately respond to this program requirement</u>. This year, as in past years, a number of applicants failed to present an argument indicating how a BoRSF award would help to address the applicant's barriers to national competitiveness. In several proposals it appeared that the principal investigator was already nationally competitive and had significant external competitive funding. For other proposals, the barriers to national competitiveness were so great that funding the proposal would not overcome

these barriers within the time limits of the program (i.e., three years). The ratings of those proposals not in compliance with program guidelines were lowered accordingly.

RCS One-Year Component. Although the objective of the RCS one-year component is to stimulate and support faculty research on a limited basis leading to near-term federal support, a number of applicants did not adequately demonstrate innovation or novel techniques, which resulted in lower scoring.

2. Profile of Applicant. The Panel scrutinized each applicant's past funding levels and took into consideration the principal investigator's research productivity, particularly in the past three to five years. In some instances, proposals were submitted by nationally competitive faculty who had recently lost funding, but who gave no indication that they faced barriers to competitiveness that needed addressing. As stipulated in the RFP, junior researchers at the threshold of becoming competitive were given priority over senior researchers who are changing fields. One-year applicants were evaluated based on their ability to develop cutting-edge techniques and/or innovative/novel concepts leading to near-term federal support.

   In some cases, proposals ranked highly by reviewers during Phase I contained little or no information about the applicant or lacked a history of funding. In such cases, reviewers cannot sufficiently evaluate the applicant's profile for eligibility. Therefore, the Panel could not recommend these proposals for funding.

3. Format, Syntax, and Appearance of Application. In several cases, research ideas suffered greatly because the proposals were not well written. From the finished products presented to the Panel (i.e., the proposals), it also appears that some investigators did not sufficiently appreciate the competitive nature of the RCS. Applicants should be made aware that typically no more than twenty-five percent of the proposals submitted to this program can be funded with the money available, and that every year the number of excellent proposals far exceeds the funds available. Applications containing numerous spelling and typographical errors were viewed more critically than other applications, because an evident lack of care went into their preparation.

4. Requests for Equipment. As stated in the RFP, the R & D program is not an equipment grants program. Equipment may be requested only in the context of the particular research activity proposed. It is the applicant's responsibility to justify the uniqueness of the equipment and/or software requested under the aegis of this program. With respect to computing equipment and software, it is the firm belief of the Panel that items such as personal computers, laptops, and standard word processing and data crunching software packages should be provided to faculty by their institutions. Board of Regents Support Fund money should be used only to support the acquisition of special peripherals and software that are specific to and justified by the proposed research.

5. Proposal Submission History. In several cases the Panel found it very helpful to have a detailed record tracking the submission of the proposal to other funding agencies. Also, as indicated in the RFP, if the project had been reviewed previously by another granting agency, it greatly enhanced the current proposal's chances of obtaining RCS funding if copies of these reviews were included, along with an explanation of any revisions that were made in the current application and a further explanation of how RCS support would help to overcome the problems identified by federal and/or other reviewers.

6. Funds Requested for Travel and Release Time. The Panel noted that requests for travel support and faculty release time frequently were poorly justified and itemized. Such requests should be carefully justified and detailed in future proposals.

7. Requests for Post-Doctoral Researchers and Graduate Research Assistants. The subject-area panels noted that some proposals requested funds for post-doctoral researchers instead of graduate assistants but did not provide an adequate explanation or justification of the need for the more expensive post-doctoral researchers. Because BoRSF funds are quite limited, the Panel recommends that principal investigators request funding for less costly graduate assistants unless a compelling need for assistance from one or more post-doctoral researchers can be demonstrated.

8. Use of Consultants. In some proposals, funding was requested for "consultants" with inadequate identification of who the consultants were or why their services were required. The need for consultants must be clearly articulated.

9. General Comments.

   a) The Panel agreed that, at a minimum, a successful proposal must contain the following:

      (1) A precisely identified research problem or statement of a research hypothesis;

      (2) A section describing the importance of solving the research problem;

      (3) Evidence that the identified research problem is new and unresolved;

      (4) A section describing the precise research methodology to be used;

      (5) A section detailing expected results and future contributions;

      (6) A discussion of the state and/or national implications of this research and identification of prospective future funding sources; and

      (7) An assessment of the barriers that prevent the principal investigator from competing successfully for federal funding. This assessment should incorporate items 1-6 in a manner that will convince the reviewers that BoRSF support for up to three years will enable the PI to secure federal R & D dollars for the PI's research endeavors.

   b) Applicants whose proposals have been declined two or more times are encouraged to seek assistance in proposal/grant writing from a mentor or an established, nationally competitive investigator in the same field, perhaps at a nearby institution.

   c) Applicants whose proposals were submitted and declined for the first time this year should look to the reviewer comments for guidance in strengthening future proposals.

   d) Inexperienced principal investigators are helped by workshops on the preparation of research proposals. It would be beneficial if the institutions developed mentor programs, through which competitive scientists can assist these investigators in the preparation of good proposals. Mentors could also review the proposals prepared by junior investigators and suggest ways to strengthen these proposals. The Panel continues to be impressed by a marked improvement in the quality of proposals submitted by faculty from undergraduate teaching-oriented public and private institutions.

e) A number of top-ranked proposals were submitted by scientists who are clearly already nationally competitive. The Panel believes that it is inappropriate to use limited RCS resources to support such scientists, even if these PIs are changing research directions. It should also be noted that some highly ranked proposals were submitted by scientists who had already received three years of BoRSF R & D support. In those cases where three years of previous BoRSF R & D support did not enable the PI to become nationally competitive, the Panel found it difficult to recommend or justify additional support when so many other equally worthy applicants had yet to receive BoRSF R & D funds. In the Panel's view, three years of BoRSF R & D support should enable a scientist to become nationally competitive if the research area is capable of attracting support from national funding agencies. All proposals recommended for funding by the Panel are believed to have strong potential for overcoming the barriers that have prevented the submitting scientists from achieving national competitiveness.

To the Board of Regents:

1. Limitations on Salary Requests as Applicable and Requests for Post-Doctoral Researchers. The Panel strongly believes that the investigators funded through the RCS should be involved actively (i.e., play a "hands-on" role) in their research. For this reason, some requests for post-doctoral researchers were declined when budgets were reviewed. In most cases the Panel recommended BoRSF funding for only one month's summer salary for principal investigators. The Panel believes that the institutions should be strongly encouraged to provide release time to their investigators. The institutional provision of release time provides tangible evidence to reviewers and the Board that the institution is committed to the research endeavors of its investigators and frees up Board funds that would otherwise be committed to salary support, thereby helping to ensure that the maximum number of excellent projects will be funded.

2. Limitations on Overall Funding Requests. In no year of the RCS's operation have the monies available sufficed to fund all proposals worthy of support. The Panel must reduce proposal budgets significantly each year to ensure that the maximum possible number of worthy projects is funded. Therefore, the Panel strongly recommends that the Board maintain the existing overall cap on the amount of funds that may be requested ($200,000 over a three-year period or $20,000 for a one-year award).

APPENDIX A

RCS PROPOSALS HIGHLY RECOMMENDED FOR FUNDING (PRIORITY ONE)

Rank	Proposal No.	Institution	Recommended BoRSF 1st Year Funds	Recommended BoRSF 2nd Year Funds	Recommended BoRSF 3rd Year Funds
1	003A	LSU-Ag	$39,250	$36,250	$-----
1	092A	UNO	$52,574	$52,574	$52,574
1	025A	LSU A&M	$57,979	$57,979	$40,431
1	050A	LA-TECH	$48,088	$46,730	$44,399
1	037A	LSU A&M	$20,000	$-----	$-----
1	051A	LA-TECH	$44,936	$44,936	$44,936
1	060A	Southeastern	$14,238	$-----	$-----
1	087A	UNO	$48,369	$48,016	$48,016
1	016A	LSU A&M	$52,011	$52,011	$50,011
1	064A	TULANE	$53,783	$53,783	$53,783
1	013A	LSU A&M	$52,291	$48,700	$27,209
1	074A	ULL	$35,404	$35,404	$------
1	077A	ULL	$45,306	$45,306	$45,253
1	019A	LSU A&M	$65,406	$63,656	$54,281
15	024A	LSU A&M	$59,450	$54,070	$39,986
16	061A	Southeastern	$19,972	$-----	$-----
17	073A	ULL	$60,055	$52,309	$49,564
18	005A	LSU A&M	$44,950	$42,990	$39,795
19	023A	LSU A&M	$44,852	$44,584	$41,384
20	055A	LOYOLA	$20,000	$-----	$-----
21	017A	LSU A&M	$59,900	$54,830	$51,450

APPENDIX A (continued)

RCS PROPOSALS HIGHLY RECOMMENDED FOR FUNDING (PRIORITY ONE)

22	014A	LSU A&M	$19,647	$-----	$-----
23	042A	LSU A&M	$61,250	$59,000	$58,000
24	080A	ULM	$19,633	$-----	$-----
25	036A	LSU A&M	$55,250	$53,250	$51,250
26	045A	LSU A&M	$20,000	$------	$------
27	010A	LSU A&M	$51,201	$46,701	$44,451
28	008A	LSU A&M	$46,543	$37,300	$------
29	066A	TULANE	$59,205	$56,271	$54,370
30*	084A	UNO	$50,640	$49,618	$47,643
31	004A	LSU-AG	$47,495	$42,195	$42,195
32	018A	LSU A&M	$54,200	$54,200	$46,358
33	047A	LSUHSC-Shrev	$48,625	$48,625	$48,625
34	046A	LSUHSC-NO	$49,083	$49,083	$49,083
35	054A	LUMCON	$58,623	$57,053	$17,538
	TOTALS		**$1,580,209**	**$1,387,424**	**$1,142,585**

*Note: Availability of funds for those proposals below the line is uncertain at this time. At a minimum, any remaining BoRSF first-year funds should provide partial funding for the next rank order proposal pending acceptance by the institution and Board approval.

APPENDIX B

MERITORIOUS PROPOSALS RANKED PRIORITY ONE BY THE SUBJECT-AREA PANELS AND CONSIDERED BY THE FINAL PANEL BUT NOT RECOMMENDED FOR FUNDING (6)

021A 038A 040A 062A 068A 089A

***Note*:** These proposals are not listed in rank order of merit. The Panel's comments on these proposals are provided in Appendix F. Subject-area panel reviews for each proposal will also be provided to the applicant in July 2022.

APPENDIX C

**MERITORIOUS PROPOSALS RANKED PRIORITY TWO
BY THE SUBJECT-AREA PANELS AND CONSIDERED BY THE FINAL PANEL
BUT NOT RECOMMENDED FOR FUNDING (34)**

002A	032A	057A	078A
007A	034A	058A	079A
009A	035A	059A	082A
012A	039A	065A	083A
020A	041A	067A	-----
022A	044A	069A	-----
026A	048A	070A	-----
028A	049A	071A	-----
029A	053A	072A	-----
031A	056A	075A	-----

***Note*:** These proposals are not listed in rank order of merit. The subject-area panel reviews for each proposal will be provided to the applicant in July 2022.

APPENDIX D

**PROPOSALS RANKED PRIORITY THREE OR DECLARED INELIGIBLE
BY THE SUBJECT-AREA PANELS AND NOT RECOMMENDED FOR FUNDING (17)**

001A
006A
011A
015A
027A
030A
033A
043A
052A
063A
076A
081A
085A
086A
088A
090A
091A

***Note*:** These proposals are not listed in rank order of merit. The subject-area panel reviews for each proposal will be provided to the applicant in July 2022.

APPENDIX E

COMMENTS AND FUNDING STIPULATIONS
ON PROPOSALS HIGHLY RECOMMENDED FOR FUNDING
(PRIORITY ONE)

General Comments and Stipulations

This section provides comments and stipulations set forth as conditions of funding for the thirty-five proposals highly recommended for awards by the Panel. The Panel would again like to emphasize that it considered the first fourteen proposals to be of relatively equal merit and, therefore, the order in which they have been listed is arbitrary. Proposals ranked fifteen through thirty-five are listed in descending order of merit for funding.

In some instances, the Panel deleted funds for research associates and post-doctoral researchers. The Panel believes that the principal investigators themselves should conduct a significant portion of the proposed research and that BoRSF funds should first support graduate students, who will benefit from scientific and/or engineering training.

The Panel strongly recommends that **prior to funding each proposal recommended for an award, the Board of Regents ascertain whether the principal investigator has obtained significant research support from another external funding source, such as a major foundation or federal granting agency.** Several scientists have proposals pending before such agencies or foundations. The Panel believes that some of these scientists are so close to achieving national competitiveness for research funding that they are likely to receive these requested funds. **In cases where a principal investigator obtains a commitment of significant external funding prior to receipt of an RCS award, the RCS award should be vacated and the funds thereby released should be used to support other deserving projects in the RCS or other R & D subprogram(s) of the Board of Regents Support Fund. Any principal investigator who receives notice of external funding after an award is contracted is required immediately to report the notice of external funds in accordance with Section X of the RCS grant contract.**

Although the budgets of most projects recommended for funding were reduced, the Panel did not reduce any budget to such an extent that achievement of a project's goals or execution of its work plan would be impaired. Therefore, **no reductions in the scope of work plans of projects recommended for funding should be allowed.** If the work plan submitted for a project does not correspond in scope to that of the original proposal, the award should be vacated and funds thereby made available should be used to support other worthy projects in the RCS or other Board of Regents Support Fund R & D subprogram(s).

The types and amounts of institutional match pledged in a proposal played a significant role in determining whether that proposal was recommended for funding. **Therefore, unless specifically stated in the funding stipulations of a project recommended for funding, no reductions in the types or amount of institutional match pledged in the original proposal should be permitted.** If the types or amounts of institutional match for a project recommended for funding are reduced, unless such reductions are specifically authorized by the funding stipulations for that grant, the award should be vacated and funds thereby made available should be used to fund other worthy projects in the RCS or other R & D subprogram(s) of the Board of Regents Support Fund.

Appendix E (continued):

PROPOSAL: 003A-22 **RANK: 1**

TITLE: Functional Characterization of Magnaporthe oryzae Effector Proteins in Rice Cells During Infection

INSTITUTION: Louisiana State University – Agricultural Center

PRINCIPAL INVESTIGATOR: Ely Oliveira Garcia, Ph.D.

COMMENTS: The National Science Foundation (NSF) and United States Department of Agriculture (USDA) encourage investigator-initiated research efforts to study emerging diseases that threaten food security. Diverse eukaryotic microbes threaten food security by delivering effector proteins into living plant cells to hijack host processes, but it is not well understood how these effector proteins control plant cell processes. The primary objective of this proposal is to understand how effector proteins of the fungus *Magnaporthe oryzae* reprogram cell processes to cause the devastating rice blast disease. The long-term goal is to identify targets and devise strategies for broad-spectrum and durable disease resistance. Live-cell imaging assays with fluorescently labelled effectors allowed the PI to identify Bas83, a novel plasma membrane associated effector, as well as two nuclear effectors, Bas107 and Bas170. Therefore, the overall goal of the proposal is to determine the role of the effectors Bas83, Bas107 and Bas170 in the biotrophic invasion of *M. oryzae*. The first aim is to give new insights into the role of Bas83 in manipulating the host plasma membrane through Bas83 gene knockout, overexpression and live-cell imaging with Lti6:eGFP transgenic rice lines and endocytosis trackers. The second aim is to determine the functions of Bas107 and Bas170 in reprogramming host cell functions through Bas107 and Bas170 gene knockout and overexpression. The third aim is to survey the localization of many uncharacterized effectors of *M. oryzae* through live-cell imaging assays.

The PI has (1) pending proposal:

- NSF – entitled "Functional Characterization of Effector Proteins in *Magnaporthe Oryzae*" in the amount of $1,052,175

Should the PI receive funding for the pending proposal, he/she should be considered nationally competitive and the requested funds from the BoRSF program should not be awarded.

It is recommended that the proposed budget be reduced to provide limited travel support of $2,500, resulting in a year one budget of $39,250. A budget of $36,250 is recommended for year two.

Year 1: $39,250 **Year 2: $36,250**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 092A-22 **RANK: 1**

TITLE: Detecting and Describing Database Security Breaches Using Data Lineage within the Process

INSTITUTION: University of New Orleans

PRINCIPAL INVESTIGATOR: James Wagner, Ph.D.

COMMENTS: Data lineage describes the movement and transformations of data across an organization. Knowing the life cycle of data ensures their quality, and this knowledge is critical for the activities of modern organizations, including compliance demonstration (e.g., Health Insurance Portability and Accountability Act), data governance, and reproducibility (NSF and NIH increasingly prioritize reproducibility in research). Since database management systems (DBMSes) serve as the central repositories to store and manage data, they provide abundant metadata to support data lineage computations. DBMSes offer many tools, such as log miners, for computing data lineage in and out of the DBMS; however, DBMSes do not support tools to compute data lineage within the DBMS itself. DBMSes often decrypt data in memory for query processing. However, users cannot receive feedback when DBMSes automatically decrypt data; users cannot ask what, when, and why data was decrypted. Thus, security vulnerabilities within the DBMS itself are difficult to investigate. The PI proposes a framework to compute and report data lineages within DBMSes. The PI will incorporate methods to abstract DBMS memory architecture, allowing the framework to support many common row-store DBMSes, including MySQL, PostgreSQL, Oracle, Microsoft SQL Server, IBM DB2, and SQLite. The PI will also incorporate data beyond DBMS control at any given time (i.e., dynamically allocate memory).

It is recommended that the proposed budget be reduced to provide limited travel support of $2,500, resulting in a year one budget of $52,574. Similar budgets of $52,574 are recommended for year two and year three.

Year 1: $52,574 **Year 2: $52,574** **Year 3: $52,574**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 025A-22 **RANK: 1**

TITLE: Modeling the Mechanics of Fluid-Bed-Vegetation Interactions in Coastal and Riverine Ecosystems

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Chris Kees, Ph.D.

COMMENTS: This project seeks to construct an accurate model of the interactions among water flow, wave action, soil, and vegetation. The model is critical for predicting the evolution of coastal and riverine systems. Specifically, an accurate but computationally tractable model of these complex interactions is needed to inform larger-scale models of coastal and riverine ecosystems in Louisiana and around the world, particularly as we seek to protect communities and restore ecosystem function along coasts and rivers. We face increasing threats to these systems due to sea level rise, subsidence, invasive species, and climate change. While many of these threats are man-made, there is no obvious set of policy changes that will counter them. Instead, a reliable quantitative model of these processes at small scales (i.e., a high-fidelity model) must be developed and deployed to inform large-scale predictive models already in use. Accurate, objective predictions can then guide effective policy.

It is recommended that the proposed budget be reduced to eliminate supplies charges (laptop computer) of $3,000, resulting in a year one budget of $57,979. In year 2, it is recommended that the project be funded at the level requested, i.e., $57,979. A budget of $40,431, which provides limited travel support of $2,500, is recommended in year 3.

Year 1: $57,979 **Year 2: $57,979** **Year 3: $40,431**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 050A-22 **RANK: 1**

TITLE: Elucidating Composition-Microstructure-Property Investigations of Frontally Polymerized Geopolymer Materials

INSTITUTION: Louisiana Tech University

PRINCIPAL INVESTIGATOR: Shaurav Alam, Ph.D.

COMMENTS: The project focuses on elucidating composition-microstructure-property investigations of sustainable construction materials made by frontal polymerization of landfill-bound fly ash based geopolymers. The process includes blending monomer, initiator, cross-linkers, and geopolymer slurry, which, upon application of localized heat, polymerize. The reaction front then moves forward and completes the procedure, resulting in a solid geopolymer. Initial studies showed frontal polymerization of geopolymer material is possible and this approach can eliminate the need for traditional curing at 145^{o}F for five to 24 hours by reducing geopolymer solidification time by five or more folds. However, the process leaves a significant number of pores in the formed geopolymer, which can hinder the possibility of reaching higher strength, jeopardizing such an accomplishment. Further investigation is needed. The proposed three-year project includes review of scholarly articles and fundamental research for the understanding and advancement of the rapid curing mechanism of geopolymer material.

It is recommended that the proposed budget be reduced to eliminate other expenses charges of $2,000, resulting in a year one budget of $48,088. A budget of $46,730 is recommended for year two. In year three, funding is recommended at the level requested, i.e., $44,399.

Year 1: $48,088 **Year 2: $46,730** **Year 3: $44,399**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 037A-22 **RANK: 1**

TITLE: High-Fidelity Modeling of Coupled Wind-Surge-Wave Flows and Loading on Structures

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Chao Sun, Ph.D.

COMMENTS: Devastating tropical cyclones induce multi-hazards (wind, surge, and waves), which can cause extensive structural damage to low-rise buildings. To create multi-hazard resilient buildings, it is essential to clearly understand the coupled wind-surge-wave flow fields and realistically quantify the combined wind-surge-wave loading action on buildings, especially low-rise elevated buildings, which are poorly understood currently. This research aims to characterize extreme and physically coupled wind-surge-wave loading on low-rise buildings via multi-physics-based high-fidelity modeling using OpenFOAM and large eddy simulation. The developed multi-phase flow model is expected to capture the wind-surge-wave flow turbulence characteristics' evolution during interaction with buildings. New advances will be in made in the numerical modeling of fluid-structure interaction in which surge, wave, and wind impacts are jointly considered.

The PI has (2) pending proposals:

- National Science Foundation (NSF) – entitled "Collaborative Research: Understanding and Quantifying Coupled Wind-Surge-Wave Flow Characteristic and Loading Effects on Residential Buildings" in the amount of $346,567 for the period 02/2022 – 01/2025

- National Science Foundation (NSF) – entitled "Collaborative Research: CDS&E: Exascale Computing Empowered Multi-Physics Modeling of Residential Communities Subjected to Tropical Cyclones" in the amount of $367,157 for the period 10/2022 – 09/2025

Should the PI receive funding for either of the pending proposals, he/she should be considered as having received external funding for a similar project and the requested funds from the BoRSF program should not be awarded.

It is recommended that the project be funded at the level requested, i.e., $20,000 for year one.

Year 1: $20,000

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 051A-22 **RANK: 1**

TITLE: Mitigation of Amplified Current Imbalances due to Induction Machines Using the Currents' Physical Components (CPC) Power Theory

INSTITUTION: Louisiana Tech University

PRINCIPAL INVESTIGATOR: Prashanna Bhattarai, Ph.D.

COMMENTS: While the impacts of unbalanced three-phase voltage on the performance of induction machines (IMs) have been studied in detail, there is still a gap in knowledge regarding the amplification in current imbalance caused by IMs and how this affects the constituent system, especially if the system is an isolated micro-grid. The PI hypothesizes that IMs operating under acceptable levels of voltage imbalance can cause amplified current imbalance, which can eventually lead to unacceptable levels of voltage imbalance in certain parts of the system. The purpose of this project is to study the impact of voltage imbalance on the operation of induction machines and the amplification of current imbalance due to these machines, as well as to design a balancing compensator that mitigates these issues. Data will be collected under various operating conditions of the induction machine using a combination of lab tests and software simulation. A balancing compensator based on the CPC-based power theory will be designed and analyzed using software, and then a prototype will be built as a proof of concept.

It is recommended that the proposed budget be reduced to eliminate supplies (desktop computer for GRA) and provide publication and dissemination charges of $1,500 and $500, respectively, resulting in a year one budget of $44,936. Similar budgets of $44,936 are recommended for year two and year three. The PI should note that budgets should not increase for each subsequent year of the project.

Year 1: $44,936 **Year 2: $44,936** **Year 3: $44,936**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 060A-22 **RANK: 1**

TITLE: Recycling and Reuse of Composite Materials for 3D Printing

INSTITUTION: Southeastern Louisiana University

PRINCIPAL INVESTIGATOR: Mehmet Bahadir, Ph.D.

COMMENTS: Global warming and major human-caused environmental issues have been global challenges for governments, organizations, and researchers. Identification, measurement, and mitigation of harmful human activities are vital to ensuring safe and sustainable life on earth. Manufacturing is known to be a material- and energy-intensive human activity that typically requires high amounts of natural resources and energy consumption. Manufacturing processes are also responsible for the production of waste and harmful by-products released into the air, soil, and water. For the continuation of safe and healthy human life, alternative sustainable manufacturing methods and technologies will be investigated. Recycling is a proven method for conserving natural resources, cutting energy consumption and waste, and reducing manufacturing cost. Composite materials are known to be hard to recycle due to their composition. This study will focus on the investigation of a feasible composite material recycling method. The reclaimed composite material will be used to fabricate filament feedstock for Fused Deposition Modeling (FDM) 3D printing. FDM is a common 3D printing technology that creates parts from a polymer mix layer-by-layer based on a 3D digital model.

It is recommended that the project be funded at the level requested, i.e., $14,238 for year one.

Year 1: $14,238

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 087A-22 **RANK: 1**

TITLE: Oxytocin, Social Hyperthermia, and Mouse Models of Autism Spectrum Disorder

INSTITUTION: University of New Orleans

PRINCIPAL INVESTIGATOR: Christopher Harshaw, Ph.D.

COMMENTS: Autism Spectrum Disorders (ASDs) are characterized by heterogeneous impairment in social, communicative, and repetitive behavioral domains. ASDs also involve a wide range of somatic comorbidities, including defects in temperature regulation. Links between the latter deficits and social-cognitive impairment are poorly understood. The elevation of core body temperature that typically accompanies social interaction ('social hyperthermia'; SH) and its regulation by the hormone oxytocin (OT) have promise as mechanisms that may bridge this explanatory gap. The PI recently demonstrated that the display of SH in mice requires oxytocinergic signaling. Specifically, pharmacologically antagonizing the oxytocin receptor (OTR) significantly reduces the occurrence of SH in response to interaction with a novel social partner. The degree of SH exhibited by individual mice related most closely to the display of anxiety and vigilance-related behaviors—that is, behaviors that interfere with or antagonize close, non-agonistic social interaction. The proposed research will address several questions raised by this initial study, including (1) whether OTR regulates thermic responses to social and non-social stressors (i.e., emotional hyperthermia); and (2) the role played by the vasopressin 1A receptor ($V_{1A}R$) in mediating SH. The proposal will also examine SH in two mouse models of ASD known to have deficits in social behavior and/or temperature regulation.

It is recommended that the proposed budget be reduced to provide one-month summer salary, including fringe benefits, for the PI (not to include salary support and fringe benefits for the co-PI), with other expenses and consultant costs deleted, resulting in a year one budget of $48,369. A budget of $48,016 that moves $500 from the other expenses budget category to travel is recommended for year two. A similar budget of $48,016 is recommended for year three.

Year 1: $48,369 **Year 2: $48,016** **Year 3: $48,016**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 016A-22 **RANK: 1**

TITLE: Biomarker-Based Clinical Trial Design for Identifying Subgroup-Specific Optimal Dose for Immunotherapy and Immunoradiotherapy

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Beibei Guo, Ph.D.

COMMENTS: Conventional clinical trial designs assume patient homogeneity and the "one-dose-fits-all" rule for patient allocation and optimal dose identification. However, this assumption is disconnected from medical practice as population heterogeneity is often expected for clinical trial studies. Patients form subgroups according to their biomarker status. The optimal dose for treating patients with immunotherapy, radiotherapy, or immunoradiotherapy may differ according to their biomarker status. Immunotherapy and immunoradiotherapy both involve multiple endpoints, which include the immune response, toxicity outcome, and efficacy outcome. The PI proposes methods for dealing with the problem of subgroup dose-finding based on multiple endpoints for immunotherapy or immunoradiotherapy. The objective is to identify the subgroup-specific optimal dose, defined as the dose with the best risk-benefit tradeoff, in each biomarker subgroup. The PI will consider different types of each endpoint, which are commonly used in clinical studies. The immune response can either be binary or continuous; the toxicity outcome can be binary, ordinal, or modeled as multiple types and grades; the efficacy endpoint can be binary, ordinal, or time-to-event. The three outcomes will be jointly modeled.

It is recommended that the proposed budget be reduced to provide limited travel support of $2,500 and supplies charges of $2,000, resulting in a year one budget of $52,011. A similar budget of $52,011 is recommended for year two. A budget of $50,011 is recommended for year three.

Year 1: $52,011 **Year 2: $52,011** **Year 3: $50,011**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 064A-22 **RANK: 1**

TITLE: Explainable Source-Data Protected Cross-Domain Learning

INSTITUTION: Tulane University

PRINCIPAL INVESTIGATOR: Zhengming Ding, Ph.D.

COMMENTS: With the advent of intelligent devices and smart sensors, more and more distinct types of data are collected, bringing great opportunities for knowledge transfer beyond our current capabilities. However, concerns about data privacy prohibit the sharing of data necessary to build universal models. Interest in source-data-protected domain adaptation has surged. This technique requires that no source data are utilized during the adaptation phase, providing data privacy protection, light-weight storage, and model reuse. Several pioneering attempts aim to either convert target samples to source-like ones for the source model or generate fake source samples from the source model by further using conventional domain adaptation. There is insufficient exploration of interpreting what useful information has been transferred and how this can happen. The PI will first examine source model bias from the imbalanced and long-tailed distribution in terms of feature and label space and propose an adaptive structural knowledge method to tackle feature divergence and label drift in the unified framework. Secondly, an explainable module will be developed to interpret what has been transferred and knowledge reasoning in a more conceptual fashion, which will provide more insight during transfer and plug into various models to compare performance difference. Finally, to improve training efficiency and privacy, the PI will consider a federated learning strategy to address the domain shift problem and enhance the global integrated model, which will eventually reach the win-win deal for different domains.

The PI has (1) pending proposal:

- National Science Foundation (NSF) – entitled "Collaborative Research: III: Small: Source Data-Free Unsupervised Domain Adaptation" in the amount of $230,165 for the period 05/2022 – 04/2025

Should the PI receive funding for the pending proposal, he/she should be considered nationally competitive and the requested funds from the BoRSF program should not be awarded.

It is recommended that the project be funded at the level requested, i.e., $53,783 for year one. Similar budgets of $53,783 are recommended for year two and year three. The PI should note that the project budgets should remain at the year one level or decrease in each subsequent year.

Year 1: $53,783 **Year 2: $53,783** **Year 3: $53,783**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 013A-22 **RANK: 1**

TITLE: Towards Developing Mechanism-Based Biological Models to Predict Impacts of Environmental Contaminants on Thyroid Hormone Signaling in Diverse Species of Fish

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Jonathon Doering, Ph.D.

COMMENTS: Thyroid hormone signaling is a highly conserved process involving the coordinated interactions of multiple proteins to control numerous biological functions, such as growth and development. Certain pesticides, pharmaceuticals, and other chemicals can disrupt thyroid hormone signaling by disrupting the function of one or more key proteins. Aquatic testing has focused almost exclusively on laboratory model species (e.g., zebrafish) that might not represent native species, while chemical safety screening predominantly uses mammalian-based assays (e.g., USEPA's ToxCast). The proposed study will develop and apply a battery of *in vitro* species-specific enzyme activity and transactivation assays for key proteins in thyroid hormone signaling to assess species differences in the inherent sensitivity of each protein to chemical disruption. These assays will be used to screen priority environmental contaminants for a phylogenetic diversity of fishes representing laboratory model species, species of economic importance, and potential native indicator species. The research will identify species and chemicals of greatest potential risk, but also represents a first step towards establishing linkages between inherent sensitivity of proteins to disruption and sensitivity to apical toxicities.

It is recommended that the proposed budget be reduced to provide undergraduate student support of $2,000, resulting in a year one budget of $52,291. A budget of $48,700 is recommended for year two. In year three, funding is recommended at the level requested, i.e., $27,209.

Year 1: $52,291 **Year 2: $48,700** **Year 3: $27,209**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 074A-22 **RANK: 1**

TITLE: Inventory of Heavy Metal Soil Concentrations in Lafayette, Louisiana Using X-ray Fluorescence Analysis, Geographic Information Systems, and Geostatistical Interpolation Methods

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Anna Paltseva, Ph.D.

COMMENTS: While urban soil is a sink for contaminants derived from historical anthropogenic activities, most studies have focused on large urban centers, leaving smaller communities unexplored. Better characterization of metals' varieties, concentration, and spatial distribution in urban areas is needed across different cities to address this problem. This research is a pilot study to determine the significance of metal contamination in Lafayette, Louisiana, a city impacted by a wide range of current and historical industries, highways, and railroads. At least 1,000 samples collected within two years across the city will be analyzed for lead, arsenic, nickel, zinc, chromium, and copper by portable X-ray fluorescence in the topsoil. Project deliverables will include a dataset and maps of metal concentrations available to the public and government agencies, a soil workshop and webinar, scientific articles, and a soil archive for future studies. The project team will build collaborations and strengthen partnerships with local communities to effectively address exposures to contaminants and foster informed community decision-making for promoting and establishing urban gardens or undertaking childhood lead exposure prevention. This study will broaden urban soils research and benefit society by raising awareness and communicating solutions that are typically beyond the reach of the layperson.

It is recommended that the proposed budget be reduced to provide printing charges of $1,000 (not to include two open-access articles at $7,200), resulting in a year one budget of $35,404. A similar budget of $35,404 is recommended for year two.

Year 1: $35,404 **Year 2: $35,404**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 077A-22 **RANK: 1**

TITLE: Enhanced Machine Learning and Dynamic Optimal Control of Emerging Infectious Diseases

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Xiang-Sheng Wang, Ph.D.

COMMENTS: The purposes of this proposal are (1) to understand the dynamics of infectious diseases from enhanced machine learning of epidemic data and (2) to contain the spread of infectious diseases via dynamic optimal control. The theory of enhanced machine learning will be developed to provide real-time forecasts during a disease outbreak. Optimal control problems will be formulated and the best strategy to contain the infectious disease will be determined. The following questions will be addressed: How long will the epidemic wave last? How many people will eventually be infected? Are hospital beds and medical resources sufficient during the outbreak? How effective are various control policies and what is the optimal control strategy? Is it possible that an early restoration might cause a second epidemic wave? The quantitative information on the disease outbreak obtained from the project will be shared and communicated with researchers in the field of epidemiology. The real-time forecasting results will provide the general public with reliable predictions of disease dynamics.

The PI has (2) pending proposals:

- National Science Foundation (NSF) – entitled "Enhanced Machine Learning, Dynamic Optimal Control and Dynamical Systems Analysis of Emerging Infectious Diseases" in the amount of $313,795 for the period 08/2022 – 07/2025
- National Science Foundation (NSF) – entitled "CAREER: Enhanced Machine Learning, Dynamic Optimal Control and Dynamical Systems Analysis of Emerging Infectious Diseases" in the amount of $533,469 for the period 08/2022 – 07/2027

Should the PI receive funding for either of the pending proposals, he/she should be considered nationally competitive and the requested funds from the BoRSF program should not be awarded.

It is recommended that the proposed budget be reduced to provide limited travel support of $2,500, resulting in a year one budget of $45,306. A similar budget of $45,306 is recommended for year two. In year three, funding is recommended at the level requested, i.e., $45,253.

Year 1: $45,306 **Year 2: $45,306** **Year 3: $45,253**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 019A-22 **RANK: 1**

TITLE: Maximizing the Positive Impacts of Truck Platooning on US Highways

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Hany Hassan, Ph.D.

COMMENTS: Offering safe and efficient movement of freight is a crucial component of the US economy and particularly of the south-central region, as it includes one of the most valuable truck corridors. A Connected and Autonomous Vehicles (CAVs) application of particular interest to the freight industry is truck platooning, in which several trucks equipped with CAV technology closely follow one another in a "platoon". The proposed research aims to address a gap in evidence with respect to thoroughly understanding the impacts of truck platooning on US highways (environmental, operational, and safety impacts as well as effects on highway pavement) at network levels and in different traffic and weather conditions while considering the behaviors of human-driven vehicles. The proposed research will integrate models of human driver behavior into truck platooning practices. Driving simulator experiments and microsimulation analysis will be employed to determine the optimum truck platooning configuration, which can maximize positive impacts on highways while reducing pavement deterioration due to higher loads caused by truck platooning.

It is recommended that the proposed budget be reduced to provide limited travel support of $2,500 and equipment support of $7,500, based on the 25% equipment cash match ($2,500) provided by the institution, resulting in a year one budget of $65,406. Budgets of $63,656 and $54,281 are recommended for year two and year three, respectively.

Year 1: $65,406 **Year 2: $63,656** **Year 3: $54,281**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 024A-22 **RANK: 15**

TITLE: ISRU-Based Planetary Construction 3D Printing for Lunar and Martian Infrastructure Development: Process Optimization and Automated Quality Control

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Ali Kazemian, Ph.D.

COMMENTS: To achieve NASA's goal of establishing long-term sustained presences on the Moon and Mars, a variety of supporting infrastructure, including habitats and landing pads, should be constructed on these celestial bodies. Construction 3D Printing (C3DP) holds great potential for automated planetary construction using in-situ materials and resources. Considering the extraterrestrial extreme environments and astronauts' safety considerations, a fully automated construction process – including quality control and monitoring aspects – is required. The main objective of this project is to investigate real-time automated process monitoring techniques for planetary C3DP. To accomplish this aim, two in-situ materials will be used for printing material development. Printing process parameters will be studied and optimized for the two printing materials using an existing lab-scale C3DP platform. In addition, the physical and mechanical behavior of 3D-printed specimens will also be tested under vacuum and temperature variations, for characterization and performance evaluation in extreme environments. Multiple real-time automated quality control systems, including extrudate scanning and integrated sensory systems, will be designed, implemented, and tested. Using statistical analysis, the reliability and responsiveness of these techniques will be studied in depth.

It is recommended that the proposed budget be reduced to provide undergraduate student support of $2,000, resulting in a year one budget of $59,450. A budget of $54,070 is recommended for year two. In year three, it is recommended that the project be funded at the level requested, i.e., $39,986.

Year 1: $59,450 **Year 2: $54,070** **Year 3: $39,986**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 061A-22 **RANK: 16**

TITLE: Investigation of Mechanical Properties of 3D Printed Materials Under Dynamic Loads

INSTITUTION: Southeastern Louisiana University

PRINCIPAL INVESTIGATOR: Ahmad Fayed, Ph.D.

COMMENTS: The goal of this project is to investigate the dynamic properties of 3D-printed materials in terms of fatigue strength (endurance limit) under different printing settings and material composition. Over the past few years, many classical and new materials have been used for 3D printing with comparable mechanical properties to their counterparts manufactured by classical methods. Most of the comparisons were done to the mechanical properties under static loading. The PI recently supervised an undergraduate research project funded by the Louisiana Space Grant Consortium (LaSPACE) that studied the effects of infill density and raster orientation on the tensile strength and impact strength of polylactic acid (PLA) 3D-printed specimens. The PI is currently supervising another undergraduate research project funded by LaSPACE to investigate the effect of infill patterns on the tensile strength and impact strength of PLA-3D printed specimens. An important aspect of mechanical properties that indicates the durability of the product under cyclic loading, fatigue strength is not covered in the literature except very recently and with many limitations. This project will allow further study of the fatigue properties of some 3D-printed materials including PLA, nylon, and carbon-fiber-reinforced nylon and PLA (known commercially as Onyx) with different infill patterns.

It is recommended that the project be funded at the level requested, i.e., $19,972 for year one. The PI should note that charges included as other expenses should be listed in the supplies category.

Year 1: $19,972

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 073A-22 **RANK: 17**

TITLE: Classifying Student Distraction Level in Educational Virtual Reality

INSTITUTION: University of Louisiana at Lafayette

PRINCIPAL INVESTIGATOR: Arun Kulshreshth, Ph.D.

COMMENTS: Virtual Reality (VR) has long been suggested as a way to enhance education. Students can virtually take field trips to any place or learn about different machinery and how it works with reduced concern about safety and cost. Potential benefits of VR for education include increased engagement and motivation of students, better communication of size and spatial relationships of modeled objects, and stronger memories of the experience. In a real classroom, teachers have a sense of the audience's engagement and actions from cues such as body movements, eye gaze, and facial expressions. This awareness is significantly reduced in a VR environment because a teacher cannot see students directly. Additionally, students get distracted in VR for a variety of reasons such as noise in the real environment around the student, distractions from other avatars, and checking external tools. To help these distracted students, the teacher needs to know the distraction level of students in the class. The PI proposes a system which will detect the distraction level of students in the educational VR environment using machine learning techniques applied to physiological sensor data (e.g., eye gaze, EEG, heart rate, etc.) collected from each student. The system would automatically filter students based on attention level and show a list of students who may need extra consideration, allowing a teacher to help these students.

The PI has (1) pending proposal:

- National Science Foundation (NSF) – entitled "RETTL: Interactive VR Methods for Teaching Molecular Dynamics" in the amount of $849,882 for the period 08/01/2022 – 07/30/2025

Should the PI receive funding for the pending proposal, he/she should be considered nationally competitive and the requested funds from the BoRSF program should not be awarded.

It is recommended that the proposed budget be reduced to provide undergraduate student support of $2,000 and limited travel charges of $2,500, with other expenses charges deleted, resulting in a year one budget of $60,055. Budgets of $52,309 and $49,564 are recommended for year two and year three, respectively.

Year 1: $60,055 **Year 2: $52,309** **Year 3: $49,564**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 005A-22 **RANK: 18**

TITLE: Arsenic-Induced Alterations to the Acute Stress Response and the Associated Cellular and Molecular Toxicities

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Ahmed Abdelmoneim, Ph.D.

COMMENTS: The objective of this research is to advance understanding of the species, levels, and mechanisms by which the arsenicals to which infants and toddlers are ubiquitously exposed through food and water may contribute to the development of stress-related disorders. The PI will use high-throughput behavioral tracking in the zebrafish animal model to investigate how developmental exposure to different species and concentrations of arsenic may alter the acute stress response. Because the organismal response to acute stress originates from an intertwined network between the limbic system and the glucocorticoid signaling pathways, the PI will also use molecular techniques, transgenesis, and *in vivo* imaging approaches to investigate the impacts of developmental exposure to arsenicals on both the signaling pathways of the stress circuitry in larval zebrafish and the structure and activity of noradrenergic neurons, regulators of the stress circuitry. The PI hypothesizes that developmental exposure to certain arsenic species and concentrations can alter the biological processes regulating the stress circuitry, manifested by disruptions in the organism's response to acute stress and the development of stress-related disorders.

It is recommended that the proposed budget be reduced to provide undergraduate student support of $2,000, resulting in a year one budget of $44,950. Budgets of $42,990 and $39,795 are recommended for year two and year three, respectively.

Year 1: $44,950 **Year 2: $42,990** **Year 3: $39,795**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 023A-22 **RANK: 19**

TITLE: Effect of High-Definition Transcranial Alternating Current Stimulation [HD-tACS] on Speech and Language Impairments in Healthy Aging and Parkinson's Disease

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Karim Joharikhatoonabad, Ph.D.

COMMENTS: Aging and age-related neurological conditions such as Parkinson's Disease (PD) are associated with declines in speech production and language comprehension. Aberrant neural activities within beta band (15-30 Hz) have been linked to both speech and language impairments in healthy aging and PD. However, there is a gap of knowledge between theoretical and clinical research about how to improve these deficits in healthy aging and PD by normalizing beta band oscillations. High frequency deep brain stimulation improves limb movement by normalizing beta band oscillation in PD, but has mixed effects on speech and language functions. Moreover, there is limited research on how to improve age-related decline in speech and language comprehension. There is increasing interest in using non-invasive neurostimulation such as transcranial alternating current stimulation (tACS) to improve brain functions by modulating endogenous neural activities within stimulation frequency. tACS was shown to be effective in improving cognitive (e.g., working memory) and motor (e.g., limb movement) functions. However, the application of tACS to speech and language remains to be elucidated. This project will address these gaps using personalized high-definition transcranial alternating current stimulation (HD-tACS) within beta band rate over the left motor cortex to explore the facilitatory effect of stimulation on speech production and sentence comprehension in three different groups. Aim (1) will examine the consequences of HD-tACS over the left motor cortex on speech production and action sentence comprehension in young healthy subjects. In aim (2), the PI will investigate the effect of personalized beta HD-tACS over the left motor cortex on age-related changes in speech production and action sentences comprehension in older healthy adults. Aim (3) will probe the feasibility of personalized beta HD-tACS over the left motor cortex on speech production and action sentence comprehension in PD. In all three aims, the PI will collect electroencephalogram (EEG) and behavioral data following stimulation.

It is recommended that the proposed budget be reduced to provide for the PI one-month summer salary, including fringe benefits, rather than the two months requested and undergraduate student support of $2,000, resulting in a year one budget of $44,852. Budgets of $44,584 and $41,384 are recommended for year two and year three, respectively.

Year 1: $44,852 **Year 2: $44,584** **Year 3: $41,384**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 055A-22 **RANK: 20**

TITLE: Regulation of the Chondroprotective Transcription Factor NR4A2 by Oxidative Stress

INSTITUTION: Loyola University New Orleans

PRINCIPAL INVESTIGATOR: Kimberlee Mix, Ph.D.

COMMENTS: Osteoarthritis (OA) is a major cause of disability worldwide and current treatment options fail to prevent the irreversible destruction of cartilage and bone that impairs joint function. Orphan nuclear receptor NR4A2 is a chondroprotective transcription factor and a promising molecular target for preserving joint integrity in arthritis. Nuclear receptors have proven to be excellent drug targets and synthetic ligands can modulate molecular pathways in a cell and tissue specific manner. NR4A2 is potently induced by inflammatory signals and this factor subsequently antagonizes the expression of cartilage degrading matrix metalloproteinases in chondrocytes. The proposal seeks to investigate endogenous mechanisms regulating NR4A2 that could be leveraged to develop novel OA therapeutics. Mitochondrial dysfunction in aging and OA cartilage perturbs cell signaling pathways, but the impact of reactive oxygen species on NR4A2 transcriptional activity has not been addressed. The PI will test the hypothesis that oxidative stress conditions antagonize the chondroprotective function of NR4A2 through direct oxidative modification of the receptor.

It is recommended that the project be funded at the level requested, i.e., $20,000 for year one.

Year 1: $20,000

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 017A-22 **RANK: 21**

TITLE: Role of the Entorhinal Cortical Circuit in Memory Consolidation

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Juhee Haam, Ph.D.

COMMENTS: Severe cognitive impairment in Alzheimer's Disease affects more than 10% of the population over 65 years old, which impacts quality of life. Currently, there are no effective treatment options for Alzheimer's Disease, suggesting its role in memory. The entorhinal cortex is intimately connected with the two major memory storage structures, the hippocampus and neocortex, which are temporary and long-term memory storage, respectively. By acting as the interface between the neocortex and hippocampus, the entorhinal cortex is positioned as a critical player in memory formation. To date, the role of the entorhinal cortex in memory consolidation has been largely unknown. Since memory consolidation is a pivotal step in memory formation that converts temporary memories to long-lasting stable memories during sleep, understanding memory consolidation is crucial in elucidating the mechanism behind cognitive impairment in neurodegenerative diseases. The PI aims to answer two questions: (1) how does the entorhinal cortical circuit coordinate memory consolidation activities in the brain; and (2) how do environmental stressors alter memory consolidation activities in the entorhinal cortex? The PI will use a multidisciplinary approach that incorporates cellular, behavioral, and computational studies to identify the role of the entorhinal cortex.

It is recommended that the proposed budget be reduced to limit supplies charges to $15,000, resulting in a year one budget of $59,900. A budget of $54,830 is recommended for year two. In year three, funding is recommended at the level requested, i.e., $51,450.

Year 1: $59,900 **Year 2: $54,830** **Year 3: $51,450**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 014A-22 **RANK: 22**

TITLE: Exploring the Utility of Paired U-Pb Ages and Hafnium Isotope Ratios Within Detrital Zircons to Elucidate the Tectonic History of Greater Caucasus Mountains and Adjacent Foreland Basins

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Adam Forte, Ph.D.

COMMENTS: U-Pb dating of detrital zircons (DZ) within sediments is a widely applied provenance technique that can elucidate a wide range of details from rock exhumation histories to changes in major river networks. While useful, sometimes DZ ages are ambiguous, especially when multiple possible source regions have significant overlap in ages, complicating interpretation of provenance and adding uncertainty to derived implications. Increasingly, such problems are overcome by pairing U-Pb dates with additional geochemical data from the same zircons, e.g., Hafnium (Hf) isotope ratios. In addition to helping discriminate among otherwise similar DZ populations, Hf isotope values can also constrain the long-term tectonic and magmatic histories of different crustal blocks. The PI proposes to apply U-Pb and Hf isotope measurements from a suite of zircons in the Greater Caucasus (GC) Mountains. Prior work compared DZ ages in modern GC river sediments, as a proxy for source regions, to those in foreland basin sediments to constrain the history of the range. While partially successful, uncertainties linger because of age overlaps in source region populations. To demonstrate the viability of a larger Hf isotope study of DZs in the GC foreland, the PI proposes to measure DZ U-Pb and HF isotopes extracted from modern GC river sediments as a proof of concept.

It is recommended that the project be funded at the level requested, i.e., $19,647 for year one.

Year 1: $19,647

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 042A-22 **RANK: 23**

TITLE: Towards Mixed-Reality Environments that Promote Early-Stage Design Creativity

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Andrew Webb, Ph.D.

COMMENTS: In recent years, design disciplines including architecture have relied less on abstract representation, such as sketches, instead moving towards more structured digital tools to better streamline their shortened production cycles. Further, the COVID-19 pandemic has shifted collaborative human activities, including design, into primarily online spaces where software systems often require structured representations for synchronous collaboration. The PI posits that the trend toward these structured digital tools adversely affects creativity in early-stage design. Highly structured representations ease convergence toward a single solution but may hinder divergent explorations needed in early design stages. The PI proposes to augment prevailing trends by offering new mixed-reality environments in which designers can quickly create and manipulate abstract representations, both physical and digital, in concert with their existing structured representations and tools. We presently lack the necessary building blocks to create and evaluate such environments. The PI will develop an open-source framework that makes use of augmented-reality headsets, multimodal input, bimanual interaction, computer vision, and flexible data structures to facilitate prototyping environments where designers seamlessly transition among abstract and structured representations.

It is recommended that the proposed budget be reduced to provide undergraduate student support of $2,000, resulting in a year one budget of $61,250. Budgets of $59,000 and $58,000 are recommended for year two and year three, respectively.

Year 1: $61,250 **Year 2: $59,000** **Year 3: $58,000**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 080A-22 **RANK: 24**

TITLE: Measuring Adherences to Best Practices When Dispensing Liquid Medications for Children

INSTITUTION: University of Louisiana at Monroe

PRINCIPAL INVESTIGATOR: Bryan Donald, Ph.D.

COMMENTS: Medication errors are the second most common cause of medication-related emergency department visits in children. Medication dosing errors are more common with liquid medications. Researchers have identified risk factors for medication errors and developed a set of best practices for providers who prescribe liquid medications to children. Despite significant research into best practices for patient education and medication dispensing related to liquid medications for children, there has been no investigation into the pharmacy and its role in proving this best practice level of care. Anecdotal reports from physicians do not show confidence that the pharmacy is practicing at this level. However, as most prescriptions are filled and dispensed at pharmacies, the pharmacy is an invaluable partner to prescribers if best practices are to be followed and the benefits of reduced medication errors realized. This proposal: (1) is the first investigation of the pharmacy to determine adherence to best practices when dispensing liquid medications for children and (2) serves as a necessary baseline measurement leading towards interventional studies of pharmacy and medication safety.

It is recommended that the project be funded at the level requested, i.e., $19,633 for year one.

Year 1: $19,633

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 036A-22 **RANK: 25**

TITLE: Integrating High-Fidelity Simulations and Machine Learning for Melt Pool Geometry Control in Additive Manufacturing

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Ope Owoyele, Ph.D.

COMMENTS: Additive manufacturing involves the application of localized heat from a high-energy source to form a molten pool, which subsequently cools rapidly and resolidifies. Through this process, layers of materials are successively added to build a complex part. Additive manufacturing possesses several advantages over conventional manufacturing methods and, therefore, has grown in popularity in recent decades. However, controlling various process parameters to achieve the desired microstructure and properties remains a significant challenge. Part microstructures and properties are significantly affected by the melting and re-solidification processes and the inability to control the melt pool geometry and thermal cycles invariably leads to undesired variations in product quality. The proposed research will address these issues by developing a simulation-driven framework for on-the-fly optimization of process parameters during the additive manufacturing process. The first objective of the proposed research is to develop a comprehensive computational model to predict thermal behavior and melt pool geometries as a function of process parameters under a wide range of conditions. The second part of the research will focus on developing a novel machine-learning-based approach that utilizes data from the multi-physics models to obtain optimal process parameters for a given manufacturing task.

The PI has (2) pending proposals:

- US Air Force Office of Scientific Research – entitled "Sparse and Adaptive Low-Dimensional Manifolds for Turbulent Reacting Flow Simulations" in the amount of $450,000 for the period 01/15/2022 – 01/14/2025

- National Science Foundation (NSF) – entitled "Adaptive Physics-Informed Machine Learning Strategies for Turbulent Combustion Modeling" in the amount of $270,480 for the period 06/01/2022 – 05/31/2025

Should the PI receive funding for either of the pending proposals, he/she should be considered nationally competitive and the requested funds from the BoRSF program should not be awarded.

It is recommended that the project be funded at the level requested, i.e., $55,250 for year one, $53,250 for year two, and $51,250 for year three.

Year 1: $55,250 **Year 2: $53,250** **Year 3: $51,250**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 045A-22 **RANK: 26**

TITLE: A Pilot Study on Indoor Living Walls: Developing an Integrated Model for Indoor Comfort and Stress Reduction

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Yimin Zhu, Ph.D.

COMMENTS: This pilot study aims to acquire initial evidence regarding the cooling capacity of living walls and establish an interdisciplinary team. Currently, the potential of using indoor living walls to maintain indoor thermal conditions has not been fully explored nor quantitatively evaluated. The results of this project will potentially lead to research on new biophilic and energy-efficient approaches to designing healthy buildings and cities. The PI will create a modular living wall system with four different sizes to compare with a baseline area (i.e., without living walls) at two different temperature conditions. Experiments will be conducted using a climate chamber at LSU. A combination of experimental and analytical approaches will be applied to determine the cooling capacity of living walls.

It is recommended that the project be funded at the level requested, i.e., $20,000 for year one.

Year 1: $20,000

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 010A-22 **RANK: 27**

TITLE: Decoding Contextualized Meaning from Distributed Brain Networks: Applying Machine Learning with Structured Sparsity to the Analysis of Functional Neuroimages

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Christopher Cox, Ph.D.

COMMENTS: Artificial intelligence (AI) guides decisions that constantly affect our lives. Advances in AI rely on advances in machine learning (ML), a broad class of mathematical and engineering techniques for ingesting massive datasets and tracking complex probabilistic regularities. Despite dramatic improvements in ML and the permeation of AI throughout society, machine learners have serious weaknesses that human learners do not with respect to encoding and utilizing knowledge. Unfortunately, how the brain encodes knowledge is not understood. The PI will apply ML technologies, designed for neuroscience applications, to model whole-brain fMRI data collected while participants flexibly activate prior knowledge. The first aim is to evaluate the interactivity between the single- and multi-modal brain areas while activating prior knowledge. The second aim is to identify brain areas that are involved in controlled, relative to automatic, knowledge access. The third aim is to assess whether the areas responsible for control interact directly with areas that store knowledge, or if the brain has an interface between knowledge and control (as proposed in recent neurocognitive models).

It is recommended that the proposed budget be reduced to provide support for the PI of one-month summer salary, including fringe benefits, rather than the two months requested, resulting in a year one budget of $51,201. Budgets of $46,701 and $44,451 are recommended for year two and year three, respectively.

Year 1: $51,201 **Year 2: $46,701** **Year 3: $44,451**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 008A-22 **RANK: 28**

TITLE: Disseminating an Evidence-Based Adolescent Obesity Prevention Intervention to Louisiana Schools

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Senlin Chen, Ph.D.

COMMENTS: The proposed project aims to disseminate Iowa State's SWITCH-MS, an evidence-based adolescent obesity prevention intervention, to Louisiana schools. The re-branded, Louisiana-based Preventing Obesity Using Digital-assisted Movement and Eating (ProudMe) intervention will retain the useful components of SWITCH-MS but also undergo innovative adaptations with integration of a virtual avatar system to increase reach and impact amid the lingering COVID-19 pandemic. The PI will recruit 240 adolescents (11-13 years old in 6^{th}-8^{th} grades) from 24 classes at eight schools (cluster-randomized to two treatment versus two wait-list control schools) to determine the preliminary effectiveness of the ProudME intervention in improving obesity-prevention behaviors (i.e., physical activity, screen-based sedentary behavior, dietary behavior). The PI will then assign two comparable schools to receive the previously evaluated SWITCH-MS and compare them with the two ProudMe schools to capture implementation (i.e., reach, penetration, cost, and sustainability). Mixed methods data will be collected from 12 school implementers (three per school), 40 adolescent (ten per school) and 40 parents (ten per school). This study takes on the dramatic challenges posed by the COVID-19 pandemic by disseminating an adapted, evidence-based obesity prevention intervention to benefit adolescents in Louisiana schools.

It is recommended that the proposed budget be reduced to provide one-month summer salary, including fringe benefits, for the PI and eliminate salary and fringe benefits for the co-PI, resulting in a budget of $46,543 for year one. A budget of $37,300 is recommended for year two.

Year 1: $46,543 **Year 2: $37,300**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 066A-22 **RANK: 29**

TITLE: Engineering the Dipole Orientation and Polarization in Two-Dimensional Semiconducting Layered Materials for a Novel Spin-Photon Interface

INSTITUTION: Tulane University

PRINCIPAL INVESTIGATOR: Xin Lu, Ph.D.

COMMENTS: Single photon emitters (SPEs) were found in monolayer WSe_2 around 2015. The two-dimensional (2D) layered materials have been suggested to serve as a new platform for quantum information sciences (QIS), especially as a novel spin-photon interface in quantum communication. Currently, the 2D community believes these SPEs in transition metal dichalcogenides (TMDs) are formed when free excitons are trapped by local potentials, which could arise from strain, defect or even moiré potential in the twisted bilayers. The exact origin of SPEs in the semiconducting TMDs, such as spin species of the exciton and dipole orientation, has not been completely understood. In this project, the PI aims to investigate dipole orientation and polarization in the 2D semiconducting TMDs. The goal of the proposed research is to understand, as well as dynamically control, the dipole orientation and polarization of emitters in TMD layered materials for a novel and efficient spin-photon interface.

It is recommended that the project be funded at the level requested, i.e., $59,205 for year one, $56,271 for year two, and $54,370 for year three.

Year 1: $59,205 **Year 2: $56,271** **Year 3: $54,370**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 084A-22 **RANK: 30**

TITLE: Quantifying Potential Tradeoffs and Synergies Between Food, Water and Carbon Footprint, under Range of Water Management and Climate Change Scenarios, in the Lower Mississippi River Basin

INSTITUTION: University of New Orleans

PRINCIPAL INVESTIGATOR: Satish Bastola, Ph.D.

COMMENTS: The PI proposes formulating an integrated modeling framework for studying the water, food, and environment nexus challenges for the Lower Mississippi River Basin (LMRB), one of the most productive, heavily managed, and ecologically vulnerable river basins in the US. The planned outcome of the project is a comprehensive and spatially distributed river basin tool coupled with a detailed ecohydrological process aiming to represent the basin climatic and land use conditions and changes; water and sediment flow; carbon and nitrogen cycles; and environmental responses. The spatially explicit coupled modeling tool, which is capable of representing the spatial heterogeneity in the basin, is essential to secure a sustainable economic and environmental future for the LMRB. The project will use the modeling framework to quantify the synergies and trade-offs between food, water, and environment in a basin-wide context under historical and future demand and climate conditions. The project's outcome will help advance knowledge of promising management options for the LMRB by quantifying synergies and trade-offs in the basin-wide water and food and environment nexus.

The PI has (1) pending proposal:

- National Science Foundation (NSF) – entitled "CAREER: Modeling the Resilience of Water, Food, Energy and Environment (WFE) Nexus of Lower Mississippi River Basin Under Range of Water Management and Climate Change Scenarios" in the amount of $552,840 for the period 2022 – 2027

Should the PI receive funding for the pending proposal, he/she should be considered nationally competitive and the requested funds from the BoRSF program should not be awarded.

It is recommended that the proposed budget be reduced to eliminate printing charges, resulting in a year one budget of $50,640. Budgets of $49,618 and $47,643 are recommended for year two and year three, respectively. Note that other expenses charges of $500 (registration fees for conference participation) should be moved to the travel category.

Year 1: $50,640 **Year 2: $49,618** **Year 3: $47,643**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 004A-22 **RANK: 31**

TITLE: Mechanistic Assessment of Drought Tolerance Among Bottomland Hardwood Forest Trees

INSTITUTION: Louisiana State University – Agricultural Center

PRINCIPAL INVESTIGATOR: Brett Wolfe, Ph.D.

COMMENTS: Bottomland hardwood forest (BLH) ecosystems perform vitally important functions including carbon storage, flood control, and wildlife conservation in floodplains throughout the southeastern United States. Local hydrological modifications combined with global climate change may put BLH systems at increased risk of detrimental drought impacts, including forest die-off; however, predicting these impacts is a major challenge. Trait-based process models, which use plant traits to predict physiological responses—including mortality—in trees under specified environmental conditions, offer a promising approach for predicting how forests will respond to such interacting perturbations. However, the basic knowledge of key plant functional traits needed to set parameters for and test these models in BLH systems is lacking. The project will assess the key functional traits in a diverse set of BLH tree species. A common garden drought experiment to track the physiological decline and mortality of saplings of the species will be used. For that, the PI will develop and apply a non-destructive method to measure plant water status using a field spectroradiometer. The trait and response measurements will be used to set parameters and test process models that predict tree-level physiological decline in trees subjected to drought conditions. The results will provide a baseline for projecting the impacts on BLH systems of future climate and management scenarios.

It is recommended that the proposed budget be reduced to provide undergraduate student support of $2,000, resulting in a year one budget of $47,495. A budget of $42,195 is recommended for year two. A similar budget of $42,195 that limits travel charges to $3,000 is recommended for year three.

Year 1: $47,495 **Year 2: $42,195** **Year 3: $42,195**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 018A-22 **RANK: 32**

TITLE: Impact of the Loop Current Variability on Connectivity and Dispersal Across the Gulf of Mexico

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Cheryl Harrison, Ph.D.

COMMENTS: The Loop Current (LC) is a major feature of the Gulf of Mexico (GoM), transporting warm Caribbean water into the GoM and impacting transport processes along the ecologically and economically productive shelf waters. The LC has several disparate states that transition irregularly. The PI hypothesizes that the LC state will strongly affect transport and dispersal patterns within the GoM, leading to regular connectivity patterns. To access this, the PI proposes to apply a machine learning methodology, Lagrangian Flow Networks (LFNs), in a process study determining how the LC state affects transport, dispersal, and biological connectivity Gulf-wide. The LFN methodology has been developed and implemented by collaborators to study transport and ecological impacts in the Mediterranean. The PI proposes to apply it for the first time to the GoM. LFN results will be composited with respect to LC state with a recently developed methodology utilizing self-organizing maps to assess ocean climate states in the GoM. This will allow determination of connectivity provinces based on the LC state, regions of flow that are well-connected within but not connected with outside waters, among other applications.

The PI has (1) pending proposal:

- National Science Foundation (NSF) – entitled "The Future Ocean State Estimation Framework: Formulation and an Application to Better Observe and Understand Future Ocean Deoxygenation" in the amount of $500,000

Should the PI receive funding for the pending proposal, he/she should be considered nationally competitive and the requested funds from the BoRSF program should not be awarded.

It is recommended that the proposed budget be reduced to provide the equivalent of one-month PI salary, including fringe benefits, toward post-doc support, resulting in a year one budget of $54,200. A similar budget of $54,200 is recommended for year two. In year three, funding is recommended at the level requested, i.e., $46,358.

Year 1: $54,200 **Year 2: $54,200** **Year 3: $46,358**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 047A-22 **RANK: 33**

TITLE: Bordetella Bronchiseptica Blocks Eosinophil Recruitment to Increase Persistence in the Respiratory Tract

INSTITUTION: Louisiana State University Health Sciences Center – Shreveport

PRINCIPAL INVESTIGATOR: Monica Cartelle Gestal, Ph.D.

COMMENTS: *Bordetella pertussis* is the causative agent of whooping cough, which the CDC recognizes as a reemerging infectious disease that kills hundreds of thousands of babies and children each year worldwide. Although an FDA-approved vaccine that successfully prevents severe forms of the disease is available, its allowance of colonization and transmission highlights the need for a new vaccine. Since *Bordetella* spp. has the ability to modulate host immune responses to enhance persistence, a better understanding of the mechanism that bacteria utilize to suppress host immune responses will allow the PI to identify targets for vaccine and therapeutic development. *B. bronchiseptical* (BB_{WT}) is the evolutionary ancestor of pertussis and a natural pathogen of mice. The PI previously identified a BB_{WT} sigma factor, btrS, that regulates an immunomodulatory pathway. BB_{WT} harboring a deletion in this factor, (BB_{mut}) is rapidly cleared from the respiratory tract and preliminary data point to an important uncharacterized role of eosinophil in immune clearance. Compared to BB_{WT}, large quantities of eosinophils are found in the lungs of BB_{mut} infected mice. Eosinophil deficient mice infected with BB_{mut} present a persistent colonization resembling $BB_{WT.}$ These findings suggest that btrS blocks eosinophil recruitment to BB_{WT} infected lungs. The PI hypothesizes that eosinophils modulate adaptive response against *Bordetella* spp. infections through a btrS-mediated block of eosinophil recruitment to the lungs to avoid bacterial clearance.

It is recommended that the proposed budget be reduced to limit supplies costs to $29,000, resulting in a year one budget of $48,625. Similar budgets of $48,625 are recommended for year two and year three.

Year 1: $48,625 **Year 2: $48,625** **Year 3: $48,625**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 046A-22 **RANK: 34**

TITLE: Regulation of Cytochrome C Oxidase Subunit IV Expression in Leishmania

INSTITUTION: Louisiana State University Health Sciences Center – New Orleans

PRINCIPAL INVESTIGATOR: Ben Kelly, Ph.D.

COMMENTS: Leishmaniasis is an often-deadly parasitic disease impacting 12 million people, primarily in tropical/subtropical regions, including deployed US military. Drugs against leishmaniasis are inadequate due to their toxicity and *Leishmania* drug resistance. Gaps in understanding the unique biology of trypanosomatids are hindering identification of therapeutic targets needed to develop better, parasite-selective drugs. The PI identified a novel *Leishmania* gene-regulation pathway, where expression of cytochrome c oxidase subunit IV (LmCOX4), essential for parasite mitochondrial function, requires the *Leishmania* ribosome-associated scaffold protein, LACK. Further, the PI created *L. major* expressing $LACK^{DDE}$, a ribosome-binding motif mutant of LACK. Unexpectedly, despite loss of LmCOX4 expression in this line, $LACK^{DDE}$ remained bound to ribosomes. The PI also found that, upon exposure to mammalian body temperature (~35^0C), LmCOX4 expression in $LACK^{DDE}$ and WT parasites was initially lost. LmCOX4 expression subsequently returned in $LACK^{WT}$ but not $LACK^{DDE}$ *L. major*. To bridge the knowledge gap in trypanosomatid gene regulation, the PI will elucidate how LACK modulates LmCOX4 in response to mammalian temperature. The PI hypothesizes that, upon exposure to 35°C, ubiquitin/proteasome degradation transiently targets LmCOX4. Then $LACK^{WT}$-dependent expression of new, chaperone-stabilized LmCOX4 occurs via optimized $LACK^{WT}$-ribosome interactions.

It is recommended that the proposed budget be reduced to provide one-month summer salary, including fringe benefits for the PI, rather than 1.2 months requested, and limit supplies charges to $15,000, resulting in a year one budget of $49,083. Similar budgets of $49,083 are recommended for year two and year three.

Year 1: $49,083 **Year 2: $49,083** **Year 3: $49,083**

The institutional match pledged in the proposal should be maintained in full.

Appendix E (continued):

PROPOSAL: 054A-22 **RANK: 35**

TITLE: Biogeochemistry of Submarine Groundwater Discharge in Southeastern Louisiana

INSTITUTION: Louisiana Universities Marine Consortium

PRINCIPAL INVESTIGATOR: Marshall Bowles, Ph.D.

COMMENTS: Submarine groundwater discharge (SGD) occurs along coastal regions where groundwater permeates coastal sediment and ultimately is transported into the marine environment. Numerous estimates of SGD rates suggest that they can rival that of sizeable rivers. SGD is chemically distinct from marine water, often having elevated concentrations of methane and nutrients (i.e., submarine groundwater is often enriched in N). These characteristics have important implications in an environment such as coastal southeastern Louisiana, where high nutrient inputs from the Mississippi River already support hypoxia. Furthermore, there is a knowledge gap related to SGD in muddy settings, as most previous studies are related to SGD in sandy carbon replete sediments. Thus, the PI's aims are to (1) delineate SGD hotspots in silty clay-rich sediments of coastal southeastern Louisiana; and (2) define the biogeochemical transformations occurring in porewater that are related to SGD. The PI will look at the enrichment in ^{222}Rn to define regions (e.g., within Barataria Bay and Wax Lake Delta) that are experiencing SGD. Process-based biogeochemical incubations in sediments collected from respective study sites will be used to understand transformations of organic carbon, methane, sulfate, and nitrogen species occurring as a result of SGD. The PI hypothesizes that microbial mediated nitrogen transformations in sediment dampen the impact of SGD on the shelf region. This research will allow the PI to expand research into the area of influence of SGD on microbial communities and processes, which is currently understudied in spite of extensive research focused on SGD in the coastal ocean.

The PI has (1) pending proposal:

- National Science Foundation (NSF) – entitled "Collaborative Research: Direct Measurement of CO2 Outgassing from Dissolved Organic Matter Processing at the Greenland Ice Sheet Surface and Impacts in a Warming Climate" in the amount of $896,324 for the period 01/2022 – 12/2024

Should the PI receive funding for the pending proposal, he/she should be considered nationally competitive and the requested funds from the BoRSF program should not be awarded.

It is recommended that the proposed budget be reduced to provide limited travel support of $2,500 and subcontract funding of $31,250 (supplies deleted), resulting in a year one budget of $58,623. A budget of $57,053, which eliminates printing charges of $1,500 and provides a subcontract of $31,250 (co-PI salary, fringe benefits, and supplies deleted), is recommended for year two. A budget of $17,538 is recommended for year three.

Year 1: $58,623 **Year 2: $57,053** **Year 3: $17,538**

The institutional match pledged in the proposal should be maintained in full.

APPENDIX F

COMMENTS ON PROPOSALS RANKED PRIORITY ONE BY THE SUBJECT-AREA PANELS AND CONSIDERED BY THE FINAL PANEL BUT NOT RECOMMENDED FOR FUNDING

PROPOSAL: 021A-22

TITLE: Programming Designer DNA Nanostructures for Blocking Enveloped Viral Infection

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Weishan Huang, Ph.D.

COMMENTS: COVID-19, caused by the SARS-CoV-2 virus, is highly contagious and has resulted in a global pandemic that has caused severe illness and millions of deaths. The COVID-19 pandemic reveals the challenges of the current technologies in developing effective and affordable preventive and therapeutic medicine against emerging viral infections. The PI has developed an innovative paradigm integrating molecular pattern matching DNA-based nanotechnology and customizable high-throughput safe pseudo viral inhibition assays, for programming, synthesis, screening, validation and optimization of DNA-based nanostructures that can directly recognize and block enveloped viruses through their distinct surface epitope distribution features. The PI's hypothesis is that the structural properties and layout patterns of SARS-CoV-2 surface glycoprotein epitopes can be exploited to design DNA nanostructures with nanoscale precision to match and capture SARS-CoV-2 intact virions with ultrahigh binding avidity and selectivity, therefore blocking SARS-CoV-2 infection. The objectives of the research are to design and optimize the DNA nanoconstructs (DDNs) to target a broader spectrum of SARS-CoV-2 variants and determine the antiviral potency and cytotoxicity of these DDNs during live SARS-CoV-2 infections in human lung epithelial cells.

It is the Panel's position that the proposed research does not represent cutting-edge techniques or include a plan to sharpen the research focus. For this reason the project was not recommended for RCS funding.

Appendix F (continued):

PROPOSAL: 038A-22

TITLE: Investigation of the Ecological Impacts of Nanomaterial Stress on Species Interactions in Freshwater Ecosystems

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Jiaqi Tan, Ph.D.

COMMENTS: Increasing human activities are posing tremendous threats to the health of Earth's ecosystems. As modern technology keeps introducing novel environmental stressors, our understanding of the impact of environmental stress requires continuous revision. Engineered nanomaterials in the environment are such emerging stressors. Engineered nanomaterials are the building blocks of nanotechnology. Their exceptional physicochemical properties make them highly desirable for uses in all industries, while also separating them from traditional stressors and posing a novel environmental challenge for the ecosystem. Engineered nanomaterials are highly harmful to biological organisms, according to previous research that focuses on individual species responses. Despite this, knowledge of the influences of nanomaterial stress on species interaction is lacking. Plant-microbiome symbiosis is one of the most important species interactions, driving many critical ecosystem functions. By leveraging the aquatic floating plant, *Lemna minor*, as the model system, the PI will combine field observation with controlled experiments to investigate the influences of engineered nanomaterials on the interaction between *L. minor* and its associated microbial communities (i.e., microbiomes). The PI will investigate water bodies along urbanization gradients to understand the association of nanomaterial pollution, *L. minor* population dynamics, and microbiome composition. Moreover, the PI will use controlled experiments to examine the importance of *L. minor* population-level changes for microbiomes' responses to nanomaterial stress.

Although the proposal is of good quality, it did not rank high enough in comparison with other Biological Sciences II proposals to warrant funding. It was not placed in the "Priority I" category by the Panel because there is not enough money, even if additional funds become available, to fund more than the thirty-five (35) proposals listed in Appendix A.

Appendix F (continued):

PROPOSAL: 040A-22

TITLE: Building a Quality-Driven Federated Learning System in Heterogeneous Environments

INSTITUTION: Louisiana State University and A&M College

PRINCIPAL INVESTIGATOR: Hao Wang, Ph.D.

COMMENTS: The widespread deployment of machine learning applications in ubiquitous environments has sparked interest in exploiting the vast amount of data collected on mobile devices, such as smartphones, personal health wearables, and unmanned aerial vehicles. Federated learning (FL) has been proposed to serve as a shared model by orchestrating participating devices to train models with their local data and iteratively aggregate the local models into a global one without leaking any private data. However, heterogeneous data samples, system performance, and network connectivity across devices pose non-trivial challenges to improving the training efficiency and model quality of FL. This project aims to design and implement a new FL system that performs quality-driven model training in heterogeneous environments. Specifically, the PI will advance the project in the following phases: (1) build a FL system prototype for real-world environments involving heterogenous datasets, hardware devices, and networks; (2) design quality-driven model pruning strategies for FL with heterogenous networks; (3) design new adaptive FL algorithms for data samples in heterogenous specifications; and (4) design model parameter selection algorithms to optimize personal FL.

Although the proposal is of good quality, it did not rank high enough in comparison with other Computer and Informational Sciences proposals to warrant funding. It was not placed in the “Priority I” category by the Panel because there is not enough money, even if additional funds become available, to fund more than the thirty-five (35) proposals listed in Appendix A.

Appendix F (continued):

PROPOSAL: 062A-22

TITLE: Modeling the Effects of Long-Term Storage Conditions on the Performance of Respirators Against Biological Aerosols in Preparation to Respond to Future Pandemics

INSTITUTION: Southeastern Louisiana University

PRINCIPAL INVESTIGATOR: Ephraim Massawe, Ph.D.

COMMENTS: Use of Respirators and other personal protective equipment (PPE) can prevent exposure to biological aerosols. The Centers for Disease Control (CDC) and the World Health Organization (WHO) have recommended that healthcare workers and the general public use respirators to prevent the transmission of COVID-19 between persons and from surfaces to persons. As a result of this recommendation, respirator usage has seen a significant increase. Because the demand for respirators overwhelmed the supply, state and federal government and other organizations will continue to stockpile large quantities of respirators to quickly respond to future pandemics. One advantage of this practice is to make respirators readily available when needed. However, storage conditions may impact the performance of respirators for their intended purposes. The overall goal of this project is to develop a model that can track and predict the effects of long-term storage conditions on respirator performance. The specific objectives of this project are: (1) to investigate the performance "filtration efficiency" of the filtering face piece respirators (FFRs) during long-term storage; (2) to investigate and quantify face-FFR-interface leakage of various models of FFRs; (3) to develop mathematical models to track and predict the effects of long-term storage on respirator performance; and (4) to investigate the effects of long-term storage of FFRs on strap performance and comfort for users as well as impacts on the respiratory protective levels of the FFRs.

Dr. Massawe is the past recipient of RCS grant LEQSF(2011-14)-RD-A-22 for his project entitled "*Development of Exposure Assessment Models*" for the period 6/1/2011 – 6/30/2016. Junior research faculty are given priority for funding. For this reason, the project was not recommended for RCS funding.

Appendix F (continued):

PROPOSAL: 068A-22

TITLE: Chagas Disease Clinical Progression During Natural Infection and Therapeutic Vaccination in Rhesus Macaques

INSTITUTION: Tulane University Health Sciences Center

PRINCIPAL INVESTIGATOR: Eric Dumonteil, Ph.D.

COMMENTS: Chronic Chagasic cardiomyopathy caused by *Trypanosoma cruzi* parasites is responsible for 10,600 annual deaths and $7.2 billion in annual economic losses. Current drug treatments are effective during the acute phase of infection, but efficacy declines as the chronic phase progresses. In addition, severe adverse effects are frequent, so therapeutic vaccine based Tc24 and TSA1 antigens are effective in reducing cardiac tissue damage and cardiac dysfunction. This vaccine is also safe and immunogenic in naïve rhesus macaques. The results provide a strong rationale for the further evaluation of therapeutic vaccination in non-human primates, as a key step towards clinical trials. The clinical course of natural or experimental *T. cruzi* infection in rhesus chagasic cardiomyopathy in this animal model is lacking. Therefore, the PI proposes the following aims: (1) to measure changes in cardiac (dys)function and parasitemia over time in naturally infected Rhesus macaques; (2) to associate cardiac dysfunction and PBMC gene expression profiles to identify the gene signature of disease progression; and (3) to associate fibronectin and other plasma biomarkers with clinical disease progression. The PI hypothesizes that changes in cardiac (dys)function can be detected over a twelve-month period of follow-up and that cardiac (dys)function correlates with parasitemia; PBMC gene expression profiles differ between progressor and non-progressor Chagasic macaques; and fibronectin and other biomarker levels differ between progressor and non-progressor Chagasic macaques.

Dr. Dumonteil is the past recipient of RCS grant LEQSF(2018-21)-RD-A-19 for his project entitled “Next Generation Sequencing and Metabarcoding as a Novel Approach for the Molecular Epidemiology of *Trypanosoma cruzi* Transmission” for the period 6/1/2018 – 6/30/2021. Junior research faculty are given priority for funding. For this reason, the project was not recommended for RCS funding.

Appendix F (continued):

PROPOSAL: 089A-22

TITLE: Topology Aware Collaborative Filtering Against DDoS Attacks

INSTITUTION: University of New Orleans

PRINCIPAL INVESTIGATOR: Abdullah Nur, Ph.D.

COMMENTS: The Internet introduces a variety of vulnerabilities that put the security and privacy of computer-based systems at risk. One of the most perilous threats to the Internet is Distributed Denial of Service (DDoS) attacks. Unfortunately, we do not have a scalable, robust, fully working defense mechanism against DDoS attacks. Defense techniques in the industry usually focus on attack mitigation, which aims to reduce the effects of an attack. Even though attack mitigation is a useful short-term, act-immediately type of method, it is not feasible to use over the long run. In addition to mitigation techniques, a proper defense mechanism should contain attack source identification and response. DDoS attacks also affect intermediate Autonomous Systems (AS), which carry the attack traffic. These ASes are unintentional victims. The ultimate goal of this project is developing a defense mechanism to solve the DDoS attack problem. The PI's objectives are (1) to develop a single packet, AS traceback method to find the path between attacker and the victim even if the IP address of the attacker is spoofed; (2) to develop a collaborative filtering mechanism to filter out the attack traffic as close as possible to the attack site; (3) to develop secure messaging protocol to enable collaboration; and (4) to develop a testbed environment which mimics the Internet adequately to test the methods without affecting the Internet.

Although the proposal is of good quality, it did not rank high enough in comparison with other Computer and Information Sciences proposals to warrant funding. It was not placed in the "Priority I" category by the Panel because there is not enough money, even if additional funds become available, to fund more than the thirty-five (35) proposals listed in Appendix A.

APPENDIX G

OUT-OF-STATE EXPERTS WHO SERVED AS FINAL AND FULL SUBJECT-AREA PANELISTS

FINAL PANEL

Richard Vulliet, Ph.D., D.V.M., Chair
Professor, Laboratory of Veterinary Cytotherapeutics
Department of Veterinary Molecular Biosciences
University of California at Davis

Michael E. Prudich, Ph.D.
Professor Emeritus
Department of Chemical and Biomolecular Engineering
Ohio University

Kirk Peterson, Ph.D.
Professor, Chair
Department of Chemistry
Washington State University

Appendix G (continued):

SUBJECT-AREA PANELS

BIOLOGICAL SCIENCES I (Human Biology, Immunology, Virology and Microbiology)

Eric Prossnitz, Ph.D., Chair
Professor of Cell Biology and Physiology
University of New Mexico Health Sciences Center

Clinton D. Allred, Ph.D.
Associate Professor
Department of Nutrition and Food Science
Texas A&M University

Helen J. Hathaway, Ph.D.
Professor of Cell Biology & Physiology
University of New Mexico Health Sciences Center

BIOLOGICAL SCIENCES II (Natural Sciences, Ecology, Microbiology, Genetics)

Steven N. Francoeur, Ph.D., Chair
Professor
Department of Biology
Eastern Michigan University

Gregory Blayne Cunningham, Ph.D.
Professor
Department of Biology
St. John Fisher College

Shahid S. Siddiqui, Ph.D.
Associate Professor
Department of Medicine
University of Chicago

CHEMISTRY

Alexander Li, Ph.D., Chair
Professor
Department of Chemistry
Washington State University

Y. Charles Cao, Ph.D.
Professor
Department of Chemistry
University of Florida

Appendix G (continued):

COMPUTER & INFORMATION SCIENCES

Sartaj Sahni, Ph.D., Chair
Distinguished Professor
Department of Computer & Information Sciences and Engineering
University of Florida

Sanguthevar Rajasekaran, Ph.D.
Professor
Department of Computer Science & Engineering
University of Connecticut

EARTH & ENVIRONMENTAL SCIENCES

Charles J. Wurrey, Ph.D., Chair
Curators' Distinguished Teaching Professor Emeritus
James C. Olson Professor Emeritus of Chemistry
University of Missouri at Kansas City

Jeffrey A. Lee, Ph.D.
Professor
Department of Geosciences
Texas Tech University

ENGINEERING B

Daniel A. Gulino, Ph.D., Chair
Associate Professor Emeritus
Department of Chemical & Biomedical Engineering
Ohio University

James R. Wilson, Ph.D.
Professor
Department of Industrial Engineering
North Carolina State University

Preston S. Wilson, Ph.D.
Professor
Walker Department of Mechanical Engineering
University of Texas at Austin

Amit Bandyopadhyay, Ph.D.
Professor
School of Mechanical & Materials Engineering
Washington State University

Appendix G (continued):

HEALTH & MEDICAL SCIENCES

Gerald Sonnenfeld, Ph.D., Chair
Microbiologist and Immunologist
Research Administrator

Terrence Deak, Ph.D.
Associate Director
Center for Developmental and Behavioral Neuroscience
State University of New York at Binghamton (SUNY Binghamton)

Michael G. Skidmore, B.S., Retired
General Engineer Aerospace Technology
National Aeronautics and Space Administration (NASA)

APPENDIX H

RESEARCH COMPETITIVENESS SUBPROGRAM
FY 2021-22
SUMMARY OF PROPOSALS

92	**TOTAL PROPOSALS**	
5	BS I	Biological Sciences I
18	BS II	Biological Sciences
2	CHEM	Chemistry
13	C/IS	Computer and Information Sciences
9	EAR	Earth and Environmental Sciences
29	ENG B	Engineering B
16	H/M	Health and Medical

TOTAL FIRST-YEAR FUNDS REQUESTED: $4,620,672

Proposals Submitted to the Research and Development Program - Research Competitiveness Subprogram (RCS)
FY 2021-22 Review Cycle

Proposal #	PI Name	Category	Institution	Duration	Project Title	Amount Requested			
						Year 1	Year 2	Year 3	Total
001A-22	Prof. Haeyeon Yang	Engineering B [Industrial, Materials, Mechanical, etc.]	Grambling State University	3 Years	Study of the interaction of laser plasma with laser pulses	$71,988	$48,151	$45,716	$165,855
002A-22	Prof. Kevin Hoffseth	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University Agricultural Center	3 Years	Finite Element Modeling of Regenerated Murine P3 Digit Bone	$63,371	$63,371	$64,871	$191,613
003A-22	Prof. Ely Oliveira Garcia	Biological Sciences I	Louisiana State University Agricultural Center	2 Years	Functional characterization of Magnaporthe oryzae effector proteins in rice cells during infection	$39,750	$36,750	$0	$76,500
004A-22	Dr. Brett Wolfe	Biological Sciences II	Louisiana State University Agricultural Center	3 Years	Mechanistic assessment of drought tolerance among bottomland hardwood forest trees	$52,995	$47,695	$44,281	$144,971
005A-22	Dr. Ahmed Abdelmoneim	Biological Sciences II	Louisiana State University and A & M College	3 Years	Arsenic-induced alterations to the acute stress response and the associated cellular and molecular toxicities	$49,950	$47,990	$43,545	$141,485
006A-22	Dr. Carolina Barbosa Resende	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	2 Years	Construction Engineers and Managers Training Methods - Current Practices	$99,238	$90,228	$0	$189,466
007A-22	Dr. Robb Brumfield	Biological Sciences II	Louisiana State University and A & M College	1 Year	Genetic control of color variation in herons and egrets	$18,850	$0	$0	$18,850
008A-22	Dr. Senlin Chen	Health and Medical Sciences	Louisiana State University and A & M College	2 Years	Disseminating an Evidence-based Adolescent Obesity Prevention Intervention to Louisiana Schools	$60,000	$40,000	$0	$100,000
009A-22	Dr. Henrique / H Cheng	Biological Sciences II	Louisiana State University and A & M College	2 Years	Stem cell therapy without stem cell transplantation for diabetes	$26,100	$17,711	$0	$43,811
010A-22	Dr. Christopher Cox	Biological Sciences II	Louisiana State University and A & M College	3 Years	Decoding contextualized meaning from distributed brain networks: Applying machine learning with structured sparsity to the analysis of functional neuroimages	$65,311	$60,811	$58,561	$184,683
011A-22	Prof. Chunli Dai	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	Investigating the physical linkage between earthquakes and the subsequent landslides using satellite imagery	$66,000	$58,501	$49,000	$173,501
012A-22	Dr. Rebeca de Jesus Crespo	Earth/Environmental Sciences	Louisiana State University and A & M College	3 Years	The epidemiological significance of spatio-temporal segregation patterns of mosquito vectors in New Orleans, Louisiana	$47,781	$39,515	$35,383	$122,679
013A-22	Prof. Jonathon Doering	Biological Sciences II	Louisiana State University and A & M College	3 Years	Towards developing mechanism-based biological models to predict impacts of environmental contaminants on thyroid hormone signaling in diverse species of fish	$62,991	$61,800	$27,209	$152,000
014A-22	Dr. Adam Forte	Earth/Environmental Sciences	Louisiana State University and A & M College	1 Year	Exploring the Utility of Paired U-Pb ages and Hafnium Isotope Ratios within Detrital Zircons to Elucidate the Tectonic History of Greater Caucasus Mountains and Adjacent Foreland Basins	$19,647	$0	$0	$19,647
015A-22	Dr. Hunter Gilbert	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	A Systematic Modeling Framework for a Transformative Understanding of Continuum Robots	$54,729	$53,445	$50,445	$158,619
016A-22	Dr. Beibei Guo	Health and Medical Sciences	Louisiana State University and A & M College	3 Years	Biomarker-based Clinical Trial Design for Identifying Subgroup-specific Optimal Dose for Immunotherapy and Immunoradiotherapy	$54,511	$52,511	$50,511	$157,533
017A-22	Dr. Juhee Haam	Biological Sciences II	Louisiana State University and A & M College	3 Years	Role of the entorhinal cortical circuit in memory consolidation	$64,900	$56,330	$51,450	$172,680
018A-22	Dr. Cheryl Harrison	Earth/Environmental Sciences	Louisiana State University and A & M College	3 Years	Impact of the Loop Current variability on connectivity and dispersal across the Gulf of Mexico	$77,100	$69,900	$46,358	$193,358

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Proposal #	PI Name	Category	Institution	Duration	Project Title	Amount Requested			
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019A-22	Dr. Hany Hassan	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	Maximizing the positive impacts of truck platooning on US highways	$68,406	$66,656	$54,781	$189,843
020A-22	Dr. Achim Herrmann	Earth/Environmental Sciences	Louisiana State University and A & M College	1 Year	Hafnium isotopes of detrital zircons	$11,430	$0	$0	$11,430
021A-22	Dr. Weishan Huang	Biological Sciences II	Louisiana State University and A & M College	1 Year	Programming designer DNA nanostructures for blocking enveloped viral infection	$20,000	$0	$0	$20,000
022A-22	Dr. Amirhosein Jafari	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	Developing an Occupant-Centric Energy Management System for Office Buildings	$54,950	$48,950	$46,450	$150,350
023A-22	Dr. karim joharikhatoonabad	Health and Medical Sciences	Louisiana State University and A & M College	3 Years	Effect of High-Definition transcranial Alternating Current Stimulation [HD-tACS] on Speech and Language Impairments in Healthy aging and Parkinson's Disease	$65,169	$64,901	$54,983	$185,053
024A-22	Dr. Ali Kazemian	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	ISRU-based Planetary Construction 3D Printing for Lunar and Martian Infrastructure Development: Process Optimization and Automated Quality Control	$63,200	$55,320	$39,986	$158,506
025A-22	Prof. Chris Kees	Earth/Environmental Sciences	Louisiana State University and A & M College	3 Years	Modeling the mechanics of fluid-bed-vegetation interactions in coastal and riverine ecosystems	$60,979	$57,979	$42,931	$161,889
026A-22	Dr. Yong-ha Kim	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	Removal of Radionuclides in Aqueous Environments	$56,881	$51,771	$47,846	$156,498
027A-22	Dr. YONG-CHEOL LEE	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	AI-based Generative Design of Modular Housing for Rapid and Resilient Post-Disaster Recovery	$58,611	$58,454	$57,611	$174,676
028A-22	Dr. Daijiang Li	Biological Sciences II	Louisiana State University and A & M College	3 Years	Understanding the effects of urbanization on plant phenology	$62,679	$55,779	$53,779	$172,237
029A-22	Dr. Li-Hsiang Lin	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	1 Year	Statistics and AI Aided Computer Experiments for Density and Dynamic Models	$20,000	$0	$0	$20,000
030A-22	Prof. Omar Magana-Loaiza	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	Quantum Control of Many-body Photonic Systems using Plasmonic Nanoscale Platforms	$73,260	$64,211	$59,929	$197,400
031A-22	Dr. Nicholas Mason	Biological Sciences II	Louisiana State University and A & M College	3 Years	Systematics of Andean Sky-islands: Comparative Phylogeography, Integrative Taxonomy, and Rapid Inventories of Polylepis Avifauna	$72,621	$62,621	$52,285	$187,527
032A-22	Dr. Xiangyu Meng	Computer and Information Sciences	Louisiana State University and A & M College	3 Years	A Reinforcement Learning Approach to Eco-Driving of Connected and Autonomous Vehicles	$66,994	$66,494	$65,494	$198,982
033A-22	Dr. Shyam Menon	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	Engineering microbubble dynamics for targeted cancer drug delivery	$52,000	$50,000	$48,000	$150,000
034A-22	Dr. Bijoyaa Mohapatra	Health and Medical Sciences	Louisiana State University and A & M College	3 Years	Neuropsychophysiological Correlates of Mental Workload in Individuals with Aphasia	$64,034	$63,034	$62,534	$189,602
035A-22	Dr. Olalekan Ogundele	Biological Sciences II	Louisiana State University and A & M College	3 Years	In vivo characterization of a neural circuit for novelty detection in working memory	$57,365	$47,365	$42,365	$147,095

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						Year 1	Year 2	Year 3	Total
036A-22	Dr. Ope Owoyele	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	Integrating High-fidelity Simulations and Machine Learning for Melt Pool Geometry Control in Additive Manufacturing	$55,250	$53,250	$51,250	$159,750
037A-22	Dr. Chao Sun	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	1 Year	High-fidelity modeling of coupled wind-surge-wave flows and loading on structures	$20,000	$0	$0	$20,000
038A-22	Dr. Jiaqi Tan	Biological Sciences II	Louisiana State University and A & M College	3 Years	Investigation of the ecological impacts of nanomaterial stress on species interactions in freshwater ecosystems	$64,963	$61,929	$59,805	$186,697
039A-22	Prof. Xun Tang	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	3 Years	Machine Learning-based Feedback Control for Colloidal Self-Assembly	$59,360	$58,360	$58,060	$175,780
040A-22	Dr. Hao Wang	Computer and Information Sciences	Louisiana State University and A & M College	3 Years	Building a Quality-Driven Federated Learning System in Heterogeneous Environments	$62,950	$61,250	$59,750	$183,950
041A-22	Dr. Lei Wang	Earth/Environmental Sciences	Louisiana State University and A & M College	2 Years	Evaluating the accessibility to life-saving facilities of elderly people during events of extreme flooding using Cloud computing	$54,718	$46,173	$0	$100,891
042A-22	Prof. Andrew Webb	Computer and Information Sciences	Louisiana State University and A & M College	3 Years	Towards Mixed-Reality Environments that Promote Early-Stage Design Creativity	$65,000	$62,750	$61,750	$189,500
043A-22	Dr. Amy Xu	Biological Sciences I	Louisiana State University and A & M College	3 Years	Conformation and behavior of monoclonal antibodies in crowded environments	$64,325	$49,925	$43,375	$157,625
044A-22	Dr. Masami Yoshimura	Health and Medical Sciences	Louisiana State University and A & M College	1 Year	Alcohol effects on airway immune cell profile during sepsis: role of adenylyl cyclase type 7	$20,000	$0	$0	$20,000
045A-22	Dr. Yimin Zhu	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana State University and A & M College	1 Year	A pilot study on indoor living walls: Developing an integrated model for indoor comfort and stress reduction	$20,000	$0	$0	$20,000
046A-22	Dr. Ben Kelly	Biological Sciences I	Louisiana State University Health Sciences Center - New Orleans	3 Years	Regulation of cytochrome C oxidase subunit IV expression in Leishmania	$60,000	$60,000	$60,000	$180,000
047A-22	Prof. Monica Cartelle Gestal	Health and Medical Sciences	Louisiana State University Health Sciences Center Shreveport	3 Years	Bordetella bronchiseptica blocks eosinophil recruitment to increase persistence in the respiratory tract	$53,625	$53,625	$53,625	$160,875
048A-22	Dr. Subhajit Chakrabarty	Computer and Information Sciences	Louisiana State University in Shreveport	1 Year	Classification of types of brain seizures using data-driven methods	$19,914	$0	$0	$19,914
049A-22	Dr. Amy Erickson	Earth/Environmental Sciences	Louisiana State University in Shreveport	3 Years	Controlling the invasive water fern Salvinia molesta by allelopathic effects of common aquatic plants	$45,495	$44,975	$39,870	$130,340
050A-22	Dr. Shaurav Alam	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana Tech University	3 Years	Elucidating Composition-Microstructure-Property Investigations of Frontally Polymerized Geopolymer Materials	$50,088	$47,730	$44,399	$142,217
051A-22	Dr. Prashanna Bhattarai	Engineering B [Industrial, Materials, Mechanical, etc.]	Louisiana Tech University	3 Years	Mitigation of Amplified Current Imbalances due to Induction Machines Using the Currents' Physical Components (CPC) Power Theory	$46,936	$45,436	$50,436	$142,808
052A-22	Dr. William Glisson	Computer and Information Sciences	Louisiana Tech University	3 Years	Virtual Reality Research	$73,974	$60,583	$57,983	$192,540
053A-22	Dr. Aaron Hutchinson	Computer and Information Sciences	Louisiana Tech University	3 Years	Analysis of Post-Quantum Cryptosystems and their Implementations	$42,910	$43,566	$44,250	$130,726
054A-22	Dr. Marshall Bowles	Earth/Environmental Sciences	Louisiana Universities Marine Consortium	3 Years	Biogeochemistry of submarine groundwater discharge in southeastern Louisiana	$63,223	$63,085	$25,468	$151,776
055A-22	Dr. Kimberlee Mix	Biological Sciences I	Loyola University New Orleans	1 Year	Regulation of the chondroprotective transcription factor NR4A2 by oxidative stress	$20,000	$0	$0	$20,000

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						Year 1	Year 2	Year 3	Total
056A-22	Dr. Bei Xie	Engineering B [Industrial, Materials, Mechanical, etc.]	McNeese State University	2 Years	Quantum Circuits Design for Computational Fluid Dynamics	$58,659	$58,659	$0	$117,318
057A-22	Dr. Katherine Galloway	Biological Sciences II	Nicholls State University	3 Years	Investigating the ecological and morphological impacts of invasive Rio Grande Cichlids on native bluegill	$49,414	$51,814	$50,814	$152,042
058A-22	Dr. Himanshu Verma	Engineering B [Industrial, Materials, Mechanical, etc.]	Nicholls State University	3 Years	Investigation of structural and magnetic properties in the nanocomposites of ferrites	$40,000	$20,000	$20,000	$80,000
059A-22	Dr. Jonathan Willis	Biological Sciences II	Nicholls State University	3 Years	Determining the role of dwarf palmetto [Sabal minor] in Louisiana bottomland hardwood carbon sequestration.	$40,315	$41,680	$40,798	$122,793
060A-22	Dr. Mehmet Bahadir	Engineering B [Industrial, Materials, Mechanical, etc.]	Southeastern Louisiana University	1 Year	Recycling and Reuse of Composite Materials for 3D Printing	$14,238	$0	$0	$14,238
061A-22	Dr. Ahmad Fayed	Engineering B [Industrial, Materials, Mechanical, etc.]	Southeastern Louisiana University	1 Year	Investigation of mechanical properties of 3D printed materials under dynamic loads	$19,972	$0	$0	$19,972
062A-22	Dr. Ephraim Massawe	Engineering B [Industrial, Materials, Mechanical, etc.]	Southeastern Louisiana University	3 Years	Modeling the Effects of Long-Term Storage Conditions on the Performance of Respirators against Biological Aerosols in Preparation to Respond to Future Pandemics	$48,201	$38,046	$37,292	$123,539
063A-22	Dr. Conrad Jones	Chemistry	Southern University and A&M College - Baton Rouge	2 Years	Synthesis & Potential Applications of Carbon Quantum Dots from Coffee Beans as Environmentally Friendly Electrocatalysts	$59,176	$59,176	$0	$118,352
064A-22	Prof. Zhengming Ding	Computer and Information Sciences	Tulane University	3 Years	Explainable Source-Data Protected Cross-Domain Learning	$53,783	$54,271	$54,775	$162,829
065A-22	Dr. Xiang Ji	Health and Medical Sciences	Tulane University	3 Years	Molecular epidemiology through scalable statistical phylogenetic modelling	$80,426	$57,221	$58,841	$196,488
066A-22	Dr. Xin Lu	Engineering B [Industrial, Materials, Mechanical, etc.]	Tulane University	3 Years	Engineering the Dipole Orientation and Polarization in Two-Dimensional Semiconducting Layered Materials for a Novel Spin-Photon Interface	$59,205	$56,271	$54,370	$169,846
067A-22	Dr. Rhea Bhargava	Health and Medical Sciences	Tulane University Health Sciences Center	3 Years	Lectin-Glycan recognition systems in Lupus Nephritis	$66,000	$66,000	$66,000	$198,000
068A-22	Dr. Eric Dumonteil	Health and Medical Sciences	Tulane University Health Sciences Center	3 Years	Chagas disease clinical progression during natural infection and therapeutic vaccination in rhesus macaques	$64,430	$65,638	$66,884	$196,952
069A-22	Dr. Chiung-Kuei Huang	Health and Medical Sciences	Tulane University Health Sciences Center	3 Years	TET1 and sex difference in fatty liver progression	$64,015	$63,455	$65,940	$193,410
070A-22	Dr. Qiuyang Zhang	Biological Sciences II	Tulane University Health Sciences Center	3 Years	The Role of USP26 in Prostate Cancer	$75,964	$76,104	$69,399	$221,467
071A-22	Dr. Tanvir Faisal	Engineering B [Industrial, Materials, Mechanical, etc.]	University of Louisiana at Lafayette	3 Years	Pathophysiology of osteoarthritic articular cartilage and the associated pathomechanics of knee	$56,373	$54,598	$53,024	$163,995
072A-22	Dr. Aminul Islam	Computer and Information Sciences	University of Louisiana at Lafayette	2 Years	Training Optimization of Deep Neural Network	$56,179	$49,681	$0	$105,860
073A-22	Dr. Arun Kulshreshth	Computer and Information Sciences	University of Louisiana at Lafayette	3 Years	Classifying Student Distraction Level in Educational Virtual Reality	$67,555	$59,809	$55,564	$182,928
074A-22	Prof. ANNA PALTSEVA	Earth/Environmental Sciences	University of Louisiana at Lafayette	2 Years	Inventory of Heavy Metal Soil Concentrations in Lafayette, Louisiana Using X-ray Fluorescence Analysis, Geographic Information Systems, and Geostatistical Interpolation Methods	$42,604	$35,863	$0	$78,467

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075A-22	Dr. Shuichi Sato	Health and Medical Sciences	University of Louisiana at Lafayette	3 Years	Hippo signaling inhibition to alleviate reduced anabolic response in cancer cachexia	$55,533	$47,168	$36,064	$138,765
076A-22	Dr. Scott Sittig	Health and Medical Sciences	University of Louisiana at Lafayette	1 Year	Promoting the Health of Future Nurses through the Development of a Mobile Health Application	$20,000	$0	$0	$20,000
077A-22	Dr. Xiang-Sheng Wang	Health and Medical Sciences	University of Louisiana at Lafayette	3 Years	Enhanced machine learning and dynamic optimal control of emerging infectious diseases	$48,806	$47,029	$45,253	$141,088
078A-22	Dr. Peng Yin	Engineering B [Industrial, Materials, Mechanical, etc.]	University of Louisiana at Lafayette	1 Year	Investigation of Acoustic Agglomeration of Fine Inhalable Particulate Matter with Binding Droplet Injection	$16,389	$0	$0	$16,389
079A-22	Dr. Joydeep Bhattacharjee	Biological Sciences II	University of Louisiana at Monroe	1 Year	Measuring and mapping stress in forest trees using multispectral image acquisition system.	$19,615	$0	$0	$19,615
080A-22	Dr. Bryan Donald	Health and Medical Sciences	University of Louisiana at Monroe	1 Year	Measuring Adherences to Best Practices when Dispensing Liquid Medications for Children	$19,633	$0	$0	$19,633
081A-22	Dr. Emad El-Giar	Chemistry	University of Louisiana at Monroe	3 Years	The Use of Electropolymerized Polyphenols for Prevention of Galvanic Corrosion between Mg and Steel Alloys in the Automotive Industry	$52,910	$48,272	$41,156	$142,338
082A-22	Dr. Matthew Overturf	Biological Sciences II	University of Louisiana at Monroe	1 Year	Transcriptomic and Steroid Biosynthetic Changes following Synthetic Progestin Exposure in Fathead Minnows	$19,500	$0	$0	$19,500
083A-22	Dr. John Rakus	Biological Sciences I	University of Louisiana at Monroe	1 Year	Lipopolysaccharide stimulation of RAW264.7 cells as a model for identifying novel clients of Hsc70, establishment of a research program at a primarily undergraduate institute in Louisiana	$20,000	$0	$0	$20,000
084A-22	Dr. Satish Bastola	Engineering B [Industrial, Materials, Mechanical, etc.]	University of New Orleans	3 Years	Quantifying Potential Tradeoffs and Synergies between Food, Water and Carbon Footprint, under Range of Water Management and Climate Change Scenarios, in the Lower Mississippi river Basin	$52,140	$50,618	$48,643	$151,401
085A-22	Dr. Elliott Beaton	Health and Medical Sciences	University of New Orleans	3 Years	Hearing loss in children at high-risk for mental illness in adulthood: Effects on brain development, stress, and cognitive function.	$61,659	$55,653	$47,161	$164,473
086A-22	Prof. Uttam Chakravarty	Engineering B [Industrial, Materials, Mechanical, etc.]	University of New Orleans	3 Years	A Comprehensive Study on the Detection Technologies of Synthetic Opioids	$62,299	$62,160	$61,935	$186,394
087A-22	Prof. Christopher Harshaw	Biological Sciences II	University of New Orleans	3 Years	Oxytocin, Social Hyperthermia, and Mouse Models of Autism Spectrum Disorder	$67,555	$67,453	$64,708	$199,716
088A-22	Dr. Md Hoque	Computer and Information Sciences	University of New Orleans	1 Year	Designed Disorder Ligands to Neutralize Mutating Germs Using Artificial Intelligence	$19,994	$0	$0	$19,994
089A-22	Dr. Abdullah Nur	Computer and Information Sciences	University of New Orleans	3 Years	Topology Aware Collaborative Filtering Against DDoS Attacks	$52,251	$51,853	$51,470	$155,574
090A-22	Prof. Atriya Sen	Computer and Information Sciences	University of New Orleans	2 Years	Explainable Artificial Intelligence for Biodiversity Science & Conservation	$52,694	$43,351	$0	$96,045
091A-22	Dr. Michelle Wade	Health and Medical Sciences	University of New Orleans	1 Year	Polyamorous Families: A Year in the Life	$19,589	$0	$0	$19,589
092A-22	Dr. James Wagner	Computer and Information Sciences	University of New Orleans	3 Years	Detecting and Describing Database Security Breaches using Data Lineage within the Process	$57,074	$54,175	$52,796	$164,045

Proposals Submitted	92
Total Funds Requested for First Year	$4,620,672
Total Funds Requested for Second Year	$3,906,899
Total Funds Requested for Third Year	$3,149,212
Total Funds Requested	$11,676,783