



RESEARCH HIGHLIGHT

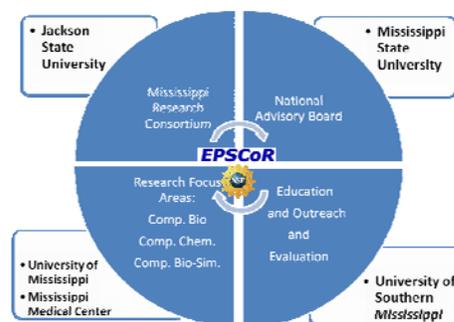
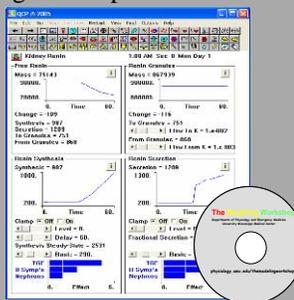
One of a kind simulation of integrative human biology

Physics based computational simulation enables scientists and engineers to predict physical behavior. To accomplish this, a numerical representation (computational mesh) of the geometry for all of the objects or articles being simulated is required. Creation of the representation is typically a tedious and time consuming process for the complex geometry of physical systems. A generalized geometry framework was developed that simplifies and reduces the time required to generate computational meshes for physics based simulation.

As part of the multi-scale modeling for biological simulation, Dr. Robert Hester with the University of Mississippi Medical Center is making freely available on the web an electronic 'model' of integrative human biology including Quantitative Circulatory Physiology (QCP), Quantitative Human Physiology (QHP), and Development of Physiological Responses.

"These are integrative models of physiological behavior that can be applied to realistic biosystems," said Hester. "With this software we have provided demonstrations and shared these educational pieces with other universities, community colleges, and high school teachers to use in their classrooms and through summer workshops," he said. The great thing is that the software program is something that can be adapted for any educational level, and it is free.

Currently it is the only model of integrative human biology. The QCP approach is well suited for developing specific foundational models as well as particularizing to areas of special interest. For more information go to: <http://physiology.umc.edu/themodelingworkshop>.



Contact Us:

Project Investigator/Director:
Dr. Sandra Harpole
sharpole@research.msstate.edu

Project Administrator
Dr. Teresa Gammill
tgammill@research.msstate.edu
662-325-3570

Research Focus Area Leaders:

Computational Biology
Dr. Susan Bridges, MSU
sbridges@cse.msstate.edu

Dr. Shane Burgess, MSU
burgess@cvm.msstate.edu

Computational Chemistry
Dr. Jerzy Leszczynski, JSU
jerzy@ccmsi.us

Computational Biological Simulation
Dr. David Marcum, MSU
marcum@erc.msstate.edu



MISSISSIPPI EPSCoR



NEWSLETTER

EPSCoR funds new faculty positions

Three individuals have been hired in new faculty positions to help carry out research among three of the four Mississippi research institutions thanks to EPSCoR funding. New hires in the computational biology focus area include Dr. Robert Diehl at the University of Southern Mississippi (USM), Dr. Raphael Isokpehi at Jackson State University (JSU), and Dr. Bindu Nanduri at Mississippi State University (MSU).



Diehl is an assistant professor in the Department of Biological Sciences at USM. His research explores ecological and behavioral processes that operate across different spatial scales in avian migratory systems.

Isokpehi is an assistant professor in the Department of Biology at JSU. His research interests include Bioinformatics and Genomics.



Nanduri is an assistant research professor in the College of Veterinary Medicine at MSU, Department of Basic Sciences. Her research interests include sub-therapeutic antibiotic effects on bovine respiratory disease pathogen *P. multocida*.

“Our collaboration within the Mississippi Research Consortium (MRC) is strong,” explained Dr. Susan Bridges, MSU computer science and engineering professor. “An example of this collaboration includes research on aquaporins - proteins that form pores in the membrane of biological

cells and selectively conduct water molecules in and out of cells. JSU has constructed 13-digit binary-encoded signatures for evidence of significant sequence similarity of taxonomically-defined aquaporins to the 13 human

aquaporins, MSU is reanalyzing proteomics datasets for differential expression of aquaporins, while USM is developing a web resource for comparative analysis of binary-encoded signatures across various organisms.”

Faculty seed grants awarded

The first round of seed grants through the Mississippi Computational Biology Consortium (MCBC) were awarded recently. The MCBC is a research focus of the Mississippi Computational Sciences Network (MCSN) and is funded through the National Science Foundation (NSF) EPSCoR Project. MCBC aims to stimulate competitive research that combines computation and biology by facilitating innovative collaborations among life scientists and computer scientists within institutions and across institutions in the state of Mississippi.

The MCBC Seed Research Grants are designed for faculty to develop innovative projects and gather preliminary data to increase their ability to compete for competitive extramural funding. These grants are intended to stimulate novel research with strong likelihood of attracting competitive funding. Although the budget can remain entirely at a single institution, grants which promote multidisciplinary collaborations between investigators at different MCBC institutions are strongly encouraged.

In round one, interdisciplinary groups of faculty from each of the following three universities: Jackson State University, Mississippi State University and University of Southern Mississippi submitted applications. Relevant research areas included high-

performance computational biology, bioinformatics, bio-ontologies, system biology, computational and mathematical modeling and ecoinformatics. “Each proposal included a specific plan to develop collaborative research with at least one other institution in the state,” said Dr. Susan Bridges, MSU professor of computer science and engineering.

Recipients of the seed grants in the amount of \$25,000 per institution included Raphael Isokpehi, Hari Cohly, Tzusheng Pei, and Barbara Wilson of Jackson State University. Their seed grant led to the following: four poster presentations, two journal articles in preparation, and the plan to apply for NSF Career Awards in the coming year. From Mississippi State University were Gary Ervin and Seth Oppenheimer. Their seed grant led to the following: two poster presentations at national meetings, journal articles which are in progress, and a proposal submitted and funded through the USDA National Research Initiative, \$100,300 (2 years). From the University of Southern Mississippi were Youping Deng, Robert Diehl, and Joe Zhang. Their seed grant led to the following: one journal article accepted, four poster presentations, and Diehl has received funding from USGS and his preliminary research will contribute to his NSF Career Award application in the coming year.



From the Director

I am pleased to serve as Project Director of Mississippi EPSCoR. There is phenomenal research going on at our four research universities (Jackson State University, Mississippi State University, University of Mississippi/University of Mississippi Medical Center, and the University of Southern Mississippi) which form the Mississippi Research Consortium (MRC).

With our current RII project, "Innovations Through Computational Sciences," we are building on success in high performance computing capacity, developing a core of experienced faculty leaders, and providing a strong basis for the state to become a national leader in the areas of computational biology, computational chemistry and biosystems simulation/modeling.

With support from prior EPSCoR funding, collaborative research among the consortium has developed a research infrastructure that supports education, extends technology development, and is enhancing economic opportunities for our state.

Increasing Mississippi's scientific and technological research competitiveness is critical. The EPSCoR program is utilizing the science and technology resources through the MRC to stimulate sustainable science and technology infrastructure improvements at these institutions to accelerate the ability of their researchers to compete for federal and private sector research and development funding. As a major emphasis in building capacity in the computational sciences, we continue to focus on the recruitment and retention of outstanding faculty to build a core of competitive teams of researchers and to attract excellent graduate students. I look forward to sharing our research efforts with you in the coming months and hope you will contact us if we can be of assistance.

Sandra N. Haydel

'Big science' opportunities identified at Gulf Coast Post-Katrina Forum

BILOXI, MS – University administrators, faculty, and commissioners from Institutions of Higher Learning (IHL), and others from the tri-state area came together in August at the Beau Rivage Casino for the Gulf States Alliance: Network Science and Recovery Forum.

Sponsored by the National Science Foundation Experimental Program to Stimulate Competitive Research (EPSCoR) programs in Alabama, Louisiana, and Mississippi, the conference materialized from a similar, but statewide, forum on the status of post-storm Louisiana research conditions held in 2006.

While the Gulf Coast has focused efforts on post-Katrina recovery, there has been a national focus on the global innovation economy. Vice Presidents and Vice Chancellors for Research from major Mississippi, Alabama, and Louisiana universities held a network science meeting prior to the start of the conference to discuss the possibilities of the tri-state conference resulting in a proposal from the three states to federal funding agencies for damage analysis, recovery, and assessment from Hurricane Katrina.

The goal of the forum was to align the Gulf States (AL-LA-MS) higher education community in the pursuit of a science and engineering research agenda that would propel the region to competitiveness and leadership in the global community. The goal and theme for the forum were inspired by two recent National Academy reports: "Rising Above the Gathering Storm" which speaks to issues of global competitiveness, the global innovation economy, and the critical role that science and engineering research play in the innovation process, and "Network

Science" which speaks to issues related to the increasing complexity of society.

Dr. Proctor Reid, National Academy of Engineering (NAE) Director, provided background on the "Gathering Storm" while explaining that "our world is more *connected* than ever: communications networks, information networks, energy and water networks, transportation and logistics networks, social networks, biological networks, financial networks and others...., these networks are large, complex, integrated and layered (and getting more so everyday). Things that happen in one network layer will often impact things in other layers." He gave the example of companies such as UPS, Amazon and Walmart who are capitalizing upon the linkages between communications, information, transportation and logistics networks to optimize their supply chains to improve company performance while reducing costs for customers. "Two years ago, the Gulf Coast experienced the worst natural disaster in U.S. history and found that a major perturbation in our physical networks (levees, transportation, communications, energy) had unanticipated impacts on our social networks (families separated and lost, faculty with a loss of data and continuity in their research programs with career threatening impacts), biological networks (infections and disease transmission), integrated information and health networks (poor medical care due to missing or non-recoverable medical records) and ecological networks (long-term impacts on the environment)," he explained.

The scope of the forum was broad in that program directors from national funding agencies such NSF, NASA, NOAA, DOD, presented information to the forum participants concerning the funding opportunities available with each of their agencies.

MSU hosts MS EPSCoR National Advisory Board

EPSCoR team members from across the state met with the Mississippi EPSCoR National Advisory Board recently on the campus of Mississippi State University (MSU) in Starkville. “We were very fortunate to have them visit our state and to spend quality time with us discussing in detail the goals and objectives of our EPSCoR program,” said Dr. Sandra Harpole, EPSCoR Project Director. “The diverse composition of our board provides insight to enable us to identify areas, both state and national, that represent opportunities for Mississippi to compete with other states at a much faster pace and higher level.”

Members of the board include Dr. Parker Antin, Dr. Lisa Grable, Mr. Jerry Hobbs, Dr. Karen Johnston, Dr. Michael Khonsari, Dr. Vincent McKoy, Dr. N. Radhakrishnan, Dr. David Silvernail, and Dr. Tom Taylor. Antin is a professor of Cell Biology and Anatomy and Molecular and Cellular Biology at the University of Arizona; Grable is the director of Learning Technology in the College of Education at North Carolina State University; Hobbs is the Director of Instructional Outreach with the American Institute of Physics; Johnston is a Professor Emerita of Physics at North Carolina State University and founder of the Momentum Group (a discipline-based



Grable

assessment, evaluation and research company) in Fort Worth, TX.; Khonsari is the Associate Commissioner for Sponsored Programs Research and Development with the Louisiana Board of Regents; McKoy is a professor of Theoretic Chemistry at the California Institute of Technology; Radhakrishnan is Vice Chancellor for Research at North Carolina A & T State University; Silvernail is the Director for the Center for Educational Policy, Applied Research and Evaluation at the University of Southern Maine, and Taylor is a Roy A Roberts Distinguished Professor in the Department of Ecology and Evolutionary Biology, Curator of Pleobotany in the Natural History Museum and Biodiversity Research Center, University of Kansas.



Khonsari

Dr. Teresa Gammill, EPSCoR project administrator said she is “extremely proud of our board and the level of expertise associated with each of the individuals. We are very fortunate to have these professionals advising us as we strive to reach national prominence in the areas of computational science through our EPSCoR funding. This group provides a ‘watchful eye’ for our program to help us make sure that we are ‘staying focused and doing what we said we would do’ in our proposal. They provide insight and input as to our specific roles and responsibilities at each institution that we might sometimes forget. This group is very passionate about our program and they want us to be successful.”

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Radha

“The wealth of knowledge this board has is exceptional and they have provided such wonderful guidance for all of us, especially the researchers.”

Silvernail believes Mississippi is doing some exciting things, and the EPSCoR funding is providing some great opportunities to further enhance the competitiveness, both nationally and internationally. “I enjoy serving on this board—it allows me to provide guidance, advice and assist the researchers and staff which enhances the achievement of the project goals,” he said.

The Mississippi EPSCoR project, Innovations Through Computational Sciences, is designed to build success in high performance computing capacity, develop a core of experienced faculty leaders, and provide a strong basis for the state to become a national leader in the computational science areas (computational biology, computational chemistry, computational biology and multi-scale biosystem simulation and modeling). Collaborative research for the EPSCoR project is shared among Mississippi’s four research universities – Jackson State, Mississippi State, University of Mississippi/Mississippi Medical Center, and University of Southern Mississippi which form the Mississippi Research Consortium (MRC).

McKoy said “the enthusiasm of the collaborators for this project and their commitment to its goals confirmed my initial expectations and made my first visit a rewarding and productive one. Their open, constructive, and responsive attitude speaks well for the future of their effort and I am looking forward to working with them.”



McKoy

Post Katrina Forum

(continued from page 2)

Dr. Kirk Schulz, Vice President of Research and Economic Development at Mississippi State University, concluded the two day forum by providing overall comments from each speaker and each breakout session, along with the strategy that must take place in order for the Gulf Region to accomplish the tasks at hand and move forward in a strong alliance between the three states. An overall consensus

from the group was that a formal research consortium be formed to include all three states to promote “big science” projects in the region. Possible thrusts would include research that is *fundamental* in nature (network science, coastal ecology - engineering and science, etc.).

For more information, please visit the website: <http://forum2007.laepscor.org/>.