



## Building a Pipeline of Sustainability

Promote innovation?  
Check.

Provide multiple societal benefits?  
Check.

Through the years, Louisiana EPSCoR has been a major catalyst for innovative advancement throughout the State and nation. This is in large part because of the sustainability of the work completed and grants continually received by researchers in Louisiana.

Sustainability through competitive research is a key objective of EPSCoR. Specifically, EPSCoR aims to create and strengthen collaborations among academic, government, and private sector stakeholders in order to advance scientific research, promote innovation and provide multiple societal benefits.

Continuing this tradition of sustainability, two LA EPSCoR researchers have recently received major grants whose work is based upon previous research done through EPSCoR-

funded grants. This new research has the potential to make significant impacts on academic, government and/or private sector stakeholders. These two active grants, which combined provide over \$2 million in funds, are supporting projects at Louisiana State University and the University of New Orleans.

Dimitris Nikitopoulos, LSU Mechanical Engineering Department Chair, and a team of three other professors, two post-doctoral students, two graduate students and two undergraduate students have begun studying the mobility of nano particles in a reservoir environment. The group's work titled, "Design Optimization, Fabrication, and Flow Experiment of 2.5D Rock-Based Artificial Porous Media Micromodel," is funded by the Advanced Energy Consortium (AEC) for a total of \$1.3 million for three years. This work will ultimately benefit the oil

EPSCoR, involves experiments that are for the first time measuring the concentration of particles in 3D, the depth on a plane, velocity in 3D, and the particle deposition rates, will validate the multi-scale computational models that the team is developing.

*"Without the EPSCoR grant, we would not have had the chance to address these multi-scale issues...and we would not have been able to put this new information into application"*

*Dr. Dimitris Nikitopoulos, LSU*

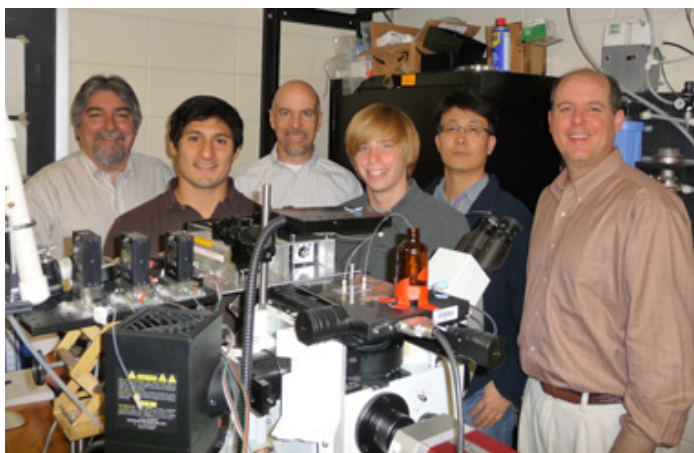
Multiscale modeling is the field of solving physical problems which have important features at multiple scales. It is aimed at calculating material properties or system behaviors on one level using information or models from different levels.

"Without the EPSCoR grant, we would not have had the chance to address these multi-scale issues," said Dr. Nikitopoulos. "We would not have been able to put this new information into this application."

While the team at LSU is making progress in research of underground reservoirs, Dr. Steven Rick from the University of New Orleans is conducting new research on charged molecules, known as ions, and how they act in water and other solutions.

Dr. Rick received his three-year \$450,000 grant from NSF for his work, "The Effects of Charge

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From left to right: Dr. Dimitris Nikitopoulos, Saade Bou-Mikael, Dr. Karsten Thompson, Sean King, Daniel Park, and Dr. Clint Wilson make up part of the AEC-funded research team.

and gas industry and service companies in relation to extracting information from underground reservoirs for the potential for oil production and also for testing the method of fracking in these reservoirs.

This project, a continuation of a previous award funded by LA



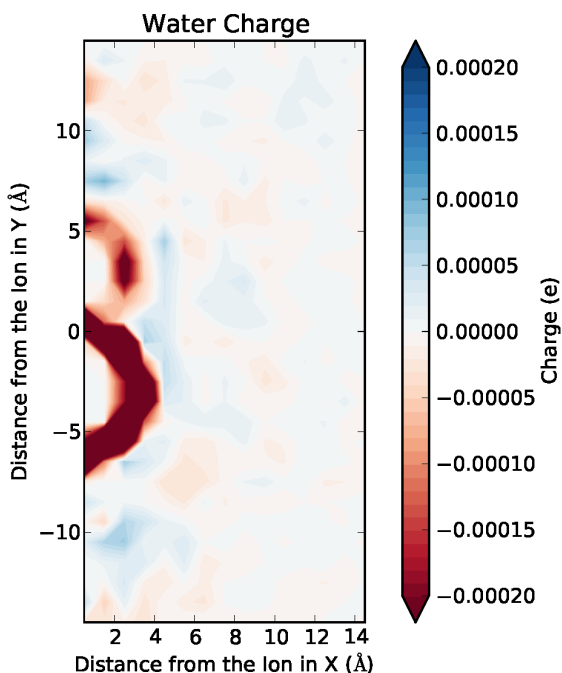


Figure credit: Dr. Steven Rick. Shows how the charge from an ion pair is transferred to the surrounding water molecules. Red indicates a negative charge and blue a positive charge.

Transfer on Aqueous and Ionic Systems.” This research could potentially have effects on both the medical and technological worlds. Examples of how his work can benefit society include the development of drugs for degenerative diseases, improved understanding of muscle and nerve functions, the effects of ions on water purification, and even

the creation of more energy-efficient storage materials such as those used in electric vehicles.

Previously, Dr. Rick focused primarily on water systems. However, with the help of a previous LA EPSCoR grant, he began working more with ions and non-aqueous systems, and now his current research under his active NSF grant has to do with models and the way molecular interactions are treated. “The central theme of this grant is how these new types of interactions between molecules are relevant to processes involving ions,” said Dr. Rick. He also said that working on a scale of a couple molecules interacting has been done, but “what’s new here is being able to develop a model that could show how those interactions on a molecular scale influence bulk and liquid properties.”

These two researchers are examples of the ongoing success of LA EPSCoR, as they continue to build sustainability through competitive research at their respective universities. Multiple collaborators, students and campuses are involved in work done with major grants. This level

of involvement not only strengthens the relationships the researchers have with various stakeholders, but also continually attracts and retains talent to be able to sustain this type of dynamic research.

Dr. Nikitopoulos received the Louisiana Engineering Foundation Professionalism Award of the LA Engineering Society in 2009; has been the principal or co-principal investigator in more than 26 Federal grants, totaling over \$30 million and 22 State/Industry grants, totaling more than \$4 million. He has also authored or co-authored 113 peer-reviewed articles.

Dr. Rick has been the principal or co-principal investigator in more than seven Federal grants, totaling over \$3.5 million and 3 State/Industry grants, totaling more than \$350,000.

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