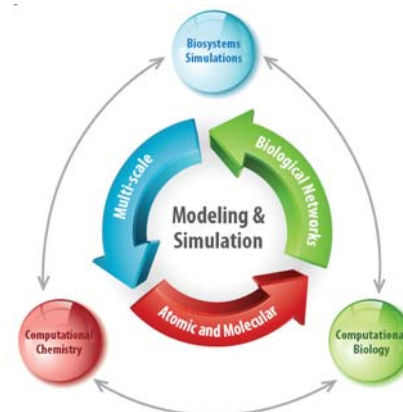


# EPSCoR Funding in Mississippi

## Science and Engineering

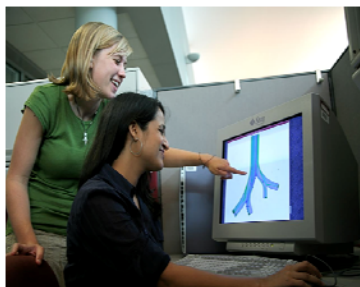
*Modeling and Simulation of Complex Systems* addresses three critical focus areas—biological systems simulation (BioSim), computational biology (CompBio), and computational chemistry (CompChem). Technologies from these three multidisciplinary areas are being integrated to address emerging scientific and workforce development challenges. Researchers from diverse fields are collaborating on complex multidisciplinary problems, training students who will become the next generation of research leaders, and building a computationally skilled workforce.

- *BioSim* research focuses on the development of a multi-scale simulation framework for investigation of human biological processes and is making this framework freely available via cyber-infrastructure for research, education, and training purposes. This framework enables the prediction of biological function ranging from fluid and structural mechanics to cellular level physiology to molecular chemistry.
- *CompBio* is developing novel cyber-enabled algorithms to model and simulate complex biological networks supporting transformational research in species of economic and environmental importance to the State. These algorithms provide the computational framework to generate predictive models of emergent behaviors by integrating and mining diverse high-throughput data sets.
- *CompChem* is developing a systematic understanding of the relationships between the organization and properties of matter at the atomic, molecular, and supramolecular levels across size scales from approximately 1 to 100 nanometers. This understanding is dramatically improving our ability to design and synthesize controlled nanoscale objects with specific properties.



## Workforce Development

Developing a highly skilled technical workforce is critical to Mississippi's economic growth and participation in today's global economy. With EPSCoR support, **a critical mass of faculty** at research universities is being developed with expertise in the computational sciences, at the intersection of biosciences and high performance computing (HPC), one of Mississippi's embryonic and niche areas. Computational sciences faculty, recruited through Mississippi EPSCoR, and students recruited to the computational sciences through integrated research and outreach efforts, are building the **human capital** necessary to provide Mississippi's workforce of the future.



Bela Soni, (seated) was a Ph.D. computational engineering student at Mississippi State University but is now a full-time faculty member at Jackson State University. Her research at MSU was how to simulate models of the human body—particularly the lungs. She continues her research at JSU, working collaborative with MSU.

## Commercialization

*HumMod Integrated Whole-Body Physiology Modeling* is a developed web-based, highly-accessible software and a dynamic mathematical macro-scale model of hundreds of organ and organ systems describing circulation, respiration, metabolism, hormones, neural control, body fluids, and kidney and temperature regulation that allows scientists to build specialized physiological models in their area of

interest. Numerous improvements continue to the integrative model of human physiology. A domain name (<http://hummod.org>) has been purchased and serves as the site for dissemination of the simulation work done by researchers. This site supports the development of the DigitalHuman and all projects associated with the DigitalHuman, including the DigitalLung and DigitalAstronaut (supported by NASA). A modular version reads the same XML data files, but is designed to be run on any type of machine: PC, Mac, Unix, etc. The numerical methods are written in C which can be used on various platforms. A web based demonstration version using HTML 5.0 is available.

Since 1989 NSF EPSCoR has awarded **\$33,900,000M** to Mississippi research and economic development.

### NSF EPSCoR Funding

