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DOE's Office of Science Awards $20 Million for Mathematics Research

WASHINGTON, DC – You may have never used trigonometry or calculus to solve problems outside of a math class, but researchers will use even higher level mathematics to help solve problems such as the production of clean energy, pollution cleanup, manufacturing ever smaller computer chips, and making new "nanomaterials" under a new program funded by the Department of Energy's Office of Science. Thirteen major research awards totaling $20 million will go to 17 universities and eight DOE national laboratories.

The research is funded under the Office of Science's "Multiscale Mathematics" program. The program addresses those science problems that span many time scales -- from femtoseconds to years -- and many length scales -- from the atomic level to the macroscopic. The problems cannot be easily broken down into simpler problems for solution using traditional mathematical techniques.

"Science is replete with examples that range over orders of magnitude in length and time scales," said Dr. Raymond L. Orbach, Director of the Office of Science. "Brute force computational simulation, even on the most powerful present-day computers, cannot handle these ranges, so new mathematics is needed. This initiative is meant to surmount this barrier to our understanding of nature."

The program will fund more than 100 researchers. The awards range from individual research grants to multi-institution collaborations. The universities and DOE laboratories receiving awards (and their three-year total funding) are:

California
- Lawrence Livermore National Laboratory, Livermore ($1,155,274)
- University of California, Los Angeles ($630,901)
- University of California, San Diego ($797,032)
- University of California, Santa Barbara ($386,688)

Colorado
- Colorado State University, Fort Collins ($213,833)

Delaware
- University of Delaware, Newark ($1,120,747)

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R-05-XXX

Florida

- Florida Atlantic University, Boca Raton ($284,003)
- Florida State University, Tallahassee ($380,215)

Georgia
- Georgia Institute of Technology, Atlanta ($552,108)

Illinois
- Argonne National Laboratory, Argonne ($1,013,862)

Iowa
- Ames Laboratory, Ames ($330,000)

Minnesota
- University of Minnesota, Minneapolis ($922,088)

New Jersey
- Princeton Plasma Physics Laboratory, Princeton ($1,576,900)

New Mexico
- Los Alamos National Laboratory, Los Alamos ($494,713)
- Sandia National Laboratories, Albuquerque ($825,000)
- University of New Mexico, Albuquerque ($375,000)

New York
- Columbia University, New York City ($122,869)
- Rensselaer Polytechnic Institute, Troy ($450,000)

Oregon
- Oregon State University, Corvallis ($647,329)

Tennessee
- Oak Ridge National Laboratory, Oak Ridge ($1,260,000)

Texas
- University of Texas at Austin ($1,162,242)

Virginia
- George Mason University, Fairfax ($297,833)

Washington
- Pacific Northwest National Laboratory, Richland ($1,621,401)
- Washington State University, Pullman ($1,000,093)

Wisconsin
- University of Wisconsin, Madison ($351,345)

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The multiscale mathematics program seeks to help break through the current barriers in understanding complex physical processes that occur on a wide range of interacting length and time scales. The current state-of-the-art in the theory and modeling of complex physical systems generally requires that the physical phenomena being modeled either occur at a single scale, or widely separated scales with little or no interaction. Complex physical systems frequently involve interactions among many phenomena at many different scales. Increases in computational power over the last decade have enabled scientists to begin creating sophisticated models with fewer simplifying assumptions. For these new models to succeed, researchers will need a deeper understanding of the mathematics of phenomena at multiple scales and how they interact.

The researchers will develop and apply new multiscale mathematics algorithms and analysis to support the Office of Science's research missions. The research will support the development of new simulations that are crucial to improved understanding of problems such as fuel cell design, accelerator design and optimization, combustion processes including clean and efficient engine design, fusion reactor design and optimization and design of materials atom-by-atom.

The researchers will also develop and share publicly programs to educate computational scientists in the use of multiscale mathematics as a tool for computational research and discovery.

A list of the projects, the collaborating institutions and principal investigators is available at **www.sc.doe.gov**

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