U.S. Dept. of Energy Awards the University of Florida $10.5 Million for Quantum Research

How to compute faster with less power consumption is one of the world's most pressing problems. Right now, cloud computing takes huge buildings with monster air conditioning because fast computing generates lots of heat.

Researchers at the University of Florida have been working with quantum materials for two decades, in search of a solution. Now, they will have the opportunity to pursue the answer to this and other energy-related conundrums in a brand-new, state-of-the-art research program.

The U.S. Department of Energy (DOE) recently chose the University of Florida as a winner in its recent competition for Energy Frontier Research Centers (EFRCs).

Led by Hai-Ping Cheng of UF Physics, the new $10.5 million *Center for Molecular Magnetic Quantum Materials*, which officially launched on August 1, is the only one led by a Florida institution and one of only five in the Southeastern USA.

M^2QM, as it will be known, involves four other UF Physics faculty (Art Hebard, Neil Sullivan, Sam Trickey, Xiaoguang Zhang), two UF Chemistry faculty (George Christou, John Stanton), and one Materials Science and Engineering faculty (Richard Hennig). Cheng, Christou, Hebard Sullivan and Zapf are also associated with the National High Magnetic Field Laboratory (NHMFL), while Cheng, Hennig, Stanton, Trickey, and Zhang are members of the Quantum Theory Project (QTP), the longest-running interdisciplinary physical science institute at UF.

"QTP members together with colleagues in physics and chemistry have been working on the idea to bring a major national center to UF for nearly 20 years," says Cheng. "Trickey, Zhang, and I have participated in a center proposal effort at least three times in the last 3-4 years, and we succeeded this time."

Collaborators from the California Institute of Technology, Los Alamos National Laboratory (NHMFL), Florida State University (NHMFL), and the University of Central Florida comprise the rest of the team.

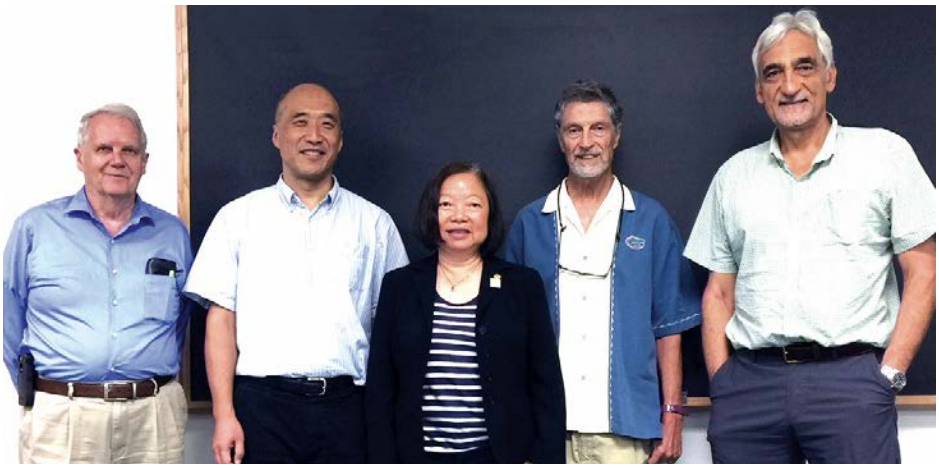

Photo credit: James Fry

L-R: *Neil Sullivan, Xiaoguang Zhang, Hai-Ping Cheng, Arthur Hebard, and George Christou*

EFRCs are established to target the DOE Office of Science's basic research aims, which are to develop future technologies for the grand challenges of an energy-demanding world.

EFRCs are established to target the DOE Office of Science's basic research aims, which are to develop future technologies for the grand challenges of an energy-demanding world. M^2QM targets the need for quantum magnetic materials at the molecular scale, in other words, nanoscale magnetic materials possessing various exotic (or "spooky", as Einstein once called them) quantum properties that are important to new 21st century technologies.

One of the big ideas the Center will pursue is assembly and study of linked arrays of molecular magnets - a major feature of Christou's, Cheng's, and Zhang's work. Another big idea is so-called "multiferroic" materials, which possess more than one important property and therefore have many applications in a variety of areas. This includes enhanced computer technology, whose pay-off is much lower power consumption from much faster computers - instead of switching electrical currents, which generates heat, quantum magnetic materials will allow switching of magnetic states with significantly less energy dissipation.

M^2QM's goals are thus to learn how to design molecular magnetic materials with targeted quantum properties, link them to form quantum devices, and support them on sustainable substrates. With the support of the DOE, the team can make important contributions to new energy-efficient quantum technologies.

For more information visit...
https://science.energy.gov/bes/efrc