# Despite incomplete status, Blue Waters yielding discoveries

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Six research teams across the U.S. have recently begun using the first phase of the Blue Waters supercomputer to answer a range of scientific questions.

Blue Waters is located at the University and is sponsored by the University's National Center for Supercomputing Applications, or NCSA.

Supported by the National Science Foundation and the University, the Blue Waters Project will allow scientists to make discoveries in various fields of research using a newly developed supercomputer. This supercomputer will be capable of one petaflop of sustained performance, which will ultimately allow the supercomputer to make quadrillions of calculations per second.

NCSA spokeswoman Trish Barker said the completed Blue Waters sustained petascale supercomputer is expected to be one of the most powerful and up-to-date research tools in the world. She said the finalized supercomputer will be built from hundreds of thousands of processors and should be finished later this year. The incomplete Blue Waters supercomputer, also referred to as the Early Science System, is already being utilized by various universities.

"Right now we have about 15 percent of the supercomputer installed, and this small portion is already being used by scientists and engineers for research," she said.

Barker said there were over 20 proposals submitted to the NCSA from different research teams detailing how they could use the Blue Waters supercomputer to benefit their studies while it is being built. Due to a limited amount of space on the unfinished Blue Waters supercomputer, only six teams were selected.

"It was a very difficult decision," Barker said. "All of the research groups are very talented and are going to be doing very interesting and important work. We felt that these six teams were very experienced in using systems during early phases, that they had projects that could be completed within the next few months and that their software codes were well-prepared to use the supercomputer."

Some of the topics the research teams are examining are explosive burning in Type Ia supernovae and a closer look at a vital step in HIV infection development.

Brian O'Shea, assistant professor at Michigan State University, and his research team were one of the six chosen teams to utilize the Early Science System. O'Shea and his team are studying the evolution of the first generation of galaxies and how they were formed. He said his research team sees remnants of this first generation of galaxies in our own Milky Way and that those remnants represent the transition between the early state of the universe and the more complex universe commonly seen today.

"Blue Waters is meant to be used for the largest-scale supercomputing, for problems that require the highest-performance systems available," O'Shea said. "We thought that this particular problem, which requires the modeling of many problems simultaneously, would be a perfect application for Blue Waters."

O'Shea said he hopes to figure out how the properties of galaxies have evolved over the 14-billion-year lifespan of the universe.

According to the NCSA website, the University is also utilizing the Early Science System. Klaus Schulten, physics professor, and his research team are creating a simulation of a cylinder-shaped protein coating that encases the HIV-

1 genome. This simulation, which shows how this protein disassembles and releases its genetic material in the body, will imitate an important step of development in the HIV infection. He said his research will help people better understand a crucial step in how HIV develops.

"We want to understand how to protect people from the HIV virus," he said.

Andrew Doskochynskyy, freshman in Engineering, said he is excited to see how research will evolve because of the Blue Waters supercomputer.

"I hear that the Blue Waters supercomputer is already letting researchers study things no one else can," he said. "It's crazy to think how quickly technology is advancing. I can't even imagine the things the supercomputer will be able to do once it's fully built."