LIVERMORE LAB

REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, June 4-8, 2012

HPC wire GETTING DOWN TO THE ITTY BITTY

Lawrence Livermore and its collaborators are getting down to the itty bitty by perfecting simulations that show a nuclear weapon's performance in precise molecular detail.

The simulations must be operated on supercomputers containing thousands of processors, but doing so has posed reliability and accuracy problems.

Until now. Researchers at Purdue University and high-performance computing experts at the Laboratory have solved several problems hindering the use of the ultra-precise simulations.

The simulations, which are needed to more efficiently certify nuclear weapons, may require 100,000 machines, a level of complexity that is essential to accurately show molecular-scale reactions taking place over milliseconds, or thousandths of a second. The same types of simulations also could be used in areas such as climate modeling and studying the dynamic changes in a protein's shape.

To read more, go to *HPC Wire*.

WHAT'S MY NAME

Two of the heaviest elements on the periodic table have their very own names.

The manmade elements 114 and 116, which contain 114 and 116 protons per atom, respectively, are now officially called flerovium (Fl) and livermorium (Lv).

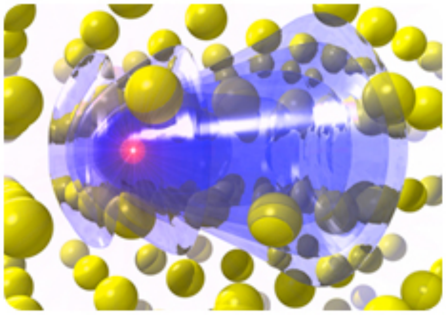
The names were chosen to honor the laboratories that first created the elements: the Flerov Laboratory of Nuclear Reactions in Dubna, Russia, and Lawrence Livermore National Laboratory.

Such large "super-heavy" elements are not stable, so element 116 decayed almost immediately into element 114.

The International Union of Pure and Applied Chemistry officially accepted the names of elements 114 and 116 last week.

To read more, go to *Live Science*.

TO BE PERFECTLY PRECISE



Model of the electronic wake (blue surfaces) generated by an energetic proton (red sphere) traveling in an aluminum crystal (yellow spheres). The resulting change in electronic density is responsible for modification of chemical bonds between the atoms and consequently for a change in their interactions.

Laboratory researchers have for the first time simulated and quantified the early stages of radiation damage that will occur in a given material.

"A full understanding of the early stages of the radiation damage process provides knowledge and tools to manipulate them to our advantage," said Alfredo Correa, a Lawrence Fellow in the Lab's Quantum Simulations Group.

Nuclear radiation leads to highly energetic ions that can penetrate large distances within matter, often leading to the accumulation of damage sites as the ions pass through the material.

During this process, the energetic ions eventually slow down as energy is lost by friction with the materials' electrons. Like a speedboat moving through a calm body of water, the passage of fast ions creates a disturbance in the electron density in the shape of a wake.

To read more, go to *Science Daily*.

HOOKING UP

Students ask questions about life in space to astronauts (from left) Joseph Acaba, Andre Kuipers and Don Pettit, of Expedition 31 aboard the ISS.

One day before summer vacation, students at Junction Avenue K-8 School had the chance to talk to four astronauts -- one in person and the other three via a live feed from the International Space Station.

The school had been preparing for Wednesday morning's event by incorporating NASA-related lessons. First grade students learned about local former astronauts including Tammy Jernigan, who was the master of ceremonies at the event and who now works at Lawrence Livermore as the deputy principal associate director for Weapons and Complex Integration.

The three astronauts seen on the screen were dressed casually as they bobbed up and down in zero gravity among a backdrop of gadgets. They each answered questions from the students, letting the mic glide slowly through the air when they passed it.

To read more, go to *Inside Bay Area*.
