

## **Petascale Computing**

Computer modeling and simulation were among the most significant developments in the practice of scientific inquiry in the 20<sup>th</sup> Century, providing the means of understanding and predicting the behavior of real-world natural and engineered systems based on a knowledge of the fundamental laws of science. Advances in computational models and algorithms and computer speeds over the past decade now make possible quantitative predictions in fields ranging from astrophysics to drug design. A revolutionary change is coming to computers as their architecture changes to accommodate hundreds of cores in a single processor and as thousands of many-core processors are integrated in a single machine to provide computing speeds thousands of times faster than those available today. While petascale computing will provide unprecedented opportunities for scientific discovery and engineering innovation, the radically different architecture of computer chips will require new programming paradigms and new computing algorithms and methodologies. New curricula will also be required to prepare our students to harness the power of these new computing technologies.

Four interdisciplinary junior faculty “scientific computationalists” will work at the “bleeding edge” of manycore- and petascale-enabled high performance computing and simulation-based engineering and science. Faculty will be hired in the areas of: Many-Core Systems and Parallel Computing (Electrical Engineering and Computer Science – College of Engineering); Computational Materials Science (Materials Science and Engineering – College of Engineering); High-Performance Climate Modeling (Atmospheric, Oceanic & Space Sciences, and Civil and Environmental Engineering – College of Engineering); Numerical Linear Algebra for Scientific Computing (Mathematics – College of Literature, Science and the Arts). By hiring these faculty as a cohort, we will create a critical mass of expertise and interest in petascale computing. The petascale cluster of junior faculty will add to the breadth and depth of computational science and engineering at the University of Michigan.