The Data and Compute-Driven Transformation of Modern Science

We all know that modern science is undergoing a profound transformation as it aims to tackle the complex problems of the 21st Century. It is becoming highly collaborative; problems as diverse as climate change, renewable energy, or the origin of gamma-ray bursts require understanding processes that no single group or community alone has the skills to address. At the same time, after centuries of little change, compute, data, and network environments have grown by 9-12 orders of magnitude in the last few decades. Moreover, science is not only compute-intensive but is dominated now by data-intensive methods. This dramatic change in the culture and methodology of science will require a much more integrated and comprehensive approach to development and deployment of hardware, software, and algorithmic tools and environments supporting research, education, and increasingly collaboration across disciplines.

Edward Seidel is a physicist recognized for his work on numerical relativity and black holes, as well as in high-performance and grid computing. He earned his Ph.D. from Yale University in relativistic astrophysics. He was a professor at the Max Planck Institute for Gravitational Physics (Albert-Einstein-Institute, or AEI) in Germany from 1996-2003. There, Seidel founded and led AEI's numerical relativity and e-science groups, which became leaders in solving Einstein's equations using large-scale computers, and in distributed and grid computing. He also was a senior research scientist at the National Center for Supercomputing Applications and associate professor in the Physics Department at the University of Illinois, Urbana-Champaign.

In 2003, Louisiana State University recruited Seidel to lead its investment in the Governor's Information Technology Initiative, and he became founding director of LSU's Center for Computation & Technology. Seidel served as CCT director from 2003-2008. Seidel also is the Floating Point Systems Professor in LSU's Departments of Physics & Astronomy and Computer Science. In addition to leading the CCT, he helped initiate, and was the chief scientist for, the $40M Louisiana Optical Network Initiative. He is a recipient of the IEEE Sidney Fernbach Award, the Gordon Bell Prize, and Heinz-Billing Prize, and is a fellow of the American Physical Society.

In June 2008, the National Science Foundation selected Seidel as its director for the Office of Cyberinfrastructure (OCI). He began this position Sept. 1, 2008, in which he oversees advances in supercomputing, high-speed networking, data storage and software development on a national level. He has recently assumed the role of Assistant Director for Mathematics and Physical Sciences at NSF.