Data Explosion Driving New Era at DOE Light Sources

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A data explosion is driving a new era of computational science at Department of Energy light sources.

When scientists from around the world visit Dula Parkinson's microtomography beamline at Lawrence Berkeley National Laboratory's Advanced Light Source, they all want the same thing: amazing, scientifically illuminating, micron-scale X-ray views of matter, whether a fiber-reinforced ceramic composite, an energy-rich shale, or a dinosaur bone fragment.

Unfortunately, many of them have left lately with something else: debilitating data overload.

"They're dying because of the amount of data I'm giving them," Parkinson says. A beamline scientist at the ALS, Paula explains that, often, they can't even open up their whole data sets. They contact her and say 'Dula, do you have any idea what I can do? I haven't been able to look at my data yet because they crash my computer.'

Data sets from light sources, which produce X-rays of varying intensity and wavelengths, aren't enormous by today's standards, but they're quickly getting bigger due to technology improvements. Meanwhile, other fields — astrophysics, genomics, nuclear science and more — are seeing even mightier explosions in information from observations, experiments and simulations.

If all this knowledge is to benefit the world, scientists must find the insights buried within. They must develop ways to mine mountains of elaborate information in minutes or hours, rather than days or weeks, with less-than-superhuman efforts.

Big data management, analysis and simulation are driving users to new levels of high-performance computing at the ALS, Argonne National Laboratory's Advanced Photon Source and at three other Department of Energy Office of Science light sources. As a result, researchers are approaching their experiments from a data-intensive computational science perspective.

To deal with the challenge, Department of Energy scientists — whether at light sources or particle colliders — are collaborating with computational scientists and mathematicians on data-handling and analysis tools. Beamline users are really excited about what's happening. They believe that it's really going to accelerate and improve what they can do.

Those involved say there's enormous opportunity to stimulate leapfrog advances in light-source

science and to create innovative collaborations and a community of computational scientists specialized in such research.

That's it for this episode, but you can find more data-intensive computing information and continuous news coverage of the high performance computing industry at our Web site scientificcomputing.com. To read the complete article, "Big Data Hits The Beamline," visit www.deixismagazine.org [1].

Read more coverage of high performance computing on our Web site at http://www.scientificcomputing.com/topics/hpc [2].

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