
**Oct. 18- 24, 2009**

**LSU Professors Lead NSF Project to Unlock the Secrets of Gamma-Ray Bursts**

Even with 21st-century cyberinfrastructure at their fingertips, today's scientists still encounter problems so complex they require new computational methods and tools to solve.

In astrophysics, one such problem is investigating and understanding gamma-ray bursts, thought to occur when a massive star collapses, creating a black hole. The resulting explosion sends bright flashes of gamma rays radiating across the universe.

Researchers working in relativistic astrophysics and computer science have developed high-performance computing software and algorithms that are currently being used to analyze other phenomena such as the collisions of black holes or neutron stars. But, modeling gamma-ray bursts is a much more complex problem, involving many different physical processes that occur on different scales of space and time, and will require new advanced computational tools and physics models.

Two LSU professors, Gabrielle Allen and Erik Schnetter, have received National Science Foundation funding of more than $2 million in four different awards that will address these challenges in a comprehensive manner, in a project they call ``PetaCactus." Their research will develop the necessary physics applications, add them to Cactus and Carpet – existing, open-source software programs developed at LSU to support astrophysical research – and enable current and future high-performance computing systems to handle more complex science problems.

LSU Department of Computer Science Professor Allen and Department of Physics & Astronomy Research Professor Schnetter, who both have joint appointments with the CCT, lead the four grant proposals that make up the project, which they hope will ultimately lead to a method for studying gamma-ray bursts.

"In addition to the specific challenge of gamma-ray bursts, the codes, algorithms and software capabilities we will develop through this project will be used for other problems in science and engineering," Allen said. "For example, the infrastructure we are creating could also be used to integrate together the diverse models needed to model the effects of hurricanes, where currently independent models are used for each component such as winds, storm surge or waves. This is just one example of the many areas where such technology could lead to breakthroughs and solutions for real-world problems."

Allen and Schnetter plan to run their simulations on petascale computers, which are capable of running 1,000 trillion calculations per second and are the only class of machines becoming available that are large and fast enough to accurately model gamma-ray bursts.

This particular research project will use the Blue Waters machine at the National Center for Supercomputing Applications in Urbana-Champaign, Ill. The Blue Waters Consortium for Petascale Computing, of which LSU is a member, will deploy Blue Waters in early 2011 as the first dedicated petascale-class supercomputer for academic research.

“These awards each tackle a different part of the challenge,” Schnetter said. “Developing simulation codes for petascale computers is a major effort, and we need to develop new standards and tools that make it possible for the research communities in different locations to work together. We also need to be able to take advantage of new technologies, such as high-speed networks, to analyze the large data sets we will produce.”

The four grants contributing toward this overall research goal are:

- "PetaCactus: Unraveling the Supernova – Gamma-Ray Burst Mystery.” This award, funded at $1.4 million for five years and led by Schnetter, also involves researchers at Caltech and Princeton, and will develop the fundamental physics models and algorithms needed for codes to analyze gamma-ray bursts.

- "Collaborative Research: Community Infrastructure for General Relativistic MHD,” or CIGR, led by Allen, is a $1 million collaborative project involving partners Rochester Institute of Technology and Georgia Tech. This award will provide the community infrastructure and open code base – based on Cactus and Carpet – that will the support multi-physics simulations needed for modern relativistic astrophysics.

- "Enabling Science at the Petascale: From Binary Systems and Stellar Core Collapse To Gamma-Ray Bursts,” led by Schnetter and funded at $35,896 for three years, will allow the LSU research team to work with the Blue Waters staff at the National Center for Supercomputing Applications to prepare for the new petascale facility.

- "Strategies for Remote Visualization on a Dynamically Configurable Testbed” is led by Allen. This part of the project is funded at nearly $300,000 for two years, and funds a research team in applications of high-speed networks to prototype interactive visualization tools to produce images of gamma-ray bursts from the research data created on the petascale computer.

These awards together will support two postdoctoral researchers, three graduate students, and one research staff member at LSU.

"This groundbreaking project is a good example of how CCT provides a forum for interdisciplinary research teams to work together," said CCT Interim Director Stephen David Beck. "In order to study complex problems like gamma ray bursts, it is important to create an environment where physicists and computer scientists can collaborate, and we are pleased CCT supports this kind of joint research. I am very excited for Professor Allen and Professor Schnetter, and their entire research team, for initiating this new and innovative work."

For more information on CCT research, please visit www.cct.lsu.edu.

**Pats on the Back:**

- Professor Brygg Ullmer won the ACM Symposium on User Interface Software and Technology conference's 2009 Lasting Impact award for a paper he authored on tangible and embedded interaction.

- Congratulations to Shantenu Jha, Daniel S. Katz and co-authors Manish Parashar, Omer Rana and Jon Weissman, whose paper, "Critical Perspectives on Large-Scale Distributed Applications and Production Grids," was declared best paper in the closing session of the 10th IEEE/ACM International Conference on Grid Computing (Grid 2009).

**CCT in the News:**

- LSU Professors receive grant to study Gamma-Ray Bursts
  Source: HPC Wire
  http://www.hpcwire.com/offthewire/LSU-Professors-Lead-Project-to-Unlock-the-Secrets-of-Gamma-Ray-Bursts-64755982.html?viewAll=y

- LSU Professors lead NSF-Funded project to unlock the secrets of Gamma-Ray Bursts through Petascale
  Source: Supercomputing Online
  http://supercomputingonline.com/latest/lsu-professors-lead-nsf-funded-project-to-unlock-the-secrets-of-gamma-ray-bursts-through-petascale-supercomputing

**Lectures This Week:**

- The Computational Mathematics Seminar Series is holding a lecture by Eun-Hee Park, LSU, titled "A Domain Decomposition Method Based On Augmented Lagrangian With A Penalty Term" on Tuesday Oct. 20 from 3-4:30 p.m. in Johnston Hall room 338.

- Xin Li, Assistant Professor at CCT and Electrical and Computer Engineering, will be organizing this year's CCT Colloquium Series. He is working hard to put together an interesting program for the coming year and would appreciate any input or suggestions. Feel free to contact Xin at xinli@cct.lsu.edu.

**Please Note:**

- The ALL CCT meeting for October has been canceled. Future ALL CCT meetings for the Fall 2009 semester will take place Nov. 11 and Dec. 16. All meetings are at 3 p.m. in Johnston 338 unless otherwise announced. Please make every effort to attend these important meetings.

- There will be an Introduction to OpenMP training Thursday, Oct. 22 from 1:30-3:30 p.m. in 338 Johnston and on the Access Grid. Next week's training is OpenMP Part 2 on Thursday, Oct. 29 from 1:30 - 3:30 p.m. For more information visit http://www.hpc.lsu.edu/training

- Beginning at the end of October, the LSU Office of Communications and University Relations will merge LSU Today, the University's faculty/staff newsletter, with LSU Wire, the University's weekly e-newsletter. This effort is part of the University's sustainability initiative, aimed at decreasing printed copies of LSU Today. CCT news items regularly appear in both publications, so faculty and staff who previously received the printed copies of LSU Today should sign up to receive the electronic edition using an online form available at www.LSU.edu/lsutoday. Beginning in November, subscribers will receive an electronic LSU Today Mondays-Thursdays, then will receive a weekly recap/LSU Wire on Fridays. There is no cost to subscribe to these publications, and users can decide whether to receive the daily updates (LSU Today) or only the weekly recap (LSU Wire), or both.

- Follow CCT on Twitter for updates on news and breaking information! http://www.twitter.com/LSUCCT

- There will be a LONI HPC workshop next Monday and Tuesday, Oct. 26 and 27, hosted by University of Louisiana at Lafayette. For more information or to register, visit: http://www.hpc.lsu.edu/training/20091026/index.php .

- Registration is now open for the Supercomputing 2009 Education Program at the conference in Portland, which will take place Nov. 14-17. The Education Program helps educators and students learn more about computational science topics and gives educators ideas to bring these topics into their classrooms. The program is open to undergraduate faculty, undergraduate and graduate students, and high school teachers. To register or for more information, please visit http://computationalscience.org/sc09.

- Please remember to send your news concerning grants, awards, conferences, or other pertinent information that should be communicated to CCT to PR Manager Kristen Sunde at ksunde@cct.lsu.edu.

**Upcoming Grant Deadlines:**

Note: Please see the CCT deadline Web site, as many NSF deadlines are listed here: http://www.cct.lsu.edu/about/grants/deadlines/events.php

- EPSCoR Research Infrastructure Improvement Program: Track-1 (RII Track-1)

  October 19 2009 10:00 am
  At Most $ 4,000,000.00 available
  http://www.nsf.gov/pubs/2009/nsf09570/nsf09570.htm?govDel=USNSF_25

- EPSCoR Research Infrastructure Improvement Program: Track-2 (RII Track-2)

  November 18 2009 10:00 am
  At Most $ 2,000,000.00 available
  http://www.nsf.gov/pubs/2009/nsf09571/nsf09571.htm?govDel=USNSF_25