

With Commonwealth of Pennsylvania support, PSC provides education, consulting, advanced network access and computational resources to scientists and engineers, teachers and students across the state.

Pennsylvania State Representatives Dwight Evans, 203rd District, Philadelphia County (right center), and Jake Wheatley, 19th District, Allegheny County (right), visited PSC on August 13. PSC scientist Joel Stiles (left) and co-scientific director Ralph Roskies (right of Stiles) demonstrated CMIST, PSC's innovative program of animated teaching modules to engage high school and undergrad science students.



Cheryl Begandy, PSC manager of outreach, coordinates PSC's programs of corporate research, education & community outreach in Pennsylvania.



PSC's well-attended CAST workshops show high-school science teachers how to effectively incorporate computational science into their curricula. "Many of the teachers," says Begandy, "expressed strong interest in an advanced CAST training, and this year we introduced a two-day workshop for teachers who completed the introductory program."



K-12 SCIENCE EDUCATION

PSC's K-12 programs to help prepare technology-ready workers and a science-literate populace continued this year. PSC's K-12 workshops trained 120 science teachers in 32 school districts in Western Pennsylvania.

In December 2006, the Heinz Endowments Education Program awarded \$150,000 to support PSC's CAST (Computation and Science for Teachers) workshops, which kicked-off the 2008-09 school year with a weeklong workshop in June. Thirteen teachers learned to use software that implements the basics of mathematical modeling in the classroom. Lunchtime talks featured PSC scientists Nathan Stone and Shawn Brown and a talk about the pressing need for science education from Carnegie Mellon vice-provost for education Indira Nair.

PSC also extended its CMIST (Computational Modules in Science Teaching) program this year with a new module on atomic and molecular movements. Developed by PSC's National Resource for Biomedical Supercomputing (p. 10), CMIST creates complete

teaching modules in subject areas based on recent research at PSC (see p. 46). Together, CAST and CMIST offer an approach to secondary science that includes both specific computational modules (CMIST) and a general framework for computational science disciplines (CAST).

PSC MENTORS STUDENT-SCIENCE WINNERS

Several Pittsburgh-area high-school and college students received recognition for their science projects at the third annual conference of the TeraGrid, NSF's program of cyberinfrastructure for U.S. science and education, June 9-13 in Las Vegas.

Matthew Stoffregen, a junior at Woodland Hills High, won a competition called "The Impact of Cyberinfrastructure on Your World," which invited students to showcase ways in which cyberinfrastructure will affect human communities. Three of six entries

TG '08 Student Winners (l to r): Max Hutchinson, Shivam Verma, Cadeal Chase, Hari Seshadri, Bryan Bemley (front), Tyrell Ferguson and Jessica Traverso.



nationwide were from the Pittsburgh region, including two university students who work at PSC. Shivam Verma, of North Allegheny School District, placed second and Srihari Seshadri, a Franklin Regional Senior High student and PSC student employee, came in third.

In a second competition, "TeraGrid Student Research," students described the benefits of grid computing. Maxwell Hutchinson, a PSC student programmer and Carnegie Mellon undergrad, came in second for his work with solenoids.

"This an impressive performance," said PSC's Laura McGinnis, manager of data information and resource services, who recruited and mentored area students in the TeraGrid competitions. "It represents a head start for this area in producing cyber-savvy individuals who will help to generate technological innovations and future economic growth."

COMMUNITY OUTREACH

PSC staff have taken part in numerous community outreach programs, both locally and nationally. For the first time this year, PSC was a bronze sponsor of the Pittsburgh Regional Science and Engineering Fair, where Matthew Stoffregen of Woodland Hills and Srihari Seshadri of Franklin Regional, also recognized at TeraGrid 08, received PSC awards for effectively incorporating computation into their projects. PSC also exhibited at the SciTech Spectacular at the Carnegie Science Center in October 2007. This event fosters understanding of science and technology among middle and high school students. PSC's booth featured activities that demonstrate how supercomputing can generate interest in science.

Through SC² (p. 8) and the PSC networking group (p. 12), Evergreene Technology Park in Greene County provides companies with access to PSC resources. PSC coordinated economic development outreach programs through Keystone Innovation Zones in Indiana, Johnstown, Fayette County and Waynesburg.

The networking group worked with eight Pennsylvania Intermediate Units in support of E-Fund applications to provide wide-area network

connectivity and access to educational resources on Internet2. PSC's network staff also coordinated K-20 outreach activities with MAGPI, the Philadelphia-based network hub, leveraging their well-developed K-20 programs.

PRIVATE-SECTOR & UNIVERSITY RESEARCH

The Council on Competitiveness, a Washington, DC organization of business, labor, academic and governmental leaders who focus on private-sector competitiveness, this year featured three of PSC's corporate-partner research projects in case studies (funded by NSF) that promote the use of high-performance computing to facilitate innovation in product development (see p. 30).

Research by university scientists in Pennsylvania supported by PSC is exemplified by several projects in this booklet:

- Turbulent Combustion: Peyman Givi, University of Pittsburgh (p. 9).
- Understanding the glutamate receptor: Maria Kurnikova & Tatyana Mamonova, Carnegie Mellon University (p. 22).
- Earthquake soil vibrations: Jacobo Bielak & David O'Hallaron, Carnegie Mellon University (p. 26).
- Game theory: Tuomas Sandholm & Andrew Gilpin, Carnegie Mellon University (p. 43).
- Epidemiological Modeling: University of Pittsburgh Graduate School of Public Health & PSC (p. 44).

RESEARCH AT PENNSYLVANIA COLLEGES & UNIVERSITIES, 2007-2008

From July 1, 2007 through June 30, 2008, PSC provided 7.4-million processor hours to 779 Pennsylvania researchers. PSC workshops in high-performance computing reached 240 Pennsylvania grad and undergrad students. This usage includes more than 200,000 hours of new-user allocations on PSC's Ben system (now decommissioned) along with 6.9-million hours on PSC's lead system, the 4,096 processor Cray XT3, BigBen. If purchased from a commercial provider, this computing time would be valued, conservatively, at over \$7-million. The following Pennsylvania universities and colleges used PSC resources during this period:

Allegheny-Singer Research Institute
Bryn Mawr College
Bucknell University
Cabrini College
Carnegie Mellon University

Cedar Crest College
Cheyney University of Pennsylvania
Drexel University
Duquesne University
Franklin and Marshall College
Immune Tolerance Network
Indiana University of Pennsylvania (all campuses)
Juniata College
Lehigh University
Lock Haven University
Pennsylvania State University (all campuses)
Shippensburg University of Pennsylvania
Temple University
University of Pennsylvania
University of Pittsburgh (all campuses)
University of the Sciences in Philadelphia
Ursinus College
Villanova University
Waynesburg College
Widener University