

# The Super Computing Science Consortium

PENNSYLVANIA-WEST VIRGINIA PARTNERS  
IN DEVELOPMENT OF CLEAN POWER TECHNOLOGIES

Formed in 1999, the Super Computing Science Consortium is a regional partnership of research and educational institutions in Pennsylvania and West Virginia. (SC)<sup>2</sup> provides intellectual leadership and advanced computing and communications resources to solve problems in energy and the environment and to stimulate regional high-technology development.

During the past year, Waynesburg College, a small liberal arts college in Greene County, Pennsylvania, between Pittsburgh and Morgantown, became a new (SC)<sup>2</sup> partner.

**MORE INFORMATION:** <http://www.sc-2.psc.edu>

## TECHNOLOGIES FOR CLEAN, AFFORDABLE POWER

Since the spring of 2000, a high-speed network — which provided the first fiber-optic service to Morgantown, West Virginia — has linked the National Energy Technology Laboratory (NETL) campuses in Morgantown and Pittsburgh with PSC, facilitating NETL collaborations. Researchers at NETL and West Virginia University have used this high-speed channel to tap the computational resources at PSC for a range of projects involving state-of-the-art simulation technology. This work includes:

- fluidized-bed combustion of silane,  
<http://www.psc.edu/publicinfo/netl/>
- lean-fuel mixes in next-generation power-generating turbines,  
[http://www.psc.edu/science/Richards/clean\\_power.html](http://www.psc.edu/science/Richards/clean_power.html)
- industrial-scale technology for coal gasification,  
<http://www.psc.edu/publicinfo/2002/sc2/>
- a new design for a power-generating turbine.  
<http://www.psc.edu/science/cizmas2002.html>

In recent work (p. 42), NETL researchers have used LeMieux, PSC's terascale system, to make significant new progress toward a realistic simulation technology for industrial-scale coal gasification.

## WORKFORCE DEVELOPMENT & EDUCATION

Economic development for the Pennsylvania and West Virginia region was the central topic of the (SC)<sup>2</sup> Seminar 2003: Regional Business Opportunities in Supercomputing. This July 14 event at Waynesburg College brought together leaders in technology, business, higher education and government. Participants included over 130 people representing 31 companies, 15 colleges and universities, seven economic-development agencies and six government agencies.

“With the most advanced technological resources, as well as through partnerships with local technology leaders, our Commonwealth’s small businesses will be able to face current challenges,

achieve their long-term goals, and set a positive course for the future,” said Pennsylvania governor Edward G. Rendell in a letter commending the (SC)<sup>2</sup> event.

In another event, held June 23-27, ten middle and high-school teachers from Pennsylvania and West Virginia participated in the first annual (SC)<sup>2</sup> parallel-computing workshop. Developed and presented by Duquesne University, Penn Hills School District, Fluent Corporation and NETL, the workshop featured presentations on topics that included parallel versus sequential processing and scientific visualization as well as a hands-on practicum.



The (SC)<sup>2</sup> Seminar 2003 provided many opportunities for discussion. Thomas McGraw (left) of the Pennsylvania Department of Community and Economic Development talks with Bob Romanosky, NETL manager of Power Systems Advanced Research, and Lynn Layman (right), (SC)<sup>2</sup> co-director.

Twenty-seven students from 11 regional colleges presented posters on a range of topics related to technology and computational science.



### (SC)<sup>2</sup> PARTNERS

Carnegie Mellon University  
 Duquesne University  
 The Institute for Scientific Research  
 The National Energy  
 Technology Laboratory  
 The Pittsburgh Supercomputing Center  
 The Pennsylvania State University  
 The University of Pittsburgh  
 Waynesburg College  
 West Virginia University  
 The West Virginia Governor’s Office  
 of Technology

## MAVIS: SEEING THE INNER FLAME

During the past year, PSC scientific-visualization specialist Kent Eschenberg collaborated with NETL researchers to develop software for interactive 3D visualization. The program, called Mavis, operates with NETL data sets produced by a powerful simulation technology called MFI (Multiphase Flow with Interphase Exchanges). Developed over years of research, MFI realistically models the complex processes — gas and particle dynamics, chemical reactions and heat transfer — involved in combustion.

Detailed understanding of combustion lies at the heart of NETL’s research objective: environmentally clean, affordable power from fossil fuel. Mavis provides a quick, effective way to see and comprehend the results from computational study of these processes.

This frame from a Mavis visualization represents “bubble coalescence” in a fluidized-bed reactor, a combustion process in which air is injected from below at high speed into a bed of particles. The particles collectively behave like fluid and, among other fluid-like effects, form bubbles, which affect heat distribution. In this simulation, two jets of different velocity are injected into the bed. Larger bubbles formed above the faster jet (left) attract bubbles formed from the slower jet.

