

## 5. Education and University Integration

The Center has had a major impact on the University of Illinois in a variety of ways. Above all, it has engendered an unprecedented level of collaboration across disciplines and departments. Even within single disciplines, such as fluid dynamics or structural analysis, faculty collaboration across departmental lines has been enhanced enormously. As a result, the Center has become a model for other interdisciplinary, interdepartmental research initiatives. In addition, because of the broad applicability of the technologies it represents, CSAR has also provided leverage to, and benefited greatly from, many other separately funded programs on our campus, both individual faculty research grants and other large centers such as NCSA.

By hiring more than 40 new professional staff and postdoctoral associates during the first three years of the program, the Center has significantly enlarged the local technical talent pool, providing a whole new set of collaborators for existing faculty and staff. The Center has also hosted a number of visitors, both long-term and short-term, and has organized a very popular seminar series that is designed specifically to reach out across disciplinary boundaries to enhance collaboration.

The Center spans twelve departments (Table 5.1), and its recognition and influence are pervasive throughout the College of Engineering and beyond. We work very closely with NCSA, which contributes both research personnel and computer time toward our effort. Several key members of our research team are also research scientists at NCSA. It has been especially convenient to do initial code development locally on parallel systems at NCSA preceding full implementation on the remote ASCI platforms.

Another major impact of the Center has been on graduate education and training. CSAR is playing a major role in educating a new generation of scientists and engineers prepared to work in computational simulation of complex systems by supporting more than forty graduate students at any given time. By virtue of this experience, the students we train are already attuned to the needs of interdisciplinary collaboration. The level of involvement by undergraduate students has been limited, but we are beginning to involve undergraduates, especially in laboratory environments.

The Center has enhanced the awareness on our campus of computational simulation, and it has substantially increased the visibility and influence of our interdisciplinary Computational Science

and Engineering (CSE) Program, which administratively houses the Center. The computationally oriented, interdisciplinary educational program provided by CSE fits perfectly with the needs of CSAR, and the

<b>Aeronautical and Astronautical Engr</b>	<b>Materials Science and Engineering</b>
<b>Astronomy</b>	<b>Mechanical and Industrial Engineering</b>
<b>Chemistry</b>	<b>NCSA</b>
<b>Civil and Environmental Engineering</b>	<b>Nuclear, Plasma, &amp; Radiological Engr</b>
<b>Computational Science and Engineering</b>	<b>Physics</b>
<b>Computer Science</b>	<b>Theoretical and Applied Mechanics</b>

Fig. 5.1.1: Twelve UIUC units participate in CSAR.

students in this program are ideally trained to participate in the research activities of the Center. CSE courses are specially designed to lower the usual barriers to interdisciplinary course work and enable students to master both applied and computational disciplines.

**Table 5.1**  
**1999-2000 CSAR Seminars**

- Alan Needleman, Brown University, "Discrete Dislocation Analyses of Crack Growth," TAM/MIE Joint Seminar, 4:00 P.M., Friday, September 22, 2000, 103 Talbot Lab.
- Maria Garzaran, CS/UIUC, "Buffering State with Software Logging in Scalable Speculative Parallelization" CSAR Seminar, 2:00 P.M., Monday, September 18, 2000, 2240 DCL.
- Werner Krotz-Vogel, PALLAS GmbH, "Analyzing MPI Applications With Vampir," NCSA Seminar, 1:30 P.M., Thursday, September 14, 2000, 2269 BI.
- Jose Moreira, IBM T. J. Watson Research Center, "Blue Gene: A Massively Parallel System," CSAR Noon Seminar, 12:00, Wednesday, September 13, 2000, 2240 DCL.
- Kausik Sarkar, UIUC, "Viscous/Viscoelastic Drop Deformation: Numerical and Theoretical Analysis," CSAR Noon Seminar, 12:00, Wednesday, September 6, 2000, 2240 DCL.
- Mikel Lujan, University of Manchester, "Object Oriented Linear Algebra," CSAR Noon Seminar, 12:00, Wednesday, August 9, 2000, 3211 DCL.
- Jenq-Kuen Lee, National Tsing-Hua University, Taiwan, "Efficient Supports and Compiler Optimizations for Parallel Sparse Programs with Array Intrinsics of Fortran 90," CS Seminar, 2:00 P.M., Monday, August 7, 2000, 2501 DCL.
- Saara Hyvoenen, Helsinki Institute of Technology, "On the Convergence of Iterative Methods for Nonnormal Problems," CSAR Noon Seminar, 12:00, Wednesday, August 2, 2000, 2240 DCL.
- Lixing Zhou, Tsinghua University, Beijing, China, "Recent Advances in Two-Fluid Models for Simulating Turbulent Gas-Particle Flows and Combustion," CSAR Noon Seminar, 12:00, Wednesday, July 26, 2000, B02 CSRL.
- Fang-Pang Lin, National Center for High-Performance Computing, Taiwan, "System Prototype and Application Integration for Numerical Wind/Water Tunnel," NCSA Seminar, 9:30-10:00 A.M., Friday, July 21, 2000, 5269 BI.
- Video Presentation, "Spaceflight: The Territory Ahead," CSAR Noon Seminar, 12:00, Wednesday, July 5, 2000, 2240 DCL.
- Video Presentation, "Spaceflight: One Giant Leap," CSAR Noon Seminar, 12:00, Wednesday, June 21, 2000, 2240 DCL.
- Video Presentation, "Spaceflight: The Wings of Mercury," CSAR Noon Seminar, 12:00, Wednesday, June 7, 2000, 2240 DCL.
- Video Presentation, "Spaceflight: Thunder in the Skies," CSAR Noon Seminar, 12:00, Wednesday, May 31, 2000, 2240 DCL.

Walter Gander, ETH Zurich, "Adaptive Quadrature - Art or Science?" CSAR Noon Seminar, 12:00, Wednesday, May 24, 2000, 2240 DCL.

Rudi Eigenmann, Purdue University, "Parallel Programming through Web-Based Tools," NCSA Seminar, 1:30 P.M., Wednesday, May 10, 2000, 4169 BI.

Randall LeVeque, University of Washington, "Finite-Volume Methods and Software for Hyperbolic PDEs and Conservation Laws," CSE Symposium, 3:00 P.M., Friday, April 28, 2000, Second Floor Commons, Grainger Engineering Library.

Mitchell Smooke, Yale University, "Computational and Experimental Study of Energetic Materials," CSE Symposium, 9:00 A.M., Friday, April 28, 2000, Second Floor Commons, Grainger Engineering Library.

Jeff Grandy, Lawrence Livermore National Laboratory, "A Parallel Method for Remapping Polyhedral Meshes," CSAR Noon Seminar, 12:00, Wednesday, April 26, 2000, 2240 DCL.

Scott Baden, UCSD, "Retargetable Programming with the KeLP Infrastructure," NCSA Seminar, 11:00 A.M., Tuesday, April 25, 2000, 5602 BI.

Petros Sofronis, UIUC/TAM, "Micromechanics of Damage in Solid Propellants," CSAR Noon Seminar, 12:00, Wednesday, April 19, 2000, 2240 DCL.

Andreas Haselbacher, ABB Alstom Power Technology, Zurich, "Discretisation Aspects on Mixed Unstructured Grids," Tuesday, April 18, 2000, 10:00 A.M., 2240 DCL.

Sergey Surzhikov, Russian Academy of Sciences, "Problems of Radiation Heat Transfer for SRM Numerical Simulations," CSAR Noon Seminar, 12:00, Wednesday, April 12, 2000, 2240 DCL.

Sourabh Apte, Pennsylvania State University, "Numerical Simulation of Unsteady Flow Evolution and Combustion Dynamics in a Rocket Motor," CSAR Seminar, 10:00 A.M., Tuesday, April 11, 2000, 2240 DCL.

Karsten Albe, UIUC/CSAR, "Atomic Scale Modeling and Simulation of Heterophase Materials," CSAR Noon Seminar, 12:00, Wednesday, April 5, 2000, 2240 DCL.

Scott Wunsch, Sandia National Laboratory, "Density Layers in Stably Stratified Turbulence," CSAR Seminar, 10:00 A.M., Monday, April 3, 2000, 2240 DCL.

Luc Bauwens, University of Calgary, "Two- and Three-Dimensional Simulation of Detonation Cells," CSAR Noon Seminar, 12:00, Wednesday, March 29, 2000, 2240 DCL.

Ramesh Balakrishnan, Wichita State University, "Can We Design an Entropy Consistent System of Second-Order Hydrodynamic Equations?," CSAR Seminar, 10 A.M., Monday, March 27, 2000, 2240 DCL.

Joseph Powers, University of Notre Dame, "Resolved Viscous Detonation in  $H_2/O_2/Ar$  Using Intrinsic Low Dimensional Manifolds and Wavelet Adaptive Multilevel Representation," CSAR Noon Seminar, 12:00, Wednesday, March 22, 2000, 2240 DCL.

Danesh Tafti, UIUC/NCSA, "Dynamic Computing for Irregular Applications," CSAR Noon Seminar, 12:00, Wednesday, March 15, 2000, 2240 DCL.

Ole Nielsen, Technical University of Denmark, "Parallel Supercomputing in Science and Engineering," MRL/MCC Seminar, 2:00 P.M., Monday, March 13, 2000, 280 MRL.

James Ferry, UIUC/CSAR, "A Fast Eulerian Method for Particle-Laden Flows," CSAR Noon Seminar, 12:00, Wednesday, March 8, 2000, 2240 DCL.

Amit Acharya, UIUC/CSAR, "Some Reflections on Bending of Shells," CSAR Noon Seminar, 12:00, Wednesday, March 1, 2000, 2240 DCL.

Constantinos Ierotheou, University of Greenwich, "An Interactive Environment for the Rapid Parallelisation of Fortran77 Mesh-Based Codes," NCSA Seminar, 3:00 P.M., Monday, February 28, 2269 BI.

Jay Hoeflinger, UIUC/CSAR, "Producing Scalable Performance with OpenMP: Two Recent Experiments," CSAR Noon Seminar, 12:00, Wednesday, February 23, 2000, 2240 DCL.

Greg Knott, UIUC/MIE, "The Random Packing of Heterogeneous Propellants," CSAR Noon Seminar, 12:00, Wednesday, February 16, 2000, 2240 DCL.

Robert Fiedler, UIUC/CSAR, "Rocketeer Demo," CSAR Noon Seminar, 12:00, Wednesday, February 9, 2000, 2240 DCL.

Luiz DeRose, IBM Research, "The SvPablo Performance Analysis and Visualization System," NCSA Seminar, 11:00 A.M., Thursday, February 3, 2000, 3269 BI.

Robert Beddini, UIUC/AAE, "Acoustically Produced Turbulence as a Mechanism of Solid Propellant Combustion Enhancement and High-Amplitude Instability," CSAR Noon Seminar, 12:00, Wednesday, February 2, 2000, 2240 DCL.

Pratap Vanka, UIUC/MIE, "Meshless Solution of Navier-Stokes Equations Using Scattered Points and Radial Basis Functions," MIE Seminar, 4:00 P.M., Tuesday, January 25, 2000, 218 MEB.

Peter O'Sullivan, Bell Labs, "Topographic Evolution Problems in Microelectronics Using Level Set Methods," MRL/CSE Seminar, 11:00 A.M., Friday, December 10, 1999, 280 MRL.

David Kassoy, University of Colorado-Boulder, "A Unified Theory for Combustion-Driven Flow Dynamics in a Model of a Solid Rocket Motor Chamber," CSAR Noon Seminar, 12:00, Wednesday, December 8, 1999, 2240 DCL.

Todd Martinez, UIUC/Chemistry, "Molecular Dynamics with Nuclear and Electronic Quantum Effects," CSAR Noon Seminar, 12:00, Wednesday, December 1, 1999, 2240 DCL.

Ron Adrian, UIUC/TAM, "Structure of Turbulence in Channel Flow with a Fully Transpired Wall: A Model Problem for Rocket Core Flow," CSAR Noon Seminar, 12:00, Wednesday, November 17, 1999, 2240 DCL.

Kim Mish, Lawrence Livermore National Laboratory, "The Finite-Element Interface: Separating the Mechanics from the Algebra in Engineering Analysis" CSAR Noon Seminar, 12:00, Wednesday, November 10, 1999, 2240 DCL.

Said Elghobashi, UC-Irvine, "Direct Simulation of Particle-Laden Turbulent Flows: The Trajectory and Two-Fluid Approaches," MIE Seminar, 4:00 P.M., Tuesday, November 9, 1999, 218 MEB.

Steve Ashby, Lawrence Livermore National Laboratory, "Meeting the ASCI Challenge: Terascale Scientific Simulation," CSAR Seminar, 1:00 P.M., Monday, November 8, 1999, 2240 DCL.

Dinshaw Balsara, UIUC/NCSA, "Highly Parallel Structured Adaptive Mesh Refinement Using Parallel Language-Based Approaches," CSAR Noon Seminar, 12:00, Wednesday, November 3, 1999, 2240 DCL.

David Ceperley, UIUC/Physics, "Simulation Methods for Hot Dense Matter," CSAR Noon Seminar, 12:00, Wednesday, October 27, 1999, 2240 DCL.

Charles Merkle, University of Tennessee Space Institute, "Pulsed Detonation Rocket Engines," AAE Seminar, 4:00 p.m., Friday, October 15, 1999, 103 Talbot Lab.

Faisal Saied, UIUC/NCSA, "Linear Solver Technologies at NCSA," NCSA Seminar, 11:00 A.M., Friday, October 15, 1999, 5239 BI.

Ben Leimkuhler, University of Kansas, "Effective Geometric Integrators and Applications," CS Colloquium, 4:00 P.M., Thursday, October 14, 1999, 1310 DCL.

Jose Moreira, IBM, "IBM RS/6000 SP: Architecture, Design, and Applications," CSAR Noon Seminar, 12:00, Wednesday, October 13, 1999, 2240 DCL.

D. Goussis, Institute of Chemical Engineering and High Temperature Chemical Processes, Patras, Greece, "Low Dimensional Manifolds in Reaction-Diffusion Systems: Construction of Reduced Kinetic Mechanisms for Combustion," MIE Seminar, 4:00 P.M., Thursday, October 7, 1999, 218 MEB.

Pratap Vanka and Sarma Rani, UIUC/MIE, "Simulations of Gas Particle Turbulent Flows," CSAR Noon Seminar, 12:00, Wednesday, October 6, 1999, 2240 DCL.

Amit Acharya, UIUC/CSAR "Continuum Crystal Plasticity and the Theory of a Continuous Distribution of Dislocations: Length-Scale Dependent Results, and Some Ideas on a Synthesis," AAE Seminar, 4:00 P.M., Monday, October 4, 1999, 103 Talbot Lab.

Eric de Sturler, UIUC/CS, "Iterative Methods in Numerical Analysis," CS Colloquium, 4:00 P.M., Monday, October 4, 1999, 1320 DCL.