

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 50 new professional staff and postdoctoral associates during the first four 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 (Figure 5.1.1), 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 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.

Aeronautical and Astronautical Engr	Materials Science and Engineering
Chemistry	Mechanical and Industrial Engineering
Civil and Environmental Engineering	NCSA
Computational Science and Engineering	Physics
Computer Science	Theoretical and Applied Mechanics

Fig. 5.1.1: Ten UIUC units participate in CSAR.

Table 5.1
2000-01 CSAR Seminars

- Robert Dodds, UIUC/CEE, "Ductile Fracture Modeling in 3-D Using Surface Cohesive Elements," MIE Seminar, 4:00 P.M., Tuesday, September 25, 2001, 218 MEB.
- Adolfy Hoisie, Los Alamos National Laboratory, "Modeling Extreme-Scale Architectures and Applications," CS Seminar, 4:00 P.M., Wednesday, September 19, 2001, 2240 DCL.
- Damrong Guoy, UIUC/CSAR, "Tetrahedral Mesh Improvement: Algorithms and Experiments," CSAR Noon Seminar, 12:00, Wednesday, September 5, 2001, 2240 DCL.
- Ed Seidel, Max Planck Institute, "GridLab: Dynamic Grid Computing for Science and Engineering," NCSA Seminar, 10:30 A.M., Friday, August 24, 2001, 2269 BI.
- Changyu Hwang, UIUC/CSAR, "Simulation of Dynamic Fracture Events in Solid Propellant Rockets," CSAR Noon Seminar, 12:00, Wednesday, August 8, 2001, 2240 DCL.
- Nahil Sobh, UIUC/CSAR, "Discontinuous Galerkin Methods: Opportunities in Multidisciplinary Computational Science and Engineering," CSAR Noon Seminar, 12:00, Wednesday, July 25, 2001, 2240 DCL.
- Steve Chien, Jet Propulsion Laboratory, "Move over HAL ... Autonomous Spacecraft in the New Millennium," AI Seminar, 10:00 A.M., Friday, July 20, 2001, 2269 BI.
- Bruce Hendrickson, Sandia National Laboratories, "Support Theory: A Framework for Analyzing Preconditioners," CSAR Seminar, 2:00 P.M., Monday, June 25, 2001, 2240 DCL.
- Kumar Mahinthakumar, North Carolina State University, "A Hybrid MPI-OpenMP Implementation of an Implicit Finite Element Code on Parallel Architectures," NCSA Seminar, 11:00 A.M., Wednesday, June 13, 2001, 4169 BI.
- Charles Koelbel, National Science Foundation, "Doing Real Science and Engineering on Real Computers," NCSA Seminar, 3:00 P.M., Thursday, June 7, 2001, 3269 BI.
- Xu Zhou, Rutgers University, "Studies of Vortex Dynamics in Turbulent Buoyant Jets Using Large-Eddy Simulation," CSAR Noon Seminar, 12:00, Thursday, May 31, 2001, 2240 DCL.
- Paul Concus, Lawrence Berkeley National Laboratory, "Preconditioning for Parallel Computation of 3-D Isopycnal Fluid Flow," CSAR Noon Seminar, 12:00, Wednesday, May 30, 2001, 2240 DCL.
- Margaret H. Wright, Bell Laboratories, "What's (Genuinely) New in Constrained Optimization?" CS Colloquium, 10:00 A.M., Wednesday, May 9, 2001, 2240 DCL.
- Wen Chen, Mechatronics Inc., "Development of a Dynamic Solver with Incomplete Solution Based on Multilevel Iterative Method," CSAR Noon Seminar, 12:00, Wednesday, May 2, 2001, 2240 DCL.
- Xiangmin Jiao, UIUC/CS, "Interfacing Computational Modules in Integrated Rocket Simulation," CSAR Noon Seminar, 12:00, Wednesday, April 25, 2001, 2240 DCL.

- Mark Shephard, RPI, "Automation of Large-Scale Simulations with Emphasis on a Flexible Discontinuous Galerkin Procedure," CSE Symposium, 3:30 P.M., Friday, April 20, 2001, 2240 DCL.
- John Gilbert, Xerox PARC, "Smart Matter: Frontiers of Computation," CSE Symposium, 11:00 A.M., Friday, April 20, 2001, 2240 DCL.
- Tonushree Kundu, University of California, Berkeley, "The Creation of Large-Scale Zonal Flows and Eddies From Small-Scale Forcing," CSAR Seminar, 2:00 P.M., Wednesday, April 18, 2001, 2240 DCL.
- Oleg Vasilyev, University of Missouri-Columbia, "Computational Constraints on Large Eddy Simulation of Inhomogeneous Turbulent Complex Geometry Flows," CSAR Noon Seminar, 12:00, Wednesday, April 18, 2001, 2240 DCL.
- Ami Marowka, Hebrew University, "Portability of Parallel and Distributed Applications," CSAR Noon Seminar, 12:00, Monday, April 16, 2001, 2240 DCL.
- Krishnendu Sinha, University of Minnesota, "Analysis of the k-epsilon Turbulence Model for Simulation of Compressible Flows," CSAR Noon Seminar, 12:00, Wednesday, April 11, 2001, 2240 DCL.
- Paul Saylor, UIUC/CS, "What Does the Scattering Amplitude Have To Do with Conjugate Gradients, Fluid Mechanics and Differential Algebraic Equations?," CSAR Noon Seminar, 12:00, Wednesday, April 4, 2001, 2240 DCL.
- Cornelis W. Oosterlee, SCAI/GMD, "On Multigrid Methods for Linear Complementarity Problems with Application to American-Style Options," CSAR Seminar, 12:00, Friday, March 30, 2001, 2240 DCL.
- Vikram Adve, UIUC/CS, "Simulating the Performance of Highly Scalable Parallel Applications via Compiler Support," CSAR Noon Seminar, 12:00, Wednesday, March 28, 2001, 2240 DCL.
- Richard Alkire, UIUC/ChemE, "Coupling Continuum and Non-Continuum Codes with Experimental Data for Prediction of Surface Shape Evolution During Electrodeposition," CSAR Noon Seminar, 12:00, Wednesday, March 21, 2001, 2240 DCL.
- Peter Nagel, University of Texas at Austin, "Parallel Least Squares Methods for Multisatellite Orbit Determination," CSAR Seminar, 12:00, Monday, March 19, 2001, 2240 DCL.
- Neelesh Patankar, Northwestern University, "Numerical Simulation of Rigid Particulate Flows," TAM Seminar, 10:30 A.M., Thursday, March 8, 2001, 100H Talbot Lab.
- Michael Rodgers, Northwestern University, "Computational Methods for Solving Boundary Integral Equations in Fracture Mechanics and Contact Mechanics," CSAR Noon Seminar, 12:00, Wednesday, March 7, 2001, 2240 DCL.
- Marc Snir, IBM T. J. Watson Research Laboratory, "Scalable Parallel Systems at IBM Research," CS Colloquium, 4:00 P.M., Monday, March 5, 2001, 1320 DCL.
- Luca Massa, Mississippi State University, "Computational Simulation and Aerodynamic Sensitivity Analysis of Film-Cooled Turbines," CSAR Noon Seminar, 12:00, Wednesday, February 28, 2001, 2240 DCL.

- Prasanta Deb, Wichita State University, "Numerical Study of MHD-Bypass Scramjet Inlets with Finite Rate Chemistry," CSAR Seminar, 10:00 A.M., Tuesday, February 27, 2001, 2240 DCL.
- Ertugrul Taciroglu, UIUC/CSAR, "Simulation of the Solid Components of Rocket Boosters with the Finite Element Method," CSAR Noon Seminar, 12:00, Wednesday, February 21, 2001, 2240 DCL.
- Steve Owen, Sandia National Laboratories, "Research and Development in Mesh Generation at Sandia National Laboratories," CSAR Seminar, 12:00, Friday, February 16, 2001, 2240 DCL.
- Andrea Prosperetti, Johns Hopkins University, "Averaged Description of Fluid-Particle Flows: Tools, Issues, Answers," TAM Seminar, 4:00 P.M., Thursday, February 8, 2001, 103 Talbot Lab.
- Alla Sheffer, UIUC/CSAR, "Cubes and Triangles: Generation and Manipulation of Meshes in 3D," CSAR Noon Seminar, 12:00, Wednesday, February 7, 2001, 2240 DCL.
- Abdelkarim Hegab, UIUC/CSAR, "Thermal Response of an Internal Flow in an SRM Chamber," CSAR Noon Seminar, 12:00, Wednesday, January 31, 2001, 2240 DCL.
- Jiri Blazek, Alstom Power Ltd., Switzerland, "Application of CFD to Practical Problems in Aerospace Engineering and Turbomachinery," CSAR Seminar, 2:00 P.M., Friday, January 12, 2001, 2240 DCL.
- Paul Woodward, University of Minnesota, "Technical Challenges in Large-Scale Astrophysical Computation," Theoretical Astrophysics & General Relativity Seminar, 12:00 Noon, Wednesday December 6, 2000, 358 Loomis Lab.
- Paul Woodward, University of Minnesota, "Simulations of Turbulent Convection in Stars," Astrophysics Colloquium, 4:00 P.M., Tuesday, December 5, 2000, 134 Astronomy Bldg.
- Ganesh Thiagarajan, Louisiana State University, "An Equation-by-Equation Algorithm for CG Solvers for FE Problems on Distributed Memory Machines," NCSA Seminar, 10:00 A.M., Friday, December 1, 2000 BI 5239.
- Jens Gerlach and Uwe Der, GMD, Germany, "Irregular Applications in Janus" NCSA Seminar, 1:30 P.M., Wednesday, November 15, 2000, 5602 BI.
- James R. Stewart, Sandia National Laboratories, "SIERRA -- A Computational Framework for Engineering Mechanics Applications," CSAR Noon Seminar, 12:00, Wednesday, November 15, 2000, 2240 DCL.
- Elaine Chandler, Lawrence Livermore National Laboratory, "Physics Research Directions in the Science-Based Stockpile Stewardship Program," Physics Colloquium, 4:00 P.M., Thursday, November 9, 2000, 141 Loomis Lab.
- Ruhai Zhou, University of New Mexico, "Simulation of Unsteady Combustion Phenomena Using Complex Models," CSAR Seminar, 2:00 P.M., Friday, November 3, 2000, 2240 DCL.

- Herman Krier, UIUC/MIE, "Combustion of Single and Agglomerated Aluminum Droplets in Solid Rocket Motor Flow," CSAR Noon Seminar, 12:00, Wednesday, November 1, 2000, 2240 DCL.
- Xiaojian Wang, Center for Advanced Numerical Engineering Simulations, Nanyang Technological University, Singapore, "Aerodynamic Shape Optimization Using Computational Fluid Dynamics and Parallel Simulated Annealing Algorithms," CSAR Seminar, 1:00 P.M., Tuesday, October 31, 2000, 2240 DCL.
- Mark Brandyberry, Science Applications International Corp., "The Role of Quantitative Engineering Analyses in Accident, Safety, and Risk Assessment," CSAR Seminar, 2:00 P.M., Monday, October 30, 2000, 2240 DCL.
- Steve Cook, NASA Marshall Space Flight Center, "Progress Towards NASA's Space Transportation Goals," AAE Seminar, 4:00 P.M., Friday, October 27, 2000, 103 Talbot Lab.
- Dan Quinlan, Lawrence Livermore National Laboratory, "Current Work on the Overture Framework and the General Optimization of Object-Oriented Applications," CSAR Noon Seminar, 12:00, Wednesday, October 25, 2000, 2240 DCL.
- Bruce Fryxell, ASCI Flash Center, University of Chicago, "Simulation of Astrophysical Thermonuclear Flashes," Astrophysics Colloquium, 4:00 P.M., Tuesday, October 24, 2000, 134 Astronomy.
- Alba Ramaswamy, University of Maryland, "Nanoscale Initiation Studies of Energetic Materials and Propellants," M&IE Seminar, 4:00 P.M., Tuesday, October 24, 2000, 218 MEB.
- Erdal Yilmaz, Indiana University-Purdue University, Indianapolis, "Parallel Adaptive Flow Solution on Unstructured Grids and Dynamic Load Balancing Applications," CSAR Seminar, 1:00 P.M., Friday, October 20, 2000, 2240 DCL.
- Cheng Liu, Los Alamos National Laboratory, "Heterogeneity, Heterogeneity-Induced Damage, and Fracture of High-Explosives and Their Simulant," CSAR Noon Seminar, 12:00, Wednesday, October 18, 2000, 2240 DCL.
- Bono Wasistho, Arizona State University, "Simulation of Turbulent Flows using Various Techniques: RANS, LES, and DES," CSAR Seminar, 2:00 P.M., Friday, October 6, 2000, 2240 DCL.
- Bruce Hendrickson, Sandia National Laboratories, "Devising Effective Parallel Algorithms," CSAR Seminar, 4:00 P.M., Thursday, October 5, 2000, 3211 DCL.
- Mark Salita, TRW Corp., "Droplet Dynamics and Two-Phase Flow," CSAR Seminar, 10:00 A.M., Tuesday, October 3, 2000, 2240 DCL.
- Charles Pickrel, Boeing, "Testing for Model Validation in Structural Dynamics," AAE Seminar, 4:00 P.M., Monday, October 2, 2000, 103 Talbot Lab.
- Mark Salita, TRW Corp., "Overview of Solid Rocket Motor Operation and Ignition Transient Modeling," CSAR Seminar, 10:00 A.M., Monday, October 2, 2000, 2240 DCL.