

5 Education and University Integration

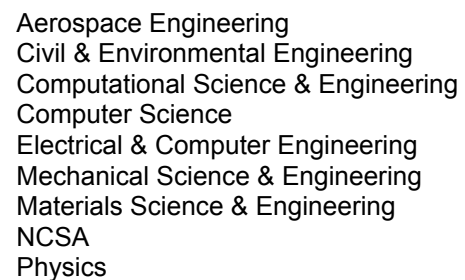
The Center has had a major impact on the University of Illinois in a variety of ways. Above all, it has engendered an unprecedented level of collaboration across disciplines and departments. Even within single disciplines, such as fluid dynamics or structural analysis, faculty collaboration across departmental 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 75 new professional staff and postdoctoral associates during the first nine 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 nine academic units (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 ASC 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 growing, 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.



- Aerospace Engineering
- Civil & Environmental Engineering
- Computational Science & Engineering
- Computer Science
- Electrical & Computer Engineering
- Mechanical Science & Engineering
- Materials Science & Engineering
- NCSA
- Physics

Fig. 5.1.1: Nine UI units participate in CSAR.

Table 5.1
2005-6 CSE/CSAR Seminars

- Renfu Li, Millennium Dynamics Co., Atlanta, “Simulation of Lamb Wave Propagation in Structures with Damage by Parallel Hybrid FD and Singular FE Method”, CSAR Seminar, 12:00 Noon, Wednesday, September 27, 2006, 2240 DCL.
- Alexander Telengator, University of California at San Diego, “Several Models in Combustion of Porous Energetic Materials”, CSAR Seminar, 10:00 A.M., Friday, August 25, 2006, 2240 DCL.
- Eunice Santos, Virginia Tech, “Models for Effective Deployment of Large-Scale Simulations across Parallel and Distributed Platforms”, CS Colloquium, 10:00 A.M., Thursday, August 24, 2006, 2405 SC.
- Asghar Afshari, Michigan State University, “Large-Scale Simulations of Complex Turbulent Reacting Flows”, CSAR Seminar, 10:00 A.M., Wednesday, August 16, 2006, 2240 DCL.
- Aaron Herrnstein, University of Louisville, “Adaptive Mesh Refinement Applied in a Numerical Ocean Model”, CSAR Seminar, 12:00 Noon, Wednesday, August 2, 2006, 2240 DCL.
- Youngjean Jung, Princeton University, “Constitutive Modeling and Numerical Simulation of Multivariant Phase Transformation in Polycrystalline NiTi Alloys”, CSAR Seminar, 2:00 P.M., Thursday, July 27, 2006, 2240 DCL.
- Liang Zhang, University of Iowa, “An Atomic Level Material Stability Theory — Failure Analysis of Nanostructures”, CSAR Seminar, 12:00 Noon, Wednesday, July 26, 2006, 2240 DCL.
- Habib Najm, Sandia National Laboratories, “Uncertainty Quantification in Reacting Flow Modeling”, CSAR Seminar, 12:00 Noon, Tuesday, June 13, 2006, 2240 DCL.
- Dongbin Xiu, Purdue University, “Stochastic Modeling and Uncertainty Quantification in Engineering Applications”, CSAR Seminar, 12:00 Noon, Wednesday, May 31, 2006, 2240 DCL.
- Thomas Jackson, UIUC/CSAR, “Multiscale Modeling of Heterogeneous Propellents: A Three-Dimensional Multiphysics Framework”, AE Seminar, 4:00 P.M., Thursday, May 25, 2006, 103 Talbot Lab.
- Daniel Bodony, Stanford University, “Sound Prediction and Generation in Complex Environments”, AE Seminar, 4:00 P.M., Monday, May 22, 2006, 103 Talbot Lab.
- Gretar Tryggvason, Worcester Polytechnic Institute, “Direct Numerical Simulations of Multiphase Flows”, MIE Seminar, 12:00 Noon, Monday, May 15, 2006, 2005 MEL.
- Katerina Papoulia, Cornell University, “Cohesive Fracture: Algorithms and Models”, CSAR Seminar, 12:00 Noon, Tuesday, May 9, 2006, 2240 DCL.
- M. Pino Martin, Princeton University, “Turbulent Hypersonic Flows: Physics and Simulation”, AE Seminar, 4:00 P.M., Monday, May 8, 2006, 103 Talbot Lab.
- Jie Wan, Rensselaer Polytechnic Institute, “Adaptive Mesh Control for Evolving Geometry Problems”, CSAR Seminar, 12:00 Noon, Wednesday, May 3, 2006, 2240 DCL.
- Steven Son, Los Alamos National Laboratory, “Combustion of Nanoscale Energetic Materials”, MIE Seminar, 12:00 Noon, Monday, April 27, 2006, 2005 MEL.
- Carlos Pantano, Caltech, “Simulation and Modeling of Nonpremixed Flame Extinction”, MIE Seminar, 4:00 P.M., Wednesday, April 19, 2006, 2005 MEL.
- Tathagata Ray, Ohio State University, “Quality Delaunay Meshing of Volumes and Surfaces”, CSAR Seminar, 12:00 Noon, Wednesday, April 19, 2006, 2240 DCL.

Edward Seidel, Louisiana State University, “Dynamic Applications on Grids”, NCSA Seminar, 1:00 P.M., Tuesday, April 18, 2006, 1122 NCSA.

John Drake, Oak Ridge National Laboratory, “Simulation of Climate and Development of Earth System Models”, CSE Symposium Keynote, 3:00 P.M., Thursday, April 13, 2006, 2240 DCL.

William Gropp, Argonne National Laboratory, “Overcoming the Barriers to Sustained Petaflop Performance”, CSE Symposium Keynote, 9:00 A.M., Thursday, April 13, 2006, 2240 DCL.

Henry Tan, UIUC/MIE, “Stability of Interface Debonding in Particulate Composite Materials”, CSAR Seminar, 12:00 Noon, Wednesday, April 12, 2006, 2240 DCL.

Pavel Bochev, Sandia National Laboratories, “Mimetic Discrete Models with Weak Material Laws, or Least Squares Principles Revisited”, Applied Math Seminar, 3:00 P.M., Monday, April 10, 2006, 3405 SC.

William Camp, Sandia National Laboratories, “Some Thoughts About the Physics of Computing and the Computing of Physics”, CS Seminar, 3:00 P.M., Thursday, April 6, 2006, 2405 SC.

Scott Stewart, UIUC/MIE, “Multi-Material Modeling of High Explosive Systems”, Combustion Symposium, 3:05 P.M., Monday, March 13, 2006, 3405 SC.

Joseph Powers, University of Notre Dame, “Mathematical Simulation of Detonation”, Combustion Symposium, 2:20 P.M., Monday, March 13, 2006, 3405 SC.

William Phillips, UIUC/TAM, “Unsteady Boundary Layers of Finite Extent”, Combustion Symposium, 1:45 P.M., Monday, March 13, 2006, 3405 SC.

David Mikolaitis, University of Florida, “A Differential Algebraic Equation with Application to Low Speed Aerodynamics”, Combustion Symposium, 9:50 A.M., Monday, March 13, 2006, 3405 SC.

Ashwani Kapila, Rensselaer Polytechnic Institute, “Diffracting Detonations”, Combustion Symposium, 9:15 A.M., Monday, March 13, 2006, 3405 SC.

Saikrishna Marella, University of Iowa, “A Parallelized Sharp-Interface, Fixed Grid Method for Moving Boundary Problems”, CSAR Seminar, 12:00 Noon, Monday, March 6, 2006, 2240 DCL.

Krishnan Mahesh, University of Minnesota, “Simulating Turbulent Flows in Complex Geometries”, MIE Seminar, 12:00 Noon, Thursday, March 2, 2006, 2005 MEL.

Steven F. Son, Los Alamos National Laboratory, “Some Examples of Advanced Energetic Material Combustion”, CSAR Seminar, 12:00 Noon, Wednesday, February 22, 2006, 2240 DCL.

Scott MacLachlan, University of Minnesota, “Coarsening in Adaptive Algebraic Multigrid”, CSE/CS/Applied Math Seminar, 12:00 Noon, Monday, February 20, 2006, 2405 SC.

Yiguang Ju, Princeton University, “Challenges of Combustion in Supersonic and Microscale Propulsion”, MIE Seminar, 4:00 P.M., Tuesday, January 31, 2006, 2005 MEL.

Anil Hirani, UIUC/CS, “Dynamical Systems and Space Mission Design”, AE Seminar, 4:00 P.M., Monday, January 30, 2006, 103 Talbot Lab.

Michael Heath, UIUC/CS, “Integrated Simulation of Solid Propellant Rockets”, AE Seminar, 4:00 P.M., Monday, January 23, 2006, 103 Talbot Lab.

Roman Arciniega, Texas A&M University, “Tensor-Based Finite Element Model for the Nonlinear Analysis of Shell Structures”, CSAR Seminar, 11:00 A.M., Thursday, January 19, 2006, 2240 DCL.

Alan Sussman, University of Maryland, “Software Tools to Support Computational Science”, ECE Seminar, 2:00 P.M., Tuesday, January 17, 2006, 50 Everitt Lab.

- Rajesh Kitey, Auburn University, “Role of Microstructure on Fracture Behavior of Particulate Composites: Toughening Mechanisms Investigation Using Optical and Boundary Element Method”, CSAR Seminar, 10:00 A.M., Wednesday, December 21, 2005, 2240 DCL.
- Phani Kumar and V.V. Nukala, Oak Ridge National Laboratory, “Statistical Physics of Fracture”, MCC Seminar, 1:30 P.M., Thursday, December 15, 2005, 201 MRL.
- Farid Abed, Louisiana State University, “Physically Based Multiscale Viscoplastic Model for Metals and Steel Alloys: Theory and Computation”, CSAR Seminar, 10:00 A.M., Wednesday, December 14, 2005, 2240 DCL.
- C. T. Liu, Southern Illinois University at Carbondale, “Multi-Scale Approach to Investigate the Tensile and Fracture Behavior in Solid Propellants”, CSAR Seminar, 12:00 Noon, Wednesday, December 7, 2005, 2240 DCL.
- Moshe Matalon, Northwestern University, “The Development of Hydrodynamically Unstable Flames”, MIE Seminar, 3:00 P.M., Monday, December 5, 2005, 2005 MEL.
- Luke Olson, UIUC/CS, “A High-Order Mess”, CS Colloquium, 4:00 P.M., Monday, November 28, 2005, 1404 SC.
- Graham Candler, University of Minnesota, “Development of a Parallel Unstructured CFD Code and Application to Inward-Turning Hypersonic Inlets”, AE Seminar, 4:00 P.M., Monday, November 14, 2005, 103 Talbot Lab.
- Richard B. Lehoucq, Sandia National Laboratories, “Numerical Methods (and Some Analysis) for Materials Science Applications”, CSE/CSAR Seminar, 3:00 P.M., Wednesday, November 9, 2005, 2240 DCL.
- Richard B. Lehoucq, Sandia National Laboratories, “Multilevel Methods for Eigenspace Computations in Structural Dynamics”, CSE/CSAR Seminar, 12:00 Noon, Wednesday, November 9, 2005, 2240 DCL.
- Marc Garbey, University of Houston, “A Domain Decomposition Method to Compute PDEs on the Grid”, Applied Math Seminar, 3:00 P.M., Monday, November 7, 2005, 2005 MEL.
- Paul F. Fischer, Argonne National Laboratory, “Spectral Elements 101”, CSE/CSAR Seminar, 12:00 Noon, Wednesday, November 2, 2005, 2240 DCL.
- Timothy J. Tautges, Sandia National Laboratories, “Geometry and Mesh Components for Component-Based Scientific Computing”, CSE/CSAR Seminar, 12:00 Noon, Tuesday, November 1, 2005, 2240 DCL.
- Stephen Vavasis, Cornell University, “Near Linear Time Solution of Elliptic Differential Equations Using Support-Graph Preconditioners”, CS Colloquium, 10:00 A.M., Wednesday, October 26, 2005, 2405 SC.
- Ted Belytschko, Northwestern University, “Computational Fracture from the Nano-Scale to the Macro-Scale”, CEE Seminar, 4:00 P.M., Monday, October 10, 2005, Beckman Auditorium.
- Jerrold Marsden, California Institute of Technology, “Geometric Fluid Mechanics: Lagrangian Coherent Structures and Swimmers”, Soo Lecture, 4:00 P.M., Thursday, October 6, 2005, Beckman Auditorium.