

5. Education and University Integration

The Center has had a major impact on the university 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 twenty new professional staff and postdoctoral associates, 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 (Table 5.1).

The Center spans twelve departments, 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 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. By virtue of this experience, the students we train are already attuned to the needs of interdisciplinary collaboration. The level of involvement by undergraduates has been limited in Year 1, but we are beginning to involve undergraduates, especially in laboratory environments.

The Center has generally 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 houses the Center administratively. The computationally-oriented, interdisciplinary educational program provided by CSE fits perfectly with the needs of the Center, 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



Fig. 5.1. Seminars are important for sharing “rocket science” across disciplines.

master both applied and computational disciplines, which is just what we need for work in the Center.

Table 5.1
1997-98 CSAR Seminars

Marianne Winslett and Yong Cho, UIUC/CS, "Speeding up Your Rocket Simulation: The Panda Parallel I/O Library in Action," CSAR Noon Seminar, 12:00, Wednesday, September 30, 1998, 2240 DCL.

Charles Merkle, University of Tennessee Space Institute, "The Role of Physics in the Convergence of Computational Algorithms," AAE Seminar, 4:00 P.M., Monday, September 28, 1998, 103 Talbot Lab.

Peter Vorobieff, Los Alamos National Laboratory, "Fluid Instabilities and Turbulence: Some Experimental Results," TAM Seminar, 10:30 A.M., Thursday, September 24, 1998, 100H Talbot Lab.

Gary Flandro, University of Tennessee Space Institute, "Effects of Vorticity on Rocket Motor Internal Ballistics," CSAR Seminar, 12:00, Wednesday, September 23, 1998, 2240 DCL.

H. G. Georgiadis, National Technical University of Athens, Greece, "Transient Thermo-Elastodynamic Analysis of Crack Problems," MIE Seminar, 4:00 P.M., Tuesday, September 22, 1998, 218 MEB.

Changyu Hwang, Cornell University, "On the Virtual Crack Extension Method for Calculating Derivatives of Energy Release Rate in Two and Three Dimensions," CSAR Seminar, 12:00, Wednesday, September 16, 1998, 2240 DCL.

Michael Heath, UIUC/CS, "Computational Science and Engineering at UIUC," CSAR Seminar, 12:00, Wednesday, September 9, 1998, 2240 DCL.

Steve Lumetta, UIUC/ECE, "Generalizing High-Performance Communication," Computer Systems Seminar, 4:00 P.M., Tuesday, September 8, 1998, B02 CSRL.

Vladimir Rokhlin, Yale University, "Higher Order Methods, Adaptive Techniques, and Real World Problems," Special Seminar, 3:00 P.M., Friday, September 4, 1998, B02 CSRL.

Matthew G. Knepley and Vivek Sarin, Purdue University, "Parallel Simulation of Particulate Flows," NCSA Seminar, 2:00 P.M., Thursday, September 3, 1998, 5239 BI.

Richard Saurel, Universite de Provence (Marseille), "Models and Methods for Compressible Multifluid and Multiphase Flows," CSAR Seminar, 3:00 P.M., Friday, August 21, 1998, 2240 DCL.

Video Presentation, "Opening New Frontiers: We Deliver," CSAR Noon Seminar, 12:00, Wednesday, August 19, 1998, 2240 DCL.

Video Presentation, "Rocketships," CSAR Noon Seminar, 12:00, Wednesday, August 12, 1998, 2240 DCL.

Video Presentation, "The Dream Is Alive: A Window Seat on the Space Shuttle," CSAR Noon Seminar, 12:00, Wednesday, July 29, 1998, 2240 DCL.

Eric Daniel, Universite de Provence (Marseille), "Modeling of Unsteady Two-Phase Dilute Flows in a Solid Rocket Motor with Eulerian Methods," CSAR seminar, 10:00 A.M., Friday, July 17, 1998, 1310 DCL.

Video Presentation, "Rockets and Missiles," CSAR Noon Seminar, 12:00, Wednesday, July 15, 1998, 2240 DCL.

Eric de Sturler, Swiss Center for Scientific Computing, ETH Zurich, "High Performance Fortran for Regular, Block-Structured, and Irregular Grid-Based Applications," CSAR seminar, 10:00 A.M., Thursday, July 9, 1998, 2240 DCL.

Video Presentation, "Extreme Machines: Spaceplanes," CSAR Noon Seminar, 12:00, Wednesday, July 8, 1998, 2240 DCL.

Video Presentation, "Rockets! Man in Space," CSAR Noon Seminar, 12:00, Wednesday, July 1, 1998, 2240 DCL.

Video Presentation, "Rockets! Missiles of the Cold War," CSAR Noon Seminar, 12:00, Wednesday, June 24, 1998, 2240 DCL.

Video Presentation, "Rockets! The Vengeance Weapon," CSAR Noon Seminar, 12:00, Wednesday, June 17, 1998, 2240 DCL.

Video Presentation, "Rockets! First Steps to the Stars," CSAR Noon Seminar, 12:00, Wednesday, June 10, 1998, 2240 DCL.

Sam Midkiff, IBM T.J. Watson Research Center, "From Flop to Megaflops: Java for Technical Computing," CS/CSAR Seminar, 4:00 P.M., Thursday, June 4, 1998, 2240 DCL.

John Gustafson and Don Heller, Ames Laboratory, Iowa State University, "HINT, NetPIPE, and More," NCSA Seminar, 2:00 P.M., Wednesday, June 3, 1998, 5239 BI.

Video Presentation, "Extreme Machines: Rockets," CSAR Noon Seminar, 12:00, Wednesday, June 3, 1998, 2240 DCL.

Peter Brezany, University of Vienna, Parallel Input/Output Support for High Performance Fortran Programming Environments, CS/CSAR Seminar, 4:00 P.M., Monday, June 1, 1998, 2240 DCL.

Sharath Girimaji, ICASE, "Low-Dimensional Manifolds in Reacting Systems: Reduction of Chemical Kinetics and Temperature-Species Correlation Modeling," TAM/CSAR Seminar, 4:00 P.M., Thursday, May 28, 1998, 103 Talbot Lab.

Sunil Dwivedi, Purdue University, "Large Deformation Finite Element and Contact Analysis," CSAR Seminar, 4:00 P.M., Thursday, May 21, 1998, 2117 Newmark Lab.

Jeff Erickson, Duke University, "Kinetic Data Structures for Collision Detection," CS Seminar, 10:30 A.M., Thursday, May 21, 1998, 2240 DCL.

Philip Papadopoulos, Oak Ridge National Laboratory, "HARNES: Heterogeneous Adaptable Reconfigurable NETworked SystemS, the Next Step Beyond PVM," CS Seminar, 1:00 P.M., Monday, May 11, 1998, 2240 DCL.

Mark Short, UIUC/TAM, "Ignition of a Non-Uniformly Perturbed Reactive Fluid Flow," TAM/CSAR Seminar, 4:00 P.M., Wednesday, May 6, 1998, 103 Talbot Lab.

Harry Hilton, UIUC/AAE, "Nonlinear Viscoelastic Characterization and Failure Analysis of Solid Propellants and Composite Cases," CSAR Noon Seminar, 12:00, Wednesday, May 6, 1998, 2240 DCL.

Stanley Osher, UCLA, "Subscale Capturing and Its Numerous Applications," CS/CSE Colloquium, 4:00 P.M., Monday, May 4, 1998, 1310 DCL.

Ron Fedkiw, UCLA, "Advances in Level Set Techniques," CSAR Seminar, 2:00 P.M., Monday, May 4, 1998, 100H Talbot Lab.

Stephen Guarini, Stanford University, "Direct Numerical Simulation of Supersonic Turbulent Boundary Layers," CSAR Seminar, 2:00 P.M., Friday, May 1, 1998, 3211 DCL.

Sandip Ghosal, Los Alamos National Laboratory, "Asymptotic Theory of Triple Flames," TAM/CSAR Seminar, 4:00 P.M., Wednesday, April 29, 1998, 103 Talbot Lab.

Paul Saylor, UIUC/CS, "Coping with Milestone Panic: Experience with a Large Computational Science Project," CSAR Noon Seminar, 12:00, Wednesday, April 29, 1998, 2240 DCL.

Fred Culick, Caltech, "Some Nonlinear Problems of Combustor Dynamics," AAE Seminar, 4:00 P.M., Monday, April 27, 1998, 103 Talbot Lab.

Edgardo Ramirez, Virginia Tech, "Finite Element Methods for Parameter Identification Problems of Linear and Nonlinear Steady-State Diffusion Equations," CSAR Seminar, 4:00 P.M., Thursday, April 23, 1998, 2501 DCL.

Robert Moser, UIUC/TAM, "Reliable Large Eddy Simulations," CSAR Noon Seminar, 12:00, Wednesday, April 22, 1998, 2240 DCL.

Tony Chan, UCLA, "Nonlinear PDE Models in Image Processing," CSE Symposium, 3:00 P.M., Friday, April 17, 1998, B02 CSRL.

John Gustafson, Ames Laboratory, Iowa State University, "Experimentless Science," CSE Symposium, 10:00 A.M., Friday, April 17, 1998, B02 CSRL.

Dennis Parsons, UIUC/CE, "Multi-Grid Methods: The Future?," CSAR Noon Seminar, 12:00, Wednesday, April 15, 1998, 2240 DCL.

Forman Williams, University of California at San Diego, "Evolving Applications of Combustion Theory," Distinguished Lecture, 11:00 A.M., Tuesday, April 14, 1998, Beckman Auditorium.

David Padua, UIUC/CS, "Compiler Technology and the Shared-Memory Programming Model," CSAR Noon Seminar, 12:00, Wednesday, April 8, 1998, 2240 DCL.

Richard A. Yetter, Princeton University, "Fundamental Studies Towards the Development of a Metalized Propellant Combustion Model," MIE Seminar, 4:00 P.M., Tuesday, April 7, 1998, 218 MEB.

Marianne Winslett, UIUC/CS, "Parallel I/O Part II: Panda Library," CSAR Noon Seminar, 12:00, Wednesday, April 1, 1998, 2240 DCL.

Marianne Winslett, UIUC/CS, "Parallel I/O Part I: The Issues," CSAR Noon Seminar, 12:00, Wednesday, March 18, 1998, 2240 DCL.

Ioannis T. Georgiou, Naval Research Laboratory, "Advanced Computational and Geometric Reduction Methods for Coupled Structures," MIE Seminar, 4:00 P.M., Wednesday, March 11, 1998, 218 MEB.

Robert Fiedler, UIUC/CSAR, "Strategies for Developing MPI Based Parallel Codes," CSAR Noon Seminar, 12:00, Wednesday, March 11, 1998, 2240 DCL.

Quinn Brewster, UIUC/MIE, "Models for Burning of Solid Propellants," CSAR Noon Seminar, 12:00, Wednesday, March 4, 1998, 2240 DCL.

Gene Golub, Stanford University, "Scientific Computing and Cyclic Reduction," CS/Math Colloquium, 4:00 P.M., Tuesday, March 3, 1998, 3rd Floor Auditorium, Altgeld Hall.

Michael Mascagni, University of Southern Mississippi, "SPRNG: A Scalable Library For Pseudorandom Number Generation" NCSA Seminar, 2:00 P.M., Monday, March 2, 1998, 4269 BI.

Steven Huss-Lederman, University of Wisconsin, "Strassen's Algorithm: A Practical Method for Fast Matrix Multiplication," CSAR/NCSA Seminar, 10:30 A.M., Friday, February 27, 1998, 3269 BI.

Sanjay Kale, UIUC/CS, "Parallel Programming with Objects and Threads," CSAR Noon Seminar, 12:00, Wednesday, February 25, 1998, 2240 DCL.

Vigor Yang, Pennsylvania State University, "Nonsteady Combustion of Solid Propellants in Rocket Propulsion Systems," MIE/CSAR Seminar, 4:00 P.M., Tuesday, February 24, 1998, 218 MEB.

Arif Karabeyoglu, Stanford University, "Transient Combustion in Hybrid Rockets," CSAR Seminar, 2:00 P.M., Friday, February 20, 1998, 2240 DCL.

Robert Haber, UIUC/TAM, "An Introduction to Space-Time Finite Elements," CSAR Noon Seminar, 12:00, Wednesday, February 18, 1998, 2240 DCL.

Rudolf Eigenmann, Purdue University, "Performance Evaluation and Benchmarking with Large-Scope Applications," NCSA Seminar, 2:00 P.M., Friday, February 13, 1998, 5239 BI.

Michael Heath, UIUC/CS, "Overview of Parallel Computing," CSAR Noon Seminar, 12:00, Wednesday, February 11, 1998, 2240 DCL.

Video Presentation, "Extreme Machines: Rockets," CSAR Noon Seminar, 12:00, Wednesday, February 4, 1998, 2240 DCL.

Kate Keahey, Indiana University and Los Alamos National Laboratory, "PARDIS: An Architecture for Application-Level PARallel DIStributed Computation," CS Colloquium, 4:00 P.M., Monday, February 2, 1998, 1310 DCL.

Randall Bramley, Indiana University, "The Linear System Analyzer Project," NCSA/CSAR Seminar, 11:00 A.M., Friday, January 30, 1998, 5239 BI.

William Humphrey, Los Alamos National Laboratory, "Object-Oriented Scientific Application Development Using the POOMA Framework," CSAR Seminar, 2:00 P.M., Tuesday, January 20, 1998, 2240 DCL.

Carter Edwards, University of Texas at Austin, "A Parallel Infrastructure for Scalable Adaptive Finite Element Methods," CSAR Seminar, 3:00 P.M., Friday, January 9, 1998, 2240 DCL.

Fady Najjar, UIUC/NCSA, "A Perspective on High-Performance Computing for DNS/LES Computations," CSAR Seminar, 11:00 A.M., Thursday, January 8, 1998, 2240 DCL.

Hong Yi, Carnegie-Mellon University, "Mixed Boundary Element Method -- Theory and Applications in Solid Mechanics," CSAR Seminar, 2:00 P.M., Saturday, December 6, 1997, 2117 Newmark Lab.

Amit Acharya, HKS Inc., "Recent Developments in Nonlinear Shell Elements and Non-Local Plasticity Models," CSAR Seminar, 11:00 A.M., Friday, December 5, 1997, 111K Talbot Lab.

Herman Krier, UIUC/MIE, "Rocket Science 101: Fundamentals of Solid Propellant Rocketry," CSAR Seminar, 4:00 P.M., Wednesday, December 3, 1997, Student Commons, Grainger Engineering Library.

Suvas Vajracharya, University of Colorado, "Runtime Optimization for Locality and Parallelism," CSAR Seminar, 3:30 P.M., Monday, December 1, 1997, 2222 DCL.

Robert Fiedler, Hewlett-Packard, "Optimization and Scaling of Shared-Memory and Message-Passing Implementations of the ZEUS Hydrodynamics Algorithm," CSAR Seminar, 4:00 P.M., Tuesday, November 25, 1997, 2240 DCL.

Keshav Pingali, Cornell University, "Data-Centric Compilation: A New Approach to Program Restructuring," CSAR/DCS Seminar, 4:00 P.M., Monday, November 24, 1997, 1310 DCL.

Xiaogang Li, Algor Inc., "Some Effective Solution Methods in Numerical Simulation by Finite Element Methods," 2:00 P.M., Saturday, November 22, 1997, 2117 Newmark Lab.

Jay Hoeflinger, UIUC/CS, "The Story of Polaris: Computer Science Meets Experimental Science," CSAR Seminar, 1:00 P.M., Monday, November 17, 1997, 2240 DCL.

Zhiqiang Cai, Purdue University, "First-Order System Least Squares (FOSLS) for Partial Differential Equations," CSAR/CSE Seminar, 4:00 P.M., Wednesday, November 12, 1997, 2240 DCL.

Alan Davies, University of Hertfordshire, "Developments in Parallel Boundary Element Methods," CSAR/AAE Seminar, 10:00 A.M., Wednesday, November 12, 1997, 2240 DCL.

Matthew Pierce, Boeing, "Numerical Optimization: Applications to Wing Design," CSAR Seminar, Friday, November 7, 1997, 1:00 P.M., 2240 DCL.

Paul Petersen, Kuck and Associates, "Language Extensions for Multiprocessors," CSAR/DCS Seminar, 4:00 P.M., Thursday, November 6, 1997, 1310 DCL.

David Greenberg, Sandia National Laboratories, "Computational Plant," CSAR/DCS Seminar, 4:00 P.M., Monday, November 3, 1997, 1310 DCL.

Peter Raboin, Lawrence Livermore National Laboratory, "Structural Mechanics Code Development at LLNL," 4:00 P.M., Monday, November 3, 1997, 1520 Hydrosystems Lab.

Guoyu Lin, Technical University of Hamburg, "Numerical Investigation of Crack Growth Behavior Using a Cohesive Zone Model," CSAR Seminar, 11:00 A.M., Friday, October 31, 1997, 1102 DCL.

Michael Heath, UIUC/CS, "Rocket Science Meets Computer Science," Computer Science Colloquium, 4:00 P.M., Monday, October 27, 1310 DCL.

Michael Wolfe, The Portland Group, "Parallel Programming with High Performance Fortran," CSAR/DCS Seminar, 4:00 P.M., Thursday, October 23, 1997, 1310 DCL.

Dennis Gannon, Indiana University, "High-Performance C++ for Scientific Applications," CSAR/DCS Seminar, 3:00 P.M., Monday, October 20, 2501 DCL.

Noel Nachtigal, Oak Ridge National Laboratory, "Iterative Methods for Nonsymmetric Linear Systems," CSAR/CSE Seminar, 2:00 P.M., Friday, October 10, 2240 DCL.

Michael Heath, UIUC/CS, "VR: Virtual Rocketry?," Computer Systems Seminar, 4:00 P.M., Tuesday, September 16, B02 CSRL.