ADTSC Science Highlights 2009

Associate Directorate for Theory, Simulation, and Computation

Preface

The Theory, Simulation, and Computation (TSC) Directorate is central to the huge national need for new generations of ideas, concepts, and methodologies to improve the fidelity, reliability, certainty and usability of tools to guide and interpret experiments, and provide prediction and control for complex phenomena and systems: the "Information Science and Technology" capability between data and prediction. Working with teams across the Laboratory, TSC undertakes major interdisciplinary challenges of integrating theory, modeling, simulation, high-performance computing, and visualization with experimental and other data to expand LANL's predictive and uncertainty quantification capability. The core nuclear weapons program depends critically on the viability of this approach. However, virtually every emerging mission initiative at LANL also relies centrally on a similar integrated capability: threat reduction, energy security, manufacturing science, and many discipline frontiers from biology to materials science to cosmology.

Each year, TSC staff select a collection of brief topical reports on their recent research results. This annual collection is not intended to be complete. Rather it aims to demonstrate, through timely examples, the interdisciplinary energy and progress across many scientific and program frontiers. The collection chosen this year represents work for the National Nuclear Security Administration and also presents examples from our "work with others" portfolio. This collection is representative of our outreach activities to universities, industry, and other research laboratories, and is a basis for providing the best science and scientists to both current and future national security missions at LANL.

Alan R. Bishop
Associate Director, Theory, Simulation, and Computation Directorate

Alan R. Bishop
Associate Director

Paul J. Dotson
Deputy Associate Director

Andrew B. White
Deputy Associate Director for High-Performance Computing

Audrey L. Archuleta
ADTSC Chief of Staff

Stephen R. Lee
CCS Division Leader

John F. Morrison
HPC Division Leader

Antonio Redondo
T Division Leader

Publications Team

Susanne King,
Kathy Pallis
Editors

Sharon Mikkelson
Design and Coordination

Guadalupe D. Archuleta
Print Coordinator

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Applied Physics Division
X-1 Applied Science and Methods Development
X-1-NAD Nuclear Atomic and EOS Data
X-3-MA Methods and Algorithms
X-4-PC Predictive Capability

Bioscience Division
B-7 Biosecurity and Public Health Group

Computer, Computational, and Statistical Sciences Division
CCS-2 Computational Physics and Methods Group
CCS-3 Information Sciences Group
CCS-6 Statistical Sciences Group

Decision Applications Division
D-4 Energy and Infrastructure Analysis Group
D-6 Risk Analysis and Decision Support Systems

Dynamic and Energetic Materials Division
DE-6 Explosive Applications and Special Projects

High Performance Computing Division
HPC-1 Scientific Software Engineering
HPC-2 Computing Operations and Support
HPC-3 High Performance Computing Systems
HPC-5 System Integration
HPC-DO High Performance Computing Division Office

International, Space & Response Division
ISR-1 Space Science and Applications

Los Alamos Institutes
INST-OFF Engineering Institute

Los Alamos Neutron Science Center
LANSCE-NS Los Alamos Neutron Science Center-Nuclear Science
LANSCE-WNR Los Alamos Neutron Science Center-Weapons Neutron Research

Materials Science and Technology Division
MST-8 Structure/Property Relations Group

Physics Division
P-21 Applied Modern Physics Group

Science and Technology Base Program Office
STBPO-RL Science and Technology Base Program Office-Research Library

Theoretical Division
T-1 Physics and Chemistry of Materials
T-2 Nuclear and Particle Physics, Astorphysics & Cosmology
T-3 Fluid Dynamics and Solid Mechanics
T-4 Physics of Condensed Matter and Complex Systems
T-5 Applied Mathematics and Plasma Physics
T-6 Theoretical Biology and Biophysics
CNLS Center for Nonlinear Studies

Theory, Simulation and Computation Directorate
ADTSC

ANL	**Argonne National Laboratory**
DoD	**Department of Defense**
DOE	**Department of Energy**
LANL	**Los Alamos National Laboratory**
LLNL	**Lawrence Livermore National Laboratory**
NASA	**National Aeronautics and Space Administration**
NNSA	**National Nuclear Security Adminstration**
ORNL	**Oak Ridge National Laboratory**
PNNL	**Pacific Northwest National Laboratory**
SNL	**Sandia National Laboratories**
UK	**(United Kingdom)**