The University of Georgia

Study Physics in a Stimulating Environment:

GRADUATE STUDIES IN COMPUTATIONAL PHYSICS

The Doctoral and Masters Program
Center for Simulational Physics
The University of Georgia (UGA)
Athens, GA USA

The Center for Simulational Physics

The Center for Simulational Physics is unique in its approach to the investigation of physical systems. Many fascinating physical phenomena defy analysis by traditional approaches, particularly near phase transitions and in strongly interacting many-body systems. The Center for Simulational Physics makes extensive use of state-of-the-art computers to develop and solve models that mimic observed behavior and incorporate theory. The result is a realistic description of the behavior of materials and phenomena that cannot otherwise be measured or observed in detail.

AREAS OF STUDY

Magnetic phase transitions and excitations
Surfaces and interfaces: Structures and transitions
Gas-surface and gas-phase interactions
Order-disorder properties of semiconductor alloys
Strongly interacting quantum many-body systems
Polymers / biopolymers
Nanocrystals and clusters
Astrophysical hydrodynamics and interstellar medium
Computational atomic and molecular astro-physics
Bioinformatics and Computational Biophysics
Quantum simulation

TECHNIQUES AND FACILITIES

Research carried out in the Center for Simulational Physics spans a vast range of length and time scales, from the microscopic to the cosmological. This versatility is the hallmark of computer simulation techniques. Computational methods used in the Center include Monte Carlo, Monte Carlo renormalization group, spin dynamics, molecular dynamics, density functional theory, close-coupling theory and hydrodynamics. Research focuses on both the application of computer simulation techniques to investigate the properties of physical systems, as well as the development of advanced analytical techniques and computational algorithms designed to enhance the efficiency and predictive power of the simulations. The extensive computing facilities available to the Center for Simulational Physics include Xeon systems with dual 16-core CPU's and 116 Tbyte of network storage, 4 GPU compute nodes, and network access to the central high performance facilities operated by the Georgia Advanced Computing Resource Center (GACRC). Two Linux clusters are available with a total core count of approximately 10,000 compute-cores. In addition to conventional compute nodes, each cluster has several large memory and GPU specific nodes. Some are connected by an InfiniBand enterprise switch. High-performance 156TB storage for the Linux clusters is provided for users' home directories and temporary scratch space. Slower storage resources are available for long-term project needs. GACRC also offers consulting, algorithm development and training workshops. Close cooperation between the Center for Simulational Physics and GACRC encourages the incorporation of a variety of advanced computational techniques.

EDUCATIONAL OPPORTUNITIES

The Ph.D. program offers broad training. Graduate courses have been designed to give detailed instruction in computer simulation in physics with insight into the development of algorithms for physical problems for which no theory or experiment exists. The Center for Simulational Physics has also organized collaborative research programs with major institutions in the United States, South America, and Europe. The Center organizes an annual Workshop on *Recent Developments in Computer Simulation Studies in Condensed Matter Physics*. Frequent seminars focus on the latest research and introduce some of the world's finest minds in simulational physics and related areas. Students are provided ample opportunity to participate in national and international meetings.

FINANCIAL SUPPORT

The Center for Simulational Physics and the Department of Physics & Astronomy offer full financial support to qualified applicants in the form of Research and Teaching Assistantships. Exceptionally qualified applicants may receive competitive UGA Graduate Assistantships.

ACADEMIC & URBAN ENVIRONMENT

UGA is one of the major research universities in the Southeast, offering a broad range of programs to an enrollment of over 34,000 students. Conveniently situated 60 miles from Atlanta and within driving distance of both mountains and ocean, Athens is far enough north to have four distinct seasons. Athens combines a pleasant, Southern small-town atmosphere with the sophistication of a major university, and features a lively cultural scene in music, theater, visual arts and literature.

FACULTY

D. P. Landau (Director), Ph.D. Yale U., 1967. Phase transitions, adsorbed monolayers, biopolymers, materials science.
H.-B. Schüttler, Ph.D. UCLA, 1984. Correlated fermion and quantum spin models, bioinformatics and functional genomics.
S. P. Lewis, Ph.D. U. of California–Berkeley, 1993. Density functional theory, gas-surface interactions, nanocrystal
P. C. Stancil, Ph.D. Old Dominion U. 1994. Computational atomic and molecular astrophysics.
R. L. Shelton, Ph.D. U. of Wisconsin, 1996. Computational astrophysics (fluid dynamics and spectral calculations).
M. Bachmann, Ph.D. Freie U. of Berlin, 2001. Molecular biophysics, polymers, statistical physics.
R. Buenker (adjunct) Ph.D. Princeton U., 1966. Theoretical chemistry, molecular electronic states and properties.
K. Binder (adjunct), Ph.D. Tech. U. of Vienna, 1969. Polymers, spinodal decomposition, bulk and surface phase transitions.
R. H. Swendsen (adjunct), Ph.D. U. of Pennsylvania, 1971. Monte Carlo methods, phase transitions and critical phenomena.
D. C. Rapaport (adjunct), Ph.D. U. of London, 1972. Molecular dynamics, granular flow, self-assembly, visualization.
D. Nicholson (adjunct) Ph.D. Brandeis U., 1982. Theoretical condensed matter, multiple scattering theory, atomic level stress.
J. Plascak (adjunct) Ph.D. U. Fed. De Minas Gerais, 1982. Phase transitions and critical phenomena in classical spin systems.
W. Janke (adjunct) Ph. D. Freie U. of Berlin, 1985. Computational statistical physics, spin systems, polymers.
S.-H. Tsai (adjunct/GACRC), Ph.D. State U. of New York–Stony Brook, 1998. Phase transitions and critical phenomena.
T. Wüst (adjunct) Ph.D. U. of Bern, 2005. Monte Carlo methods, high-performance computing, polymers and proteins.

FOR FURTHER INFORMATION

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