Carlo simulation of lattice spin models of magnetic materials, using large parallel computers. The work concentrated mainly on the investigation of new cluster update algorithms, and in particular the measurement of dynamical critical exponents for Potts models. A major part of this work was the implementation of cluster algorithms on distributed memory parallel computers. This involved the development and implementation of parallel algorithms for connected component labeling, for both SIMD and MIMD machines. The machines used include the nCUBE/10, Symult 2010, Meiko Computing Surface, and DAP.

August 1990 — August 1992

Research Associate in the Physics Department at Syracuse University, affiliated with the Northeast Parallel Architectures Center. I continued the investigation of cluster Monte Carlo algorithms for lattice spin models, and in particular attempts to find algorithms for frustrated systems and spin glasses. An interactive graphical environment to help in visualizing different spin models and algorithms was developed. I continued to develop new component labeling algorithms for parallel computers, and used them to implement cluster algorithms on MIMD machines such as the nCUBE-2 and Intel Touchstone Delta, as well as massively parallel SIMD machines such as the CM-2. Other projects included the simulation of string theories of quantum gravity using dynamically triangulated random surfaces, rewriting programs in different sequential and parallel languages for a language benchmark suite to help the development of Fortran D and High Performance Fortran, and an investigation into the use of distributed networks of workstations for parallel computing.

September 1992 — present

Research Scientist at the Northeast Parallel Architectures Center at Syracuse University. Projects include a study of the use of parallel computing in the power utility industry. This involves porting existing code to parallel computers, and developing parallel algorithms for sparse matrix computations and differential algebraic equation solvers. I have also continued the study and development of parallel algorithms for component labeling and the simulation of dynamically triangulated random surfaces.

RESEARCH INTERESTS AND EXPERIENCE

Summer 1981/82

Summer student at The Australian National University in Canberra, working on the theory of mirror charges in metals.

Summer 1982/83

Summer student at Monash University, Melbourne, writing programs for the study of renormalization group transformations in solid state physics.

October 1983 — January 1988

Postgraduate research in lattice gauge theory at the University of Southampton. Studies were made of the finite temperature deconfinement transitions in 3-dimensional U(1) and SU(2) lattice gauge theories, and using gauge fixing to study the behaviour of the lattice photon propagator in Landau gauge across the zero temperature phase transition of lattice QED. The work was done using a massively parallel computer, the Distributed Array Processor (DAP).

October 1986 — September 1987

Research Assistant in the Physics Department at the University of Southampton, investigating the applications of transputer arrays to lattice gauge theory and solid state physics problems. Parallel programs were written for the study of the abelian lattice Higgs model, the XY model, and the quantum Hall effect, and run on a 32 transputer Meiko Computing Surface.

October 1987 — September 1988

Employed half-time as a Research Assistant at the University of Southampton, in the Concurrent Computation Group of the Department of Electronics and Computer Science, and half-time at the south-west regional Transputer Support Center, a campus affiliated center for teaching and consultancy on parallel programming using transputer arrays. Projects included parallel matrix algorithms, porting a sequential FORTRAN code modeling ocean current flow to a transputer array, writing and modifying demonstration programs incorporating computer graphics, and helping to set up and run the Transputer Support Center.

September 1988 — August 1990

Research Fellow in the Physics Department at the California Institute of Technology, working in the Caltech Concurrent Computation Group. My research was in the area of Monte