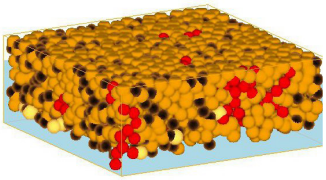
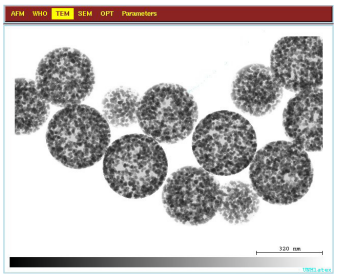
University of New Hampshire
Research

Advancing Excellence in Research, Scholarship, and Creative Activities

Research Computing Center: Advanced Data Processing and Statistical Analysis



Above: The Latex Paint Visualization was developed to aid researchers in understanding the behavior of latex paint particles and how they bind during the drying process. A greater understanding of the behavior of the particles allows researchers to experiment with manipulating the particles to create different varieties of latex paint.



Above: Kmorph image of a simulation of a Transmission Electron Microscope (TEM) micrograph.

Eqmorph and Kmorph (Don Sundberg, Yvon Durant, Ola Carlson, Jeff Stubbs, John Tsavalas): Eqmorph computes the equilibrium morphology of a two stage particle created by an emulsion polymerization. It relies on simple algebra and root finding techniques. Kmorph attemts to model the formation of a two stage particle over time. Early versions relied on large systems of coupled nonlinear ordinary differential equations. The modern version employs stochastic Monte-Carlo techniques. The graphic interface is heavily invested in the motif UID library.

Overview

The Research Computing Center (RCC) offers advanced data processing consultations and statistical analysis services to the UNH research community.

Profile

For over 35 years, Dr. Robert Carrier has worked with Research Computing to provide researchers with high-level scientific and mathematic solutions to a variety of complex problems. Dr. Carrier has contributed his rare talents to research projects spanning a variety of disciplines, a fraction of which are desribed below.

Collaboration Summaries

- **The Sea Bottom Layered Half-Space:** In conjunction with Musa Yildiz, Keifer Newman, and Al Magnuson, Dr. Carrier determined the intensity of reflected sound from the ocean bottom. This computation relied on contour integration in the complex plane and the eigen-solutions of a determinatal equation.
- **The Shell Model Code:** Developed with Jochen Heisenberg, this program calculates the nuclear energy transition energies of various heavy elements such as Thallium and Yttrium.
- **The Wave Channel:** Dr. Carrier worked with John McHugh to solve the Navier-Stokes equations for the fluid flow directions and surface height of a trough structure whose bottom and sides experience non-slip velocity conditions and whose exposed top's behavior is governed by pressure and surface tension. Solution by spectral method was appropriate. Trigonometric functions approximated the field in the long direction and Chebyshev polynomials in the lateral directions.
- **Project 54:** This segment of Project 54 was conducted with Kent Chamberlin and involved estimating the strength of signals emanating from FM transmission and transmitted over hilly terrain. The rough-cut estimate of this coverage was obtained through geometric optics.
- **Chaotic Oscillator:** Dr. Carrier collaborated with Professor Kevin Short to analyze speech and music via investigation of the trajectories generated by certain nonlinear differential equations (e.g. Grebogi). Professor Short won a Grammy Award for cleaning old Enrico Caruso recordings using these techniques.
- **Analysis of Ultra-Centrifuge Data:** In support of research done by Tom Laue and Richard Toth, Dr. Carrier devised a rational fraction approximation to data obtained through the transmission of light in a centrifuged sample cell in order to estimate the molecular weight of the quick-spun stuff.

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