1058-65-53 **Robert Krasny*** (krasny@umich.edu), Mathematics Department, 530 Church Street, University of Michigan, Ann Arbor, MI 48109-1043, and **Hualong Feng**, **Leon Kaganovskiy** and **Lei Wang**. *Some Recent Developments in Particle Methods.*

Particle methods are related to the Green's function approach for solving differential equations and they represent an alternative to the traditional methods of scientific computing such as finite-difference, finite-element, and spectral methods. Here some recent developments in particle methods will be discussed. First I'll present a treecode algorithm for multiquadric radial basis functions which reduces the operation count from $O(N^2)$ to $O(NlogN)$, where N is the number of nodes in the system. Our approach uses Cartesian Taylor expansions as opposed to the Laurent expansions used by previous investigators. Second I'll discuss Lagrangian particle simulations of vortex sheet roll-up in 3D fluid flow. The Lagrangian approach tracks the flow map and we employ special techniques such as kernel smoothing for stability, adaptive interpolation for accuracy, and a treecode for efficiency. We present simulations of vortex ring dynamics. (Received January 25, 2010)