Meeting: 1003, Atlanta, Georgia, SS 37A, AMS Special Session on In the Wake of Jacobi and Hamilton 200 Years Later, I

1003-37-815 **Wen-Xiu Ma*** (mawx@math.usf.edu), Department of Mathematics, University of South Florida, 4202 E Fowler Avenue, Tampa, FL 33620. *Symmetry Constraints and Liouville Integrability of Soliton Equations.*

A central problem in the study of integrability of nonlinear differential equations is to know which equations can be solved analytically and to develop appropriate solution techniques. The Liouville-Arnold theorem shows a case of integrability by quadratures (or so-called Liouville integrability) for ordinary differential equations (ODEs). Symmetry constraints pave a way to explore the Liouville integrability for a class of partial differential equations (PDEs), soliton equations, through relating PDEs to integrable ODEs. The results generalize the theory of finite-dimensional integrable stationary equations, suggesting the possibility of establishing a Liouville–Arnold theorem for infinite-dimensional Hamiltonian systems. Two illustrative examples in the talk are the multi-wave interaction equations and the multi-component AKNS equations. Symmetry constraints are presented to manipulate integrable transformations for the matrix spectral problems associated with these two systems of soliton equations. The resulting spatial and temporal constrained flows are shown to provide integrable decompositions for the two systems, yielding separation of variables for solving them, and thus, their Liouville integrability is exhibited through their constrained flows. (Received September 29, 2004)