1084-35-261 **Robert Buckingham***, Department of Mathematical Sciences, University of Cincinnati, PO Box 210025, Cincinnati, OH 45221-0025, and **Peter D. Miller**. *Painlevé functions and critical behavior in the sine-Gordon equation.*

The solution to a Cauchy problem for a nonlinear wave equation often exhibits two or more qualitatively different behaviors in different regions of space-time (such as having an oscillatory zone and a non-oscillatory zone). The boundaries between these regions may become well-defined in certain limits, such as small dispersion or short time. It is then natural to consider the transition behavior between the two regions. In the past three years, it has been discovered that for several equations, including the Kortweg-de Vries, nonlinear Schrodinger, and Camassa-Holm equations, that certain critical behavior can be described for wide classes of initial conditions in terms of Painlevé functions. These functions, which are solutions of nonlinear ordinary differential equations, seem to play a role for nonlinear equations analagous to the role played by the classical special functions for linear equations. We will discuss recent work with P. Miller using the Riemann-Hilbert approach on Painlevé-type asymptotics in solutions of the sine-Gordon equation, which in turn has led to a better understanding of interesting behavior of certain Painlevé II functions. (Received September 03, 2012)