Meeting: 1000, Albuquerque, New Mexico, SS 11A, Special Session on Nonlinear Partial Differential Equations Applied to Materials Science

1000-35-139 **Michal Kowalczyk*** (robusg@yahoo.com), Kent State University, Department of Mathematical Sciences, Kent, OH 44242. *Singular limits in the Liouville type equations.*

Equation

$$\Delta u + \varepsilon^2 e^{u} = 0$$

in two dimensions is one of the classical problems in nonlinear elliptic PDEs. In 1853 Liouville himself found explicit solutions to this equation in $\mathbb{R}^2$. It is also known that in bounded domains no solution exists if ε is sufficiently large. On the other hand as $\varepsilon \to 0$ it can be shown that in addition to the solution which approaches 0 (small solution) there exist solutions that blow up in the singular limit. Interestingly enough the number of such solutions and the location of their blow up points seem to be intimately related to the topology of the underlying domain.

Lately Liouville equation and other similar problems have received much attention due to their applications varying from the prescribed Gaussian curvature problem to the vortex solutions for Chern-Simons theory. In this talk I will try to give a review of some of those results. (Received August 23, 2004)