1023-35-755 **Sarah G Raynor*** (raynorsg@wfu.edu), Wake Forest University, Department of Mathematics, P.O.Box 7388, Winston Salem, NC. *Nonvariational Methods for Semilinear Elliptic Equations of Critical Growth.*

Nonlinear elliptic equations model a variety of physical applications. The particular equation in which I am interested is

$$\Delta u - \vec{c} \cdot \nabla u = \lambda u + g(x, \lambda)|u|^{p-2}u$$

where $\vec{c}$ is a constant vector, g is a continuous function, p is the critical Sobolev exponent $\frac{2N}{N-2}$, and $N \geq 3$ is the dimension. The first-order term $\vec{c} \cdot \nabla u$, which typically arises as a flow term, precludes us from using the calculus of variations. In this situation, the techniques for proving existence of solutions have been topological. Due to the nature of the nonlinearity, the corresponding operator is not compact and Leray-Schauder degree theory does not apply. In this talk, I discuss the method of concentration compactness, developed by P.L.Lions, the (S_+) degree theory of Skrypnik, and how these new techniques can be used to prove existence for this problem. These methods also apply to a wide range of elliptic systems. The development of methods to study these problems is important both theoretically and for applications, as most equations and systems are not variational. This is joint work with M. Chhetri, P. Drabek, and S. Robinson. Future work, including related quasilinear problems, will be mentioned. (Received September 26, 2006)