1046-34-984 **Robert J Decker*** (rdecker@hartford.edu), University of Hartford, Mathematics Dept, 200 Bloomfield Ave, West Hartford, CT 06117, and **V W Noonburg** (noonburg@hartford.edu), University of Hartford, Mathematics Dept, 200 Bloomfield Ave, West Hartford, CT 06117. *A periodically forced, cubic-like, single neuron equation with multiple attractors.*

The authors investigate a class of periodically forced, first-order differential equations of the form $y' = -y + S(y - f(t))$, where $f(t)$ is periodic and S is sigmoidal. Such an equation has a cubic-like shape, and variations of it are used as a component in certain models in computational neuroscience (such as the Wilson-Cowan equations). It is known that for equations which are cubic in y and periodic in t, and for which the cubic term has constant sign, that there can be at most three isolated periodic solutions. The authors show that for the class of equations under investigation, more than three isolated periodic solutions can be obtained.

A pitchfork bifurcation is demonstrated analytically for the simplest equation of this class of equations; for certain parameter ranges this results in a bifurcation from three to five periodic solutions. It is then shown that a function $f(t)$ can be explicitly constructed with arbitrarily many isolated periodic solutions, by approximating a piecewise function with a truncated Fourier series. Finally, it is shown how to develop models with a small number of Fourier terms and a large number of periodic solutions and possible bifurcation routes to such large numbers of periodic solutions are calculated numerically. (Received September 13, 2008)