1020-35-204 **Donald A. French*** (french@math.uc.edu), Mathematical Sciences, University of Cincinnati, PO Box 210025, Cincinnati, OH 45221-0025, and **Steve J. Kleene**. *Numerical approximation of solutions to nonlinear inverse problems arising in olfaction experimentation.*

Identification of detailed features of neuronal systems is an important challenge in the biosciences today. An interdisciplinary research team has been working to determine the distributions of ion channels in frog olfactory cilia which are are tiny tube-like structures (0.2 microns in diameter) that extend from the olfactory receptor neurons. The first step in the transduction of an odor into an electrical signal occurs in the membranes of the cilia and is controlled primarily by the ion channels.

A mathematical model involving integral and partial differential equations is derived to model experiments aimed at identifying features of the distribution of these ion channels. Numerical and analytical approximations to the model solutions are derived and used with experimental data to obtain estimates of the spatial distribution of the ion channels along the length of a cilium. The results from this mathematical and experimental study suggest that these channels have a non-uniform distribution. (Received August 28, 2006)