1014-92-549   **Steven J. Cox*** (`cox@rice.edu`), CAAM MS 134, Rice University, 6100 Main, Houston, TX 77005, and **Jane Hartsfield**, CAAM MS 134, Rice University, 6100 Main, Houston, TX 77005. *Inferring Calcium Channel Distribution from Calcium Fluorescence Data.*

Calcium, the most important of the second messengers, locally modulates the excitability of nerve and muscle. Calcium enters cells through single-protein channels in the cells' outer membrane. We exploit the ability to dynamically monitor cytosolic calcium, throughout intact cells, with sub–millsecond temporal resolution and sub-micron spatial resolution in the construction of a map of channel density. In the process we pose and solve two inverse problems: (1) Infer from the change in cytosolic calcium fluorescence the associated membrane calcium current in space and time, and (2) Infer from the calcium current the nonuniform distribution of calcium chanels. We apply our findings to a nonuniform Morris-Lecar fiber. (Received September 20, 2005)