1125-92-1863 **J T Lin*** (jlin46@calpoly.edu), **J P Keener**, **S Poelzing**, **R Veeraraghavan**, **S A George**, **R G Gourdie**, **M E Salama**, **K J Sciuto** and **G S Hoeker**. *Mathematical Modeling of Cardiac Tissue: Theoretical, Numerical, and Experimental Study of Ephaptic Effects.*

Conduction failure of action potential propagation has been strongly linked to ventricular arrhythmia and sudden cardiac death. Recent experimental studies have shown that cellular geometry plays an important role in action potential propagation, but existing homogenized models cannot accurately capture the effects of microscale variations.

We have developed a multiscale model that incorporates the complex cellular geometry of cardiac tissue, while remaining numerically efficient. This model has shown that the mechanisms behind action potential propagation have still yet to be well understood. In particular, ephaptic effects occurring at the cardiomyocyte intercalated disk can facilitate conduction in unexpected ways. We have used this model to reproduce results found by experimental modification of murine hearts, preferentially down-regulating gap junctional proteins, as well as sodium and potassium ion channels, that provide evidence of ephaptic effects. (Received September 19, 2016)