1114-62-158 **Xinping Cui*** (xinping.cui@ucr.edu), 1337 Olmsted Hall, University of California, Riverside, Riverside, CA 92521, and **Zhen Xiao**, **Nicolas Brunel** and **Zhenbiao Yang**. *A Constrained Mixed Effects Model Based on Semilinear Differential Equation for Cell Polarity Signaling in Tip Growth of Pollen Tubes.*

The key of tip growth in eukaryotes is the polarized distribution on plasma membrane of a particle named ROP1. This distribution is the result of a positive feedback loop, whose mechanism can be described by a Differential Equation parametrized by two meaningful parameters kpf and knf. In this paper, we introduce a mechanistic Integro-Differential Equation (IDE) derived from a spatiotemporal model of cell polarity and we show how this model can be fitted to real data i.e ROP1 intensities measured on pollen tubes. At first, we provide an existence and uniqueness result for the solution of our IDE model under certain conditions. Quite interestingly, this analysis gives a tractable expression for the likelihood, and our approach can be seen as the estimation of a constrained nonlinear model. Moreover, we introduce a population variability by introducing a constrained nonlinear mixed model. We then proposed a constrained Least Squares method to fit the model under single pollen tube case, and two methods, constrained Methods of Moments and constrained Restricted Maximum Likelihood (REML) to fit the model under the multiple pollen tubes case. The performances of all the three methods are studied in a simulation example and are used on a real multiple pollen tubes dataset. (Received August 24, 2015)