1048-60-263 **Garegin A Papoian*** (gpapoian@unc.edu), Department of Chemistry, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-3290, and **Pavel Zhuravlev** (zhur@unc.edu), Campus Box # 3290, The University of North Ca, Chapel Hill, NC 27599-3290. *Stochastic Dynamics of Cell Signaling and Cell Motility.*

Capping proteins are among the most important regulatory proteins involved in controlling complicated stochastic dynamics of filopodia, which are dynamic finger-like protrusions used by eukaryotic motile cells to probe their environment and help guide cell's motility. They attach to the barbed end of a filament and prevent polymerization, leading to effective filament retraction due to retrograde flow. When we have simulated filopodial growth in presence of capping proteins, qualitatively new dynamics emerged. We discovered that molecular noise due to capping protein binding and unbinding leads to macroscopic filopodial length fluctuations, compared with minuscule fluctuations in the actin only system. Thus, our work shows for the first time that molecular noise of signaling proteins may induce growth-retraction cycles in filopodia. When capped, some filaments eventually retract all the way down to filopodial base and disappear. This process endows filopodium with a finite lifetime. We have also developed an accurate mean field model which provides qualitative explanations of our numerical simulation results. Our results are broadly consistent with experiments, in terms of predicting filopodial growth retraction cycles and also the average filopodial lifetimes. (Received February 09, 2009)