Electronic Supplementary Material for the paper:

A Mathematical Model for Astrocyte Mediated LTP at Single Hippocampal Synapses

Shivendra Tewari and Kaushik Majumdar[#]

#To whom correspondence should be addressed. Email: kmajumdar@isibang.ac.in

This PDF file includes Figures S1 to S4.

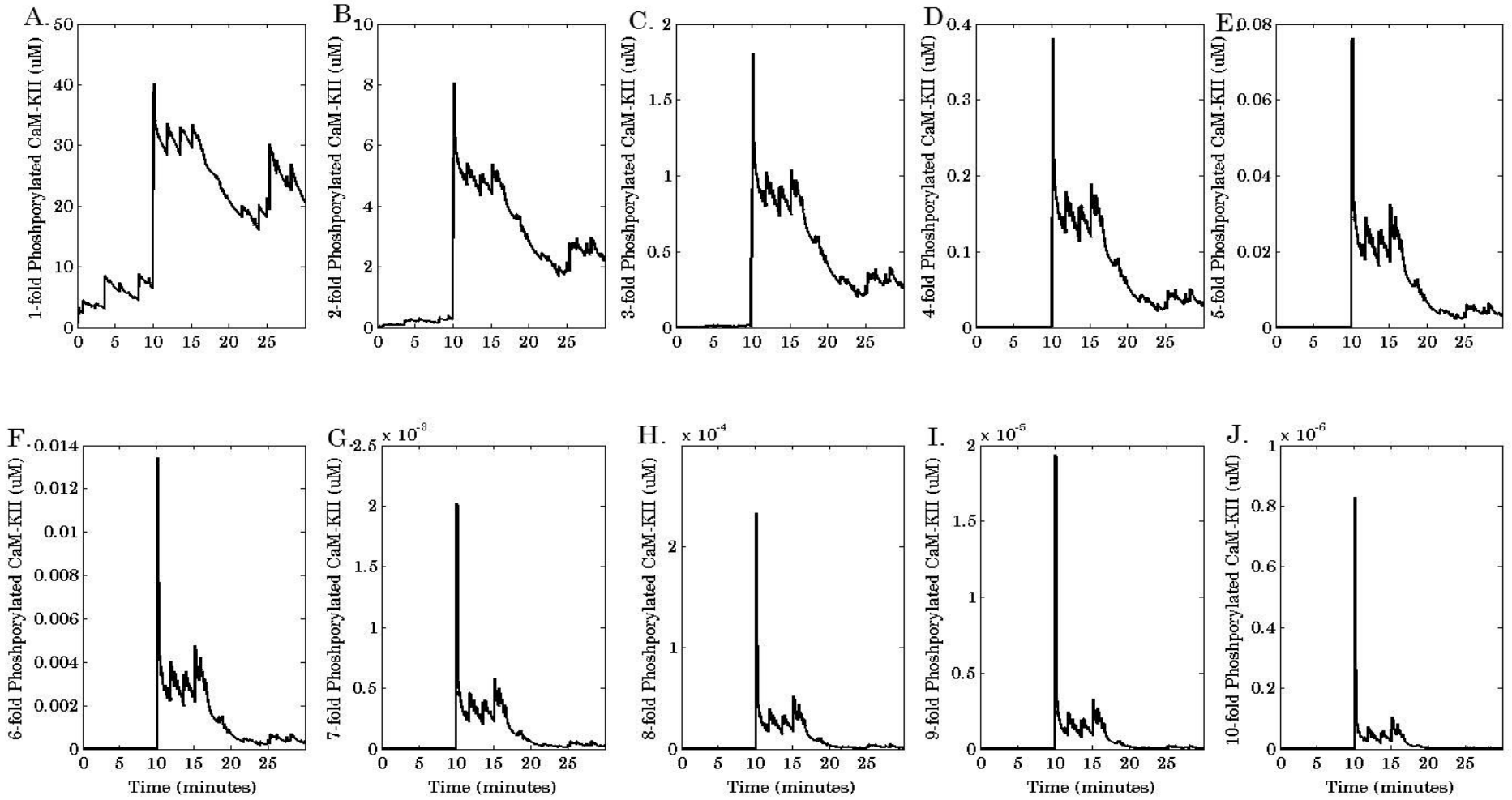
Supplementary Figure Legends:

Fig. S1. Concentration of i-fold phosphorylated CaM-KII holoenzyme (for i = 1, 2, ..., 10; where 'i' denotes the number of CaM-KII holoenzyme subunits with a phosphate group attached) when astrocyte was not photo-stimulated. All the parameters are same as listed in Tables 2–9. A. Concentration of 1-fold phosphorylated CaM-KII holoenzyme, B. Concentration of 2-fold phosphorylated CaM-KII holoenzyme, C. Concentration of 3-fold phosphorylated CaM-KII holoenzyme, D. Concentration of 4-fold phosphorylated CaM-KII holoenzyme, E. Concentration of 5-fold phosphorylated CaM-KII holoenzyme, F. Concentration of 6-fold phosphorylated CaM-KII holoenzyme, G. Concentration of 7-fold phosphorylated CaM-KII holoenzyme, H. Concentration of 8-fold phosphorylated CaM-KII holoenzyme, I. Concentration of 9-fold phosphorylated CaM-KII holoenzyme, J. Concentration of 10-fold phosphorylated CaM-KII holoenzyme.

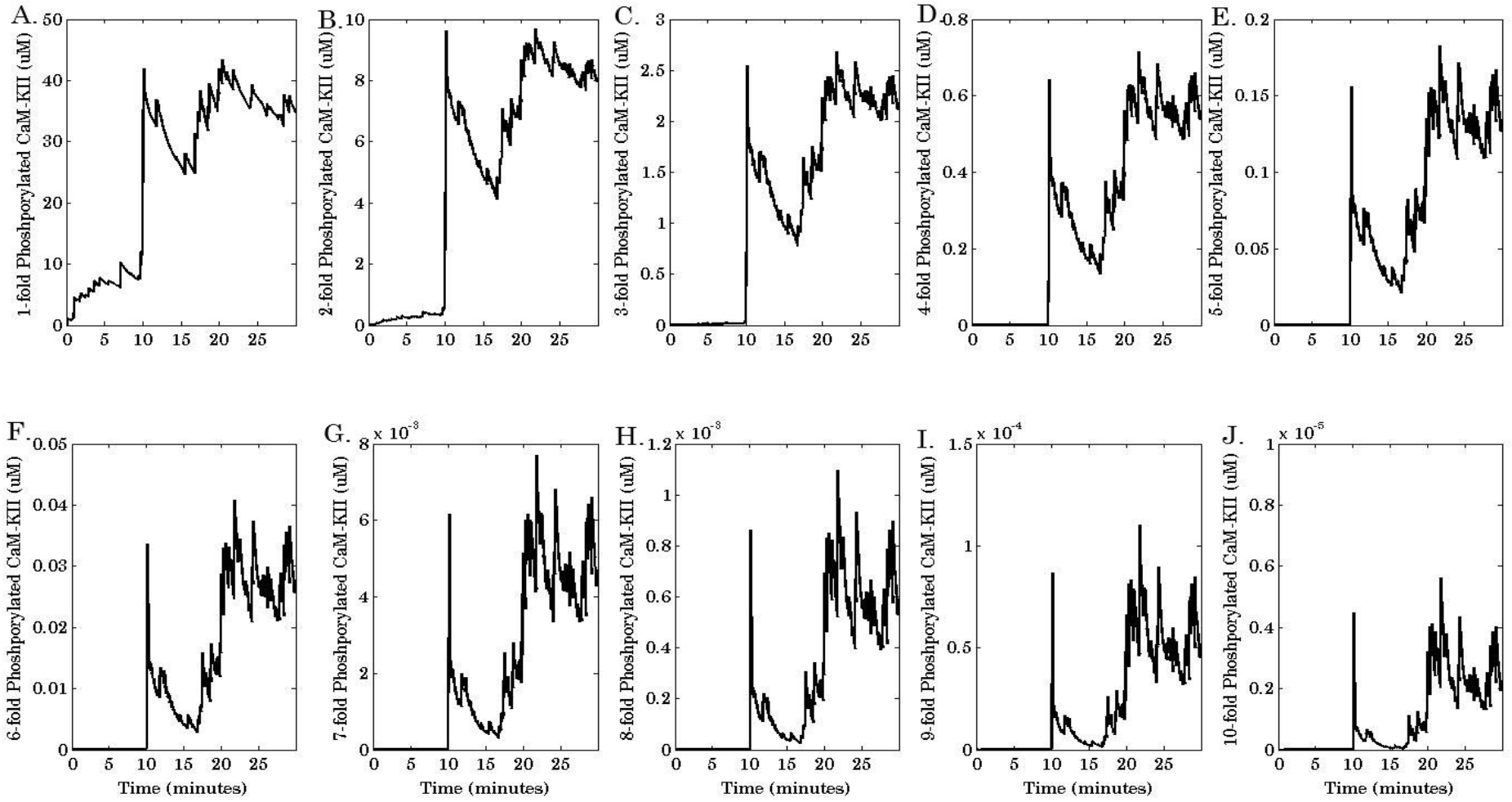
Fig. S2. Concentration of i-fold phosphorylated CaM-KII holoenzyme (for i = 1, 2, ..., 10; where 'i' denotes the number of CaM-KII holoenzyme subunits with a phosphate group attached) when astrocyte was photo-stimulated at 10 minutes mark. All the parameters are same as listed in Tables 2–9. A. Concentration of 1-fold phosphorylated CaM-KII holoenzyme, B. Concentration of 2-fold phosphorylated CaM-KII holoenzyme, C. Concentration of 3-fold phosphorylated CaM-KII holoenzyme, D. Concentration of 4-fold phosphorylated CaM-KII holoenzyme, E. Concentration of 5-fold phosphorylated CaM-KII holoenzyme, F. Concentration of 6-fold phosphorylated CaM-KII holoenzyme, G. Concentration of 7-fold phosphorylated CaM-KII holoenzyme, H. Concentration of 8-fold phosphorylated CaM-KII holoenzyme, I. Concentration of 9-fold phosphorylated CaM-KII holoenzyme, J. Concentration of 10-fold phosphorylated CaM-KII holoenzyme.

Fig. S3. A. Astrocyte calcium which remains constant at resting calcium concentration because of assumed nitrophenyl–EGTA (NP-EGTA) calcium block. In the inset we can see representative membrane potential spikes due to 0.33 Hz Theta Burst Stimulation (TBS); scales: abscissa, seconds; ordinate, mV. B. Neurotransmitter release probability in response to TBS when astrocyte was not photo-stimulated (0.25 ± 0.08; mean ± std). The windowed average of neurotransmitter release probability was taken over a window-length of 60 seconds. All the parameters are same as listed in Tables 2–9 except ρ_{Ca} which was adjusted so that average Pr lies between 0.2–0.3 when astrocyte is not photo-stimulated.

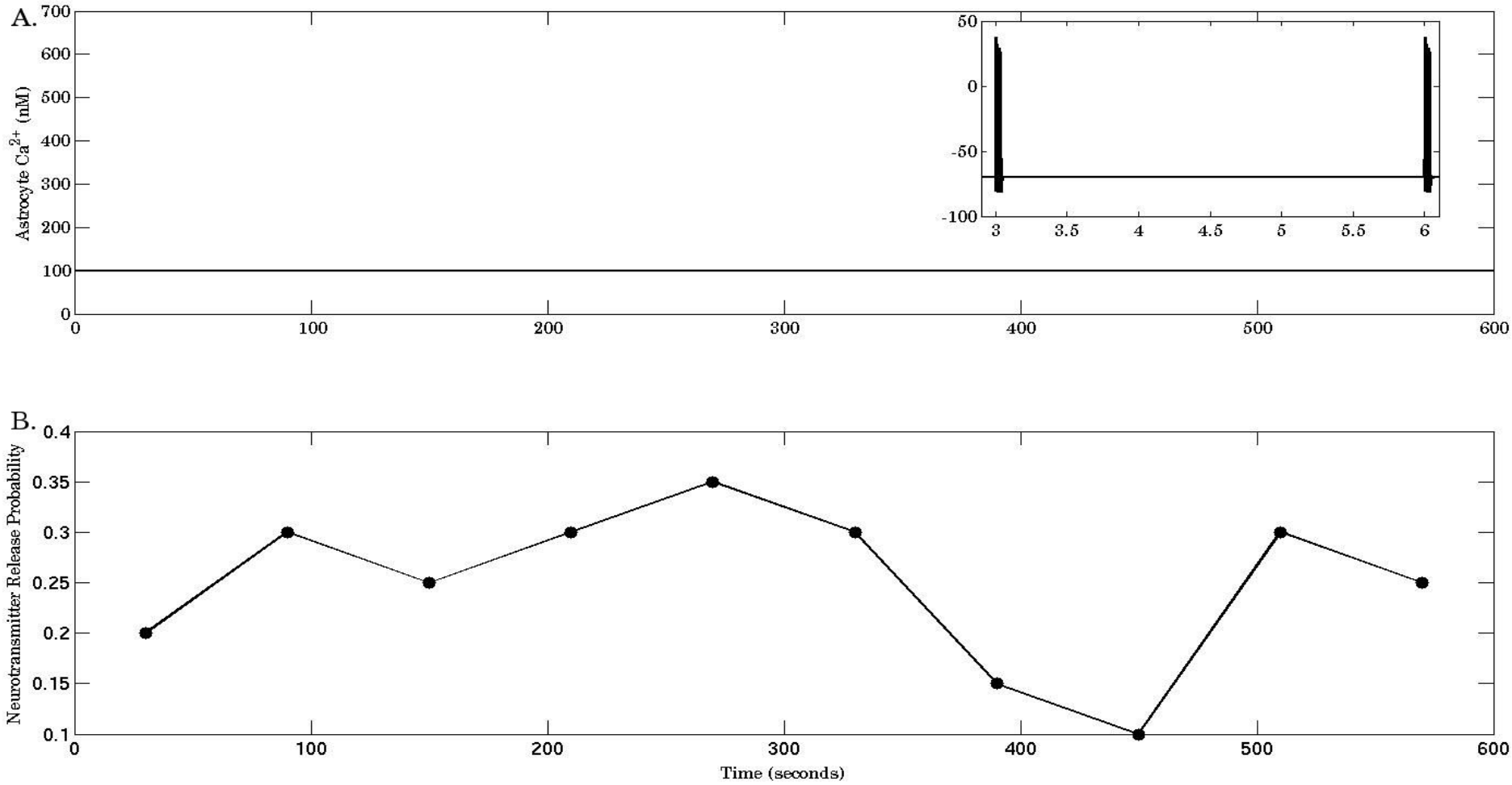
Fig. S4. A. Astrocytic calcium dynamics when it was photo-stimulated using UV-flash at 300 seconds mark. B. Neurotransmitter release probability before and after astrocyte stimulation. There is an apparent increase in neurotransmitter release probability after astrocyte is photo-stimulated at 300 seconds mark (from 0.28 ± 0.06 to 0.70 ± 0.09). The windowed average of neurotransmitter release probability was taken over a window-length of 60 seconds. All parameters are same as that for Fig. S3.



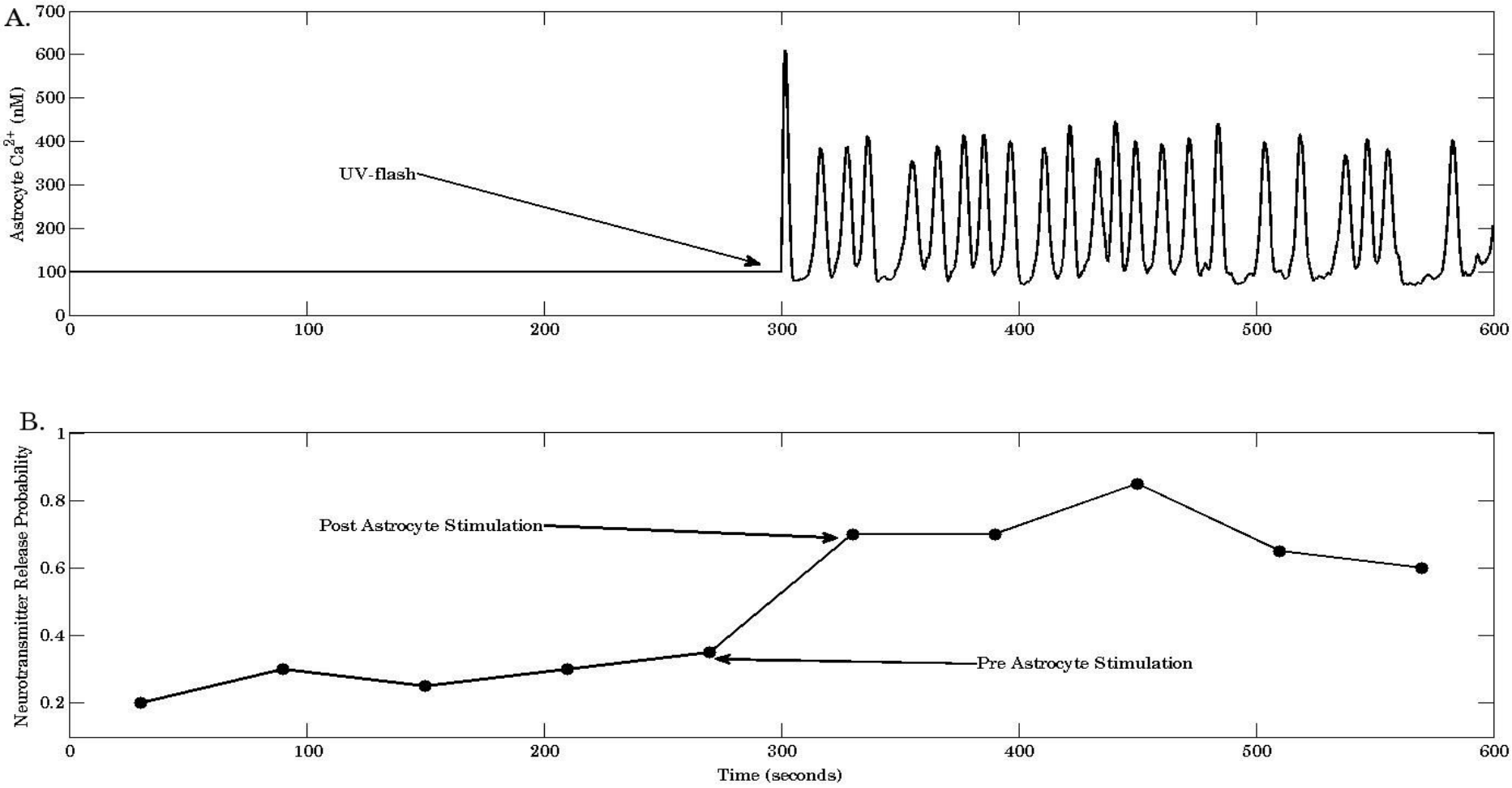
Tewari and Majumdar Fig. S1



Tewari and Majumdar Fig. S2



Tewari and Majumdar Fig. S3



Tewari and Majumdar Fig. S4