

POSTER PRESENTATION

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# Synaptic bouton sizes are tuned to best fit their physiological performances

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To truly appreciate the myriad of events which relate synaptic function and vesicle dynamics, simulations should be done in a spatially realistic environment. This holds true in particular in order to explain the rather astonishing motor patterns presented here which we observed within *in vivo* recordings which underlie peristaltic contractions at a well characterized synapse, the neuromuscular junction (NMJ) of the *Drosophila* larva. To this end, we have employed a reductionist approach and generated three dimensional models of single

presynaptic boutons at the *Drosophila* larval NMJ. Vesicle dynamics are described by diffusion-like partial differential equations which are solved numerically on unstructured grids using the uG platform. In our model we varied parameters such as bouton-size, vesicle output probability ( $P_o$ ), stimulation frequency and number of synapses, to observe how altering these parameters effected bouton function. Hence we demonstrate that the morphologic and physiologic specialization maybe a convergent evolutionary adaptation to regulate the trade

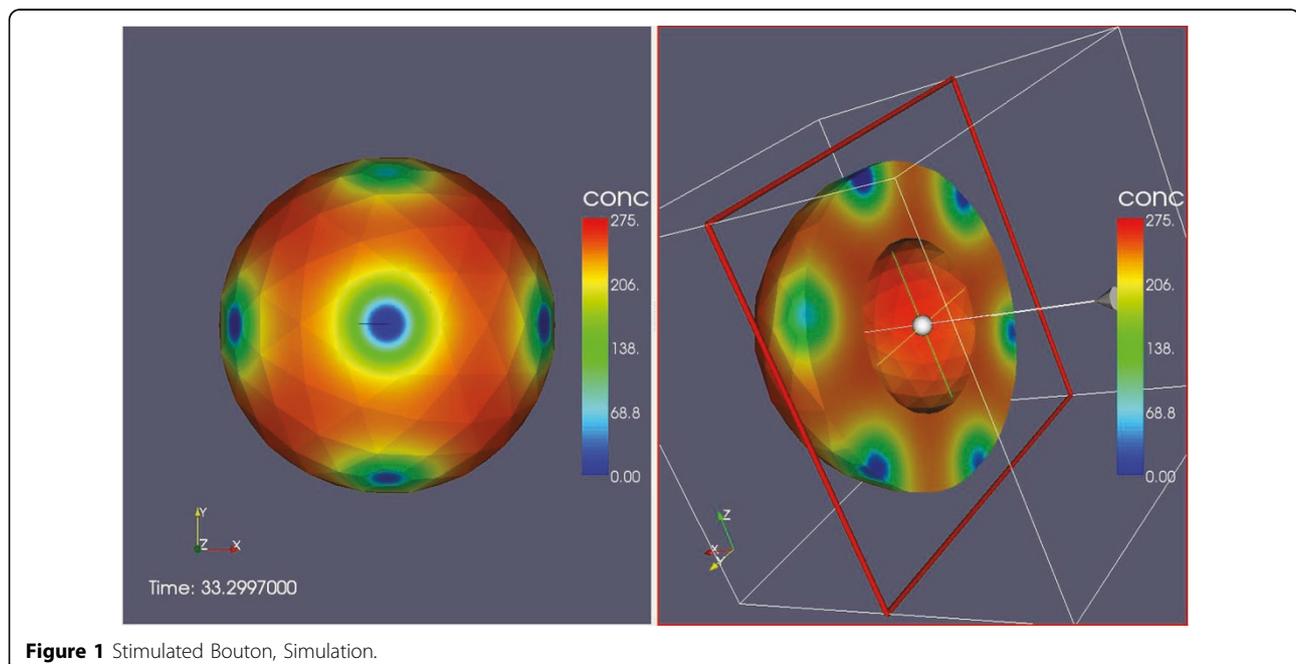


Figure 1 Stimulated Bouton, Simulation.

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off between sustained, low output, and short term, high output, synaptic signals. There seems to be a biologically meaningful explanation for the co-existence of the two different bouton types as previously observed at the NMJ (characterized especially by the relation between size and  $P_o$ ), the assigning of two different tasks with respect to short- and long-time behaviour could allow for an optimized interplay of different synapse types. As a side product, we demonstrate how advanced methods from numerical mathematics could help in future to resolve also other difficult experimental neurobiological issues. Figure 1.

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