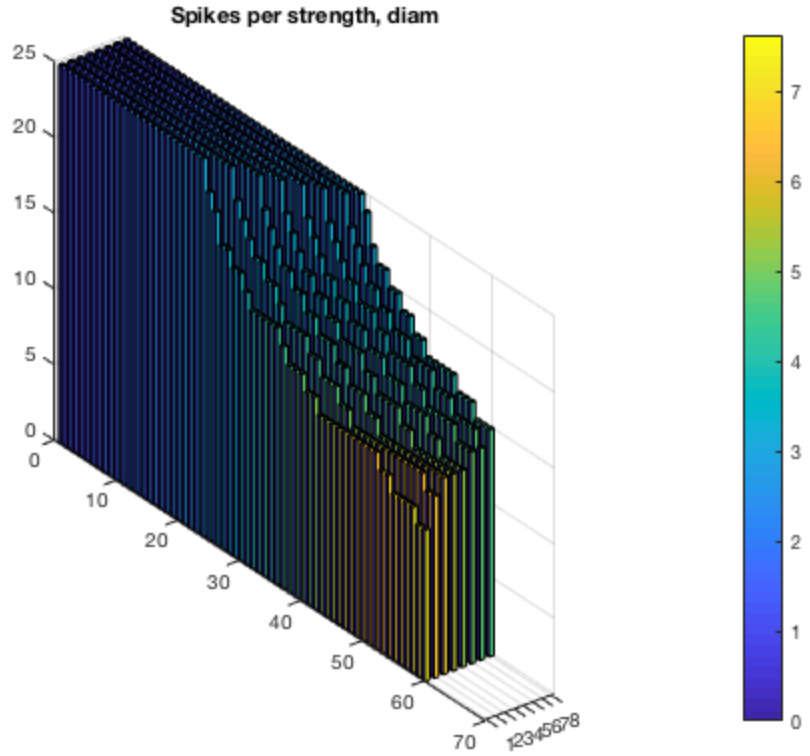
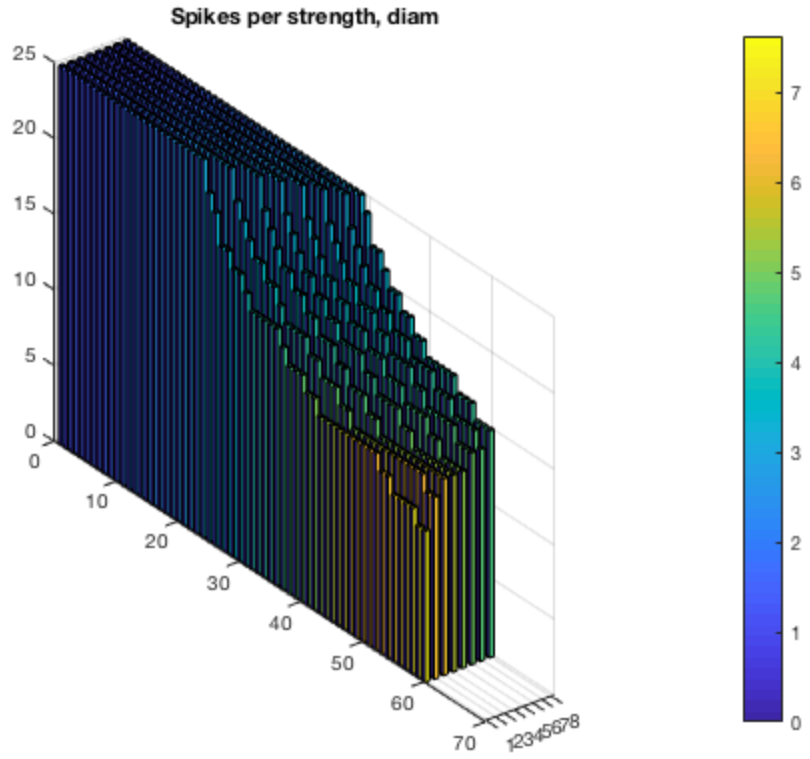
Near equivalence of multiple balls and sticks with a single ball and stick of equal membrane size.

Additional simulations were run to confirm the equivalence of multiple balls and sticks with a single ball and stick of equal membrane area (the sticks were kept the same size while the multiple balls were adjusted to a size where the combined multiple balls and sticks had the same membrane area as the single ball and stick).

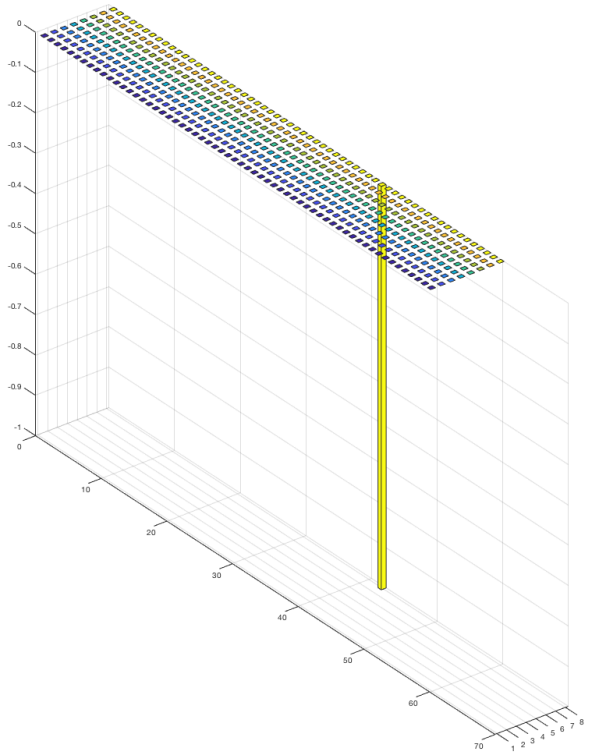
Here are images of the number of spikes transmitted through the single ball and stick dystrophies with 50 Hz 0.5 sec stimulation:



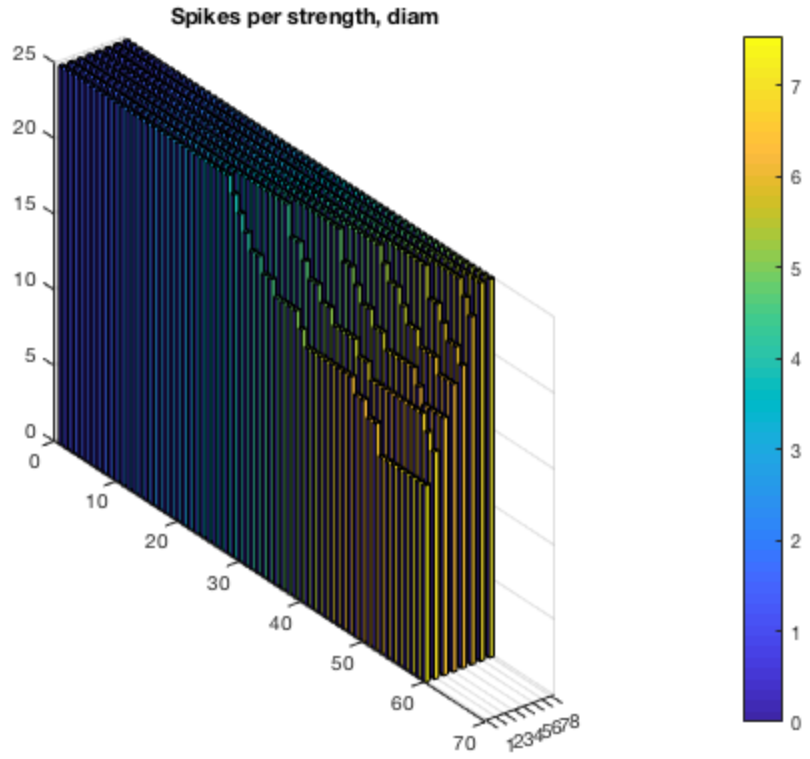
The color gives the delay of the first spike transmitted which in this case ranges up to 7ms.
The x and y axes are of increasing Can diameter and intrinsic channel conductance, respectively.
The below graph shows a similar graph for when the single ball and stick is replaced with 5 balls and sticks of total equal area to the single ball and stick:



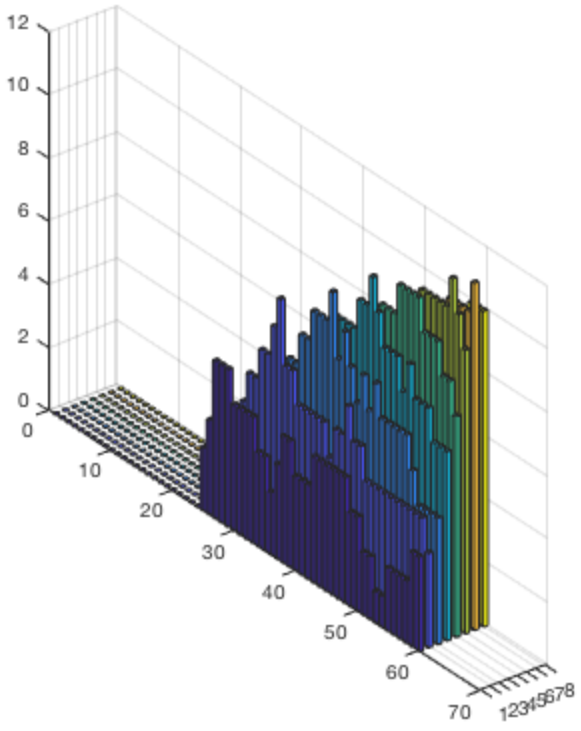
The difference in the two graphs is a single spike difference (one more spike was able to pass the 5 ball and sticks than the “equivalent” single ball and stick:



If instead of being clustered at the same mid-point of the axon, the 5 balls and sticks are evenly spaced at 20 um intervals with the group still centered at the mid point of the axon, we see that the numbers of spikes lost in the transmission is reduced (spacing the 5 dystrophies makes them have less of an effect in interfering with AP transmission):



If we subtract the number of spikes transmitted in the above spaced 20 um dystrophies from the “equivalent” single ball and stick transmitted spikes we see that spacing the dystrophies rescues these numbers of spikes:


12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
12345678