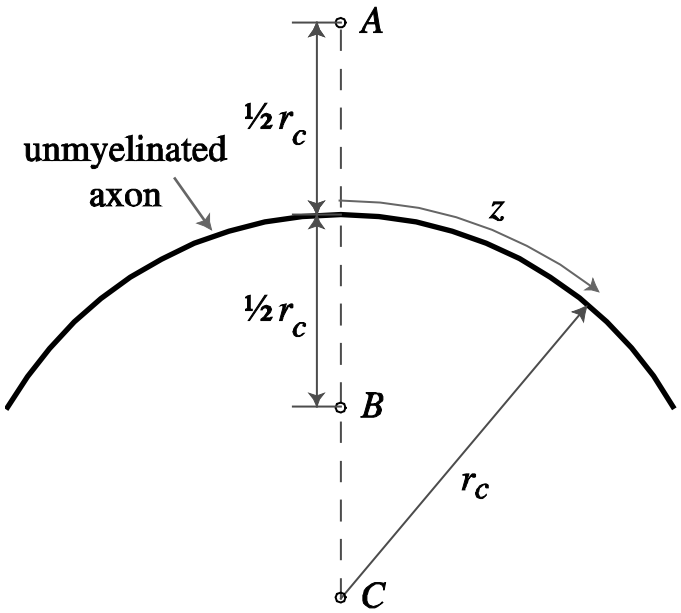
ELEC ENG 3BB3 – Cellular Bioelectricity (2014)

Tutorial #9

Consider the case of extracellular stimulation of a curved unmyelinated axon by a monopolar current source, as illustrated below.



The axon has a radius of curvature r_c. The electrode is assumed to be a point source that could be placed at the three different locations marked *A*, *B* and *C*. The electrode delivers a step in current of $-I_0$ at $t = 0$. The distance along the arc of the axon is given by z, where $z = 0$ corresponds to the intersection of the dashed line and the arc on which the axon lies.

1. Derive expressions for the activating function $\frac{\partial^2 \phi_e}{\partial z^2}$ for each of the electrode positions *A*, *B* and *C*.
2. Discuss which position would be the most effective in stimulating the axon.