Study Questions: Discussion 4 - OHCs & Electromotility

Review: Santos-Sacchi, J. (2003) New tunes from Corti's organ: the outer hair cell boogie rules. Curr. Opin. Neurobio. 13:459-468.

4a. Holley, M. C. and Ashmore, J. F. (1988)."On the mechanism of a high-frequency force generator in outer hair cells isolated from the guinea pig cochlea," Proc R Soc Lond B Biol Sci 232, 413-429.
1. What data do the authors present that suggests that membrane-bound processes give rise to motility?
2. If OHC electromotility is robust (i.e. insensitive to many manipulations that interfere with cellular metabolism), yet the compressive nonlinearity associated with cochlear "amplification" is labile (i.e. extremely vulnerable to processes that compromise cellular metabolism), doesn't that argue against the idea that electromotility is the process powering the cochlear amplifier? If so, why so; if not, why not? **What might the labile processes be?**

4b. Hallworth, R., Evans, B. N. and Dallos, P. (1993)."The location and mechanism of electromotility in guinea pig outer hair cells," J. Neurophysiol. 70, 549-558.
1. AC length changes (e.g., Fig. 3) tend to be largest for 'q' values near 1/2. AC width changes (e.g., Fig. 8) tend to decrease monotonically with increasing 'q'. What does this result suggest about the directionality of the motility motor? **Reword this question.**
2. The authors talk about both 'active' and 'passive' forms of motility. Other papers present evidence that motility is not affected by any of the common metabolic inhibitors. Discuss the sense in which the words 'active' and 'passive' apply to OHC motility.

4c. Zheng, J., Shen, W., He, D. Z., Long, K. B., Madison, L. D. and Dallos, P. (2000)."Prestin is the motor protein of cochlear outer hair cells," Nature 405, 149-155.
1. Describe the logical and molecular strategies the authors used to find the OHC motor protein
2. Describe the experiments performed to determine if the novel gene product is indeed the motor protein and indicate which is the most compelling.