Study Questions: Discussion 2 - Hair Cells & Transduction

<u>Review</u>: Roberts, W. M., J. Howard, et al. (1988). "Hair cells: transduction, tuning, and transmission in the inner ear." Annu Rev Cell Biol 4: 63-92.

2a. Corey, D. P. and Hudspeth, A. J. (1983)."Kinetics of the receptor current in bullfrog saccular hair cells," J Neurosci 3, 962-976.

a) Describe the overall experimental approach: how were the hair bundles stimulated and how was the receptor current measured? What were some of the experimenters' concerns with respect to possible artifacts in their methodology?
b) You need not understand the details of the biophysics to appreciate the overall strategy the experimenters used to try and gain insight into the molecular mechanisms of transduction. Describe the transduction model suggested by the authors and one key observation which argues for it.

2b. Pickles, J.O. , Comis, S.D. and Osborne, M.P. (1984) Cross-links between stereocilia in the guinea pig organ of Corti, and their possible relation to sensory transduction. Hear Res 15: 103-112.

a) What are the differences between scanning electron microscopy and transmission electron microscopy? Why did the authors use both approaches? Were the results consistent?
b) How many different kinds of links between stereocilia did the authors describe, and which ones did they suggest were involved in transduction? Had these links been described before?
c) Which functional properties of mechanoelectric transduction are well explained by the model presented here?

2c. Denk W, Holt JR, Shepherd GM, and Corey DP. Calcium imaging of single stereocilia in hair cells: localization of transduction channels at both ends of tip links. Neuron 15: 1311-1321, 1995.

a) Briefly explain how calcium imaging is done, and what it can and can't tell you about calcium concentration in various cellular compartments.
b) What evidence is presented here to suggest that transduction occurs at the tips of the stereocilia? How did the authors explain inconsistencies with previous published results by Ohmori?
c) What was the nature of the evidence that transduction channels are present at both ends of the tip links?