1064-92-380 **Peter J Thomas*** (pjthomas@case.edu), 10900 Euclid Avenue, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, OH 44106, and **Stephen J Fleming** (pjt9@case.edu), Cleveland, OH 44106. *Gradient Sensing as a Statistical Estimation Problem: Comparison with Experimental Data.*

A eukaryotic cell performing chemotaxis must estimate the external gradient direction from the signal available from a population of $N \gtrsim 10,000$ receptors distributed across the cell surface. We treat each receptor as an independent two-state Markov process with one transition rate (binding) proportional to the local signal concentration and another transition (release) that is constant, and study the distribution of an ideal observer's estimate of gradient direction based on maximum likelihood analysis of samples from the equilibrium distribution of receptor states in a 2D geometry. We find the accuracy of chemotaxis predicted for a 2D model better matches that observed experimentally than that predicted by one-dimensional models. However, when taking into account sampling over extended times, the accuracy of chemotaxis possible for the ideal observer is orders of magnitude finer than that observed in real cells. (Received September 14, 2010)