Many transmembrane proteins on the surface of the cell move naturally, a motion which enables immune function and signaling, for example. Cholesterol is a key component of the plasma membrane of our cells. By labeling a particular transmembrane protein with a fluorescent molecule, we can follow the motion of single proteins in real time at video rates, with minimal perturbation on the living cell. Surprisingly, we see a dramatic reduction in the diffusion coefficient (see above) when the membrane cholesterol concentration is artificially reduced. Exploring this effect is leading to a deeper understanding of how cholesterol interacts with the lipids in the membrane to control the diffusion of embedded proteins.