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Signaling reactions on membrane surfaces: breaking the law of averages

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Most intracellular signal transduction reactions take place on the membrane surface. The membrane provides much more than just a surface environment on which signaling molecules are concentrated. There is a growing realization that multiple physical and chemical mechanisms allow the membrane to actively participate in the signaling reactions. Using a combination of single molecule imaging and spectroscopic techniques, my research seeks to directly resolve the actual mechanics of signaling reactions on membrane surfaces both in reconstituted systems and in living cells. These observations are revealing new insights into cellular signaling processes as well as some unexpected functional behaviors of proteins on the membrane surface.