Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Divalent cation-induced cluster formation by polyphosphoinositides in model membranes[1] YU-HSIU WANG, PAUL JANMEY, University of Pennsylvania — Phosphatidylinositol-(4,5)-bisphosphate (PI4,5P2) binds with variable levels of specificity to hundreds of intracellular proteins in vitro. Such restricted targeting of proteins to PIP2 in cell membranes is thought to result in part from the formation of spatially distinct PIP2 pools. The hypothesis that PIP2 forms nanodomains in the membrane by electrostatic interactions with divalent cations is tested using lipid monolayer and bilayer model membranes. Competitive binding between Ca2+ and Mg2+ to PIP2 is quantified by surface pressure measurements and analyzed by a Langmuir competitive adsorption model. Addition of Ca2+, but not Mg2+, Zn2+ or polyamines to PIP2-cotnaing monolayers induces surface pressure drops coincident with the formation of PIP2 nanodomains visualized by fluorescence, atomic force and electronic microscopy. Studies of bilayer membranes using probe-partitioning fluorescence resonance energy transfer (FRET) and fluorescence correlation spectroscopy (FCS) also reveal Me2+-induced domain formation or diffusion retardation which follows the trends: Ca2+ >> Mg2+ > Zn2+, while polyamines have minimal effects. These results suggest that divalent metal ions have substantial effects on PIP2 lateral organization under their physiological concentrations.

[1]This work is supported by NIH grants GM083272 (PAJ) and HL067286 (Y-H W).

Paul Janmey
University of Pennsylvania

Date submitted: 23 Nov 2011 Electronic form version 1.4