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Effect of Protein Crowding: Multivalent Protein Binding Induces a New Phase State in Lipid Membranes

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It is well known that lipid membrane properties change as a function of composition and phase state, and that protein-lipid interaction can induce changes in the membrane's properties and biochemical response. This talk demonstrates that multivalent binding of proteins to putative membrane receptors can induce structure changes and a new phase state in lipid membranes. These molecular level changes are precisely characterized using grazing incidence X-ray diffraction. Protein binding is shown to perturb lipid packing within lipid monolayers and bilayers resulting in topological defects and the emergence of a new orientationally textured lipid phase. In bilayers this altered lipid order is transmitted from the receptor laden exterior membrane leaflet to the inner leaflet, representing a potential mechanism for lipid mediated outside-in signaling by multivalent protein binding.