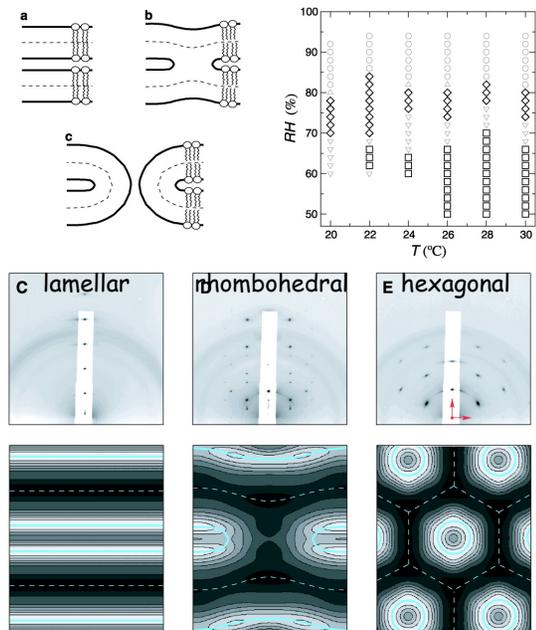


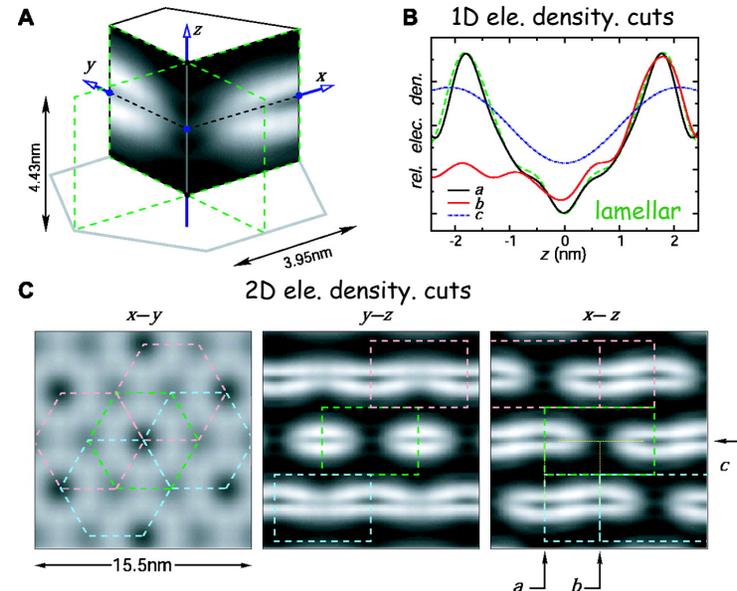
Direct observation of stalk structure

Motivation: The membrane fusion process is believed to involve an intermediate structure designated as the stalk, where the two fusing membranes establish contact between each other. The exact structure of the stalk have implications in the elastic energy cost for forming such structures and therefore affect the onset of membrane fusion.



Key result 1: Grazing incidence X-ray diffraction results show a new lipid phase exists between the lamellar and hexagonal phases of the phase diagram of lipid DPhPC.

Conclusion and significance: By manipulating the water content within a stack of planar bilayers, we were able to capture the stalk structure in a periodic lattice and obtain the electron density distribution within the stalk. The formation of the stalk structures is likely due to the competition between the bending energy cost for stalk formation and the potential energy due to repulsion between membranes. This is the first experimental confirmation of the existence of the stalk structure. The method developed to solve the stalk structure from the diffraction data will later be used to solve peptide pore structures as well.



Key result 2: The electron density map in the unit cell in the rhombohedral phase is reconstructed from the diffraction data. The unit cell appear to contain the speculated stalk structure. 1D and 2D electron density cuts through the unit cell show electron density that is consistent with known lipid structure and therefore confirm the validity of the phasing method.

Observation of a Membrane Fusion Intermediate Structure L. Yang and H. W. Huang, SCIENCE 2002