Prebiotic Compartmentalisation in Ionic Liquids and Deep Eutectic Solvents. Saffron J. Bryant[1] and Gregory G. Warr[1], [1]School of Chemistry F11, The University of Sydney, NSW 2006, Australia. (sbry9833@uni.sydney.edu.au)

Compartmentalisation is believed to be an essential component to the origin of life. To date investigations have focused on compartment self-assembly in aqueous systems. Self-assembling systems in non-aqueous solutions such as ionic liquids and deep eutectic solvents have gone largely unexplored. However, these non-aqueous solvents could provide new insights into the posited uniqueness of water or form the basis of truly alien forms of life.

Preliminary investigations have demonstrated that some lipids self-assembly into swellable lamellar structures, including vesicles, in a range of protic ionic liquids (PILs) and in the deep eutectic solvent; choline choloride urea. These structures are the same as those formed in water. The lipids also exhibit a gel-to-lamellar phase ($L_\beta \rightarrow L_\alpha$) transition upon warming and vesicle budding from myelenic figures.

Polarizing optical microscopy, small angle X-ray scattering, and small angle neutron scattering have been used to demonstrate vesicle formation by phosphatidylcholine lipids in a range of PILs and in choline chloride urea.

Vesicles are prime candidate structures for protocell formation and therefore the origin of life. The evidence gathered so far demonstrates that vesicles can self assemble in ionic liquids and deep eutectic solvents. This is a significant step towards demonstrating the possibility of water-free life-forms which would significantly broaden the range of the ‘goldilocks zone’ of planetary orbits which could potentially support life.