Novel Applications of Physical Autocatalysis. Andrew J. Bissette[1] and Stephen P. Fletcher[1]*, [1]Department of Chemistry, Chemistry Research Laboratory, University of Oxford, 12 Mansfield Road, Oxford OX1 3TA, UK, *stephen.fletcher@chem.ox.ac.uk

Introduction: Simple chemical models of living cells can offer insight into the principles underlying biology and the emergence of life on earth around 4 billion years ago. A vital component of such models is a boundary which compartmentalises the protocell and is capable of reproducing itself in order to enable propagation [1]. Micelles and vesicles are widely used as boundaries for protocells. Self-reproducing micelles and vesicles reported to date have relied almost exclusively upon hydrolysis reactions [2, 3]. This limits the range of options available for the development of self-reproducing protocell membranes as well as precluding experimental tests of some key predictions of the 'lipid world' model [4] of prebiotic chemistry.

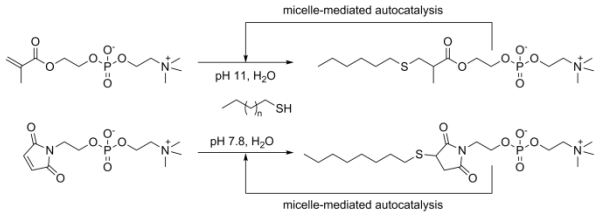

Figure 1 Bond-forming physical autocatalysis.

Here we describe the rational design of novel self-reproducing micelles driven by mild bond-forming reactions which increase the molecular complexity of the components (Figure 1) [5]. This is the first example of micellar autocatalysis driven by irreversible bond formation and offers a new technology for the development of protocell models as well as more sophisticated tests of 'lipid world' scenarios for the origins of life.

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