

**TRANSMISSION OF FUNCTIONS BETWEEN PROTOCELL GENERATIONS.** Anders N. Albertsen<sup>@,#</sup> and Pierre-Alain Monnard<sup>#</sup>

<sup>@</sup>Current address: Harvard University, Department of Earth and Planetary Sciences, Boston, MA, USA. albertsen@fas.harvard.edu

<sup>#</sup>Department of Physics, Chemistry & Pharmacy, University of Southern Denmark, 5230 Odense M, Denmark. monnard@sdu.dk.

**Introduction:** To understand how living cells could emerge from inanimate matter, many designs of minimal self-replicating chemical systems, also called protocells, have been proposed based on the self-assembly and self-organization of molecules, i.e., from the bottom up.

To investigate the dynamic processes taking place during cycles of growth and division (i.e., self-reproduction of the protocells), both essential processes in living systems, a protocell design was implemented, which is capable of producing its components (fatty acids compartment building blocks) from energy (light) and precursors available in its environment [1]. While unambiguous observations of morphological system alterations that accompany growth and division cycles can be made at the level of a population [2], the evidence for the effective function transmission (i.e., the capability for a new generation to process chemicals and undergo the same life cycles) still remained elusive.

To demonstrate function transmission, we have recently converted our protocell model into an inorganic/organic chemical system, where the protocell chemicals coat silicate microspheres. With this novel architecture, the effects of the system reproduction on the ability of both original and new protocell generations to produce their own building blocks have been assessed independently [3], and it has been established that the function maintenance between two protocell generations can be obtained even in protocell system devoid of heritable “information” component, i.e., a molecular system based on nucleic acid.

#### References:

[1] Declue et al. (2009) J. Am. Chem. Soc, 131, 931-933. [2] Maurer et al. (2011) ChemPhysChem, 12, 828-835. [3] Albertsen et al. (2014) Chem. Comm. 50, 8989-8992.