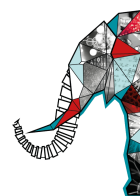


25^e Congrès Général de la Société Française de Physique



ID de Contribution: 83

Type: **Orale**

Compartmentalized autocatalytic reaction competing for resources and protocell cycles

jeudi 11 juillet 2019 10:00 (15 minutes)

A major question for the origin of life is the emergence and maintenance of protocells: out-of-equilibrium autocatalytic reactions enclosed in self-reproducing compartments. Example are fatty acid vesicles or coacervates. However, little is known about the coupling between autocatalytic reactions and compartment growth, and it could allow Darwinian properties (fitness, variation, reproduction with heredity) to be realized in compartments. Here, using microfluidics, we compartmentalize the formose reaction, a prebiotic autocatalytic reaction, in droplets and show the growth, division and regrowth of such droplets. Specifically, we found that droplets containing efficient chemistries can grow at the expense of other less efficient types, the conditions for which are explained by a coarse-grained model based on reaction-diffusion between droplets. Next, we demonstrate that division in a porous geometry, emulated by microfluidic means, allow larger sized winner droplets only to divide, thus increase their frequency in the population. The divided droplets are able to regrow when nourished with fresh resources, indicating the possibility to maintain a cycle. Finally, we observe that spatial heterogeneity in the reaction conditions induces variations in growth. Provided that droplet size differences could be propagated across generations, this study overall suggests that a rudimentary form of Darwinian evolution could be envisaged in such a purely physico-chemical system.

Choix de session parallèle

5.4 Physique et origines de la vie

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Classification de Session: Séance Parallèle