



Chemical & Physical Sciences

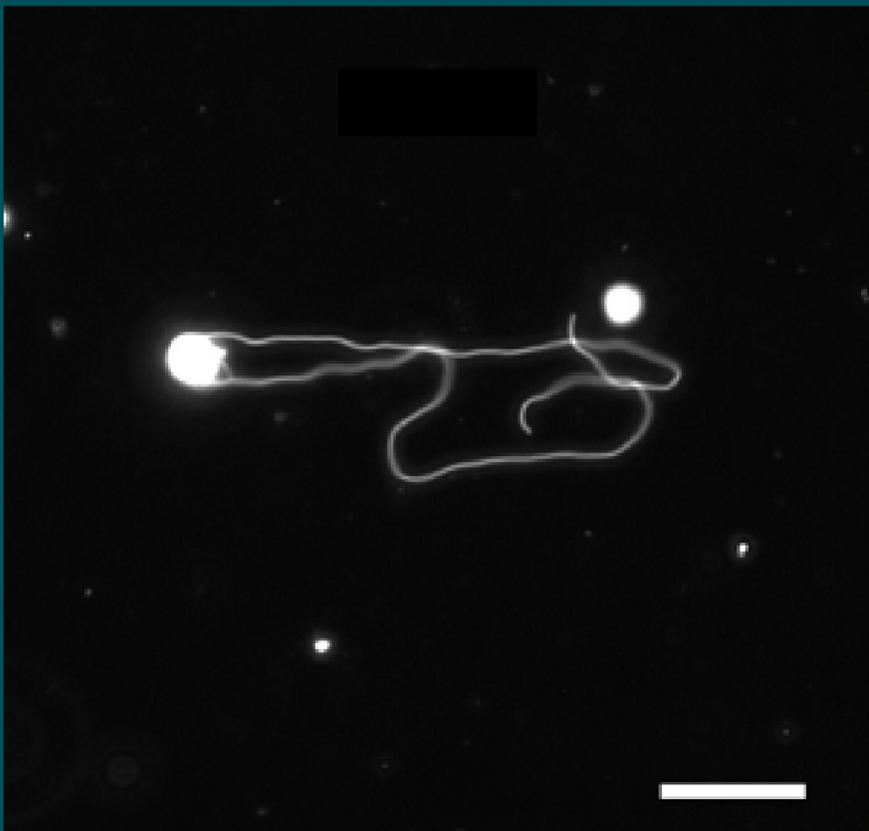
UNIVERSITY OF TORONTO

MISSISSAUGA

COLLOQUIUM SEMINAR SERIES

CELLULAR MIMICS AS MODEL PROTOCELLS

Cellular mimics are constructed with either prebiotically plausible components or biological machinery to probe the emergence of the Earth's first cells and the divide between living and non-living chemical systems. Our early work on the latter will be briefly discussed where we constructed cellular mimics capable of engaging in chemical communication with natural living cells. Our more recent work on investigating the chemistry that gives rise to metabolism and how such reactions could have fueled early cells will also be presented. For example, past laboratory models of protocells could not survive the concentrations of Mg^{2+} needed for the function and replication of nucleic acids. Recently, cyclic-lyso-phosphatidic acids, i.e., cyclophospholipids, were found to be prebiotically plausible and capable of forming vesicles resistant to a wide-range of pH and metal ion concentrations. We built on our past findings to show that protocells made of mixtures of fatty acid and cyclophospholipid can grow and divide in the presence of Mg^{2+} . Importantly, protocells retain encapsulated nucleic acids during growth and division, thus allowing for the propagation of genetic material across different generations of protocells. Our work shows for the first time a path towards the construction of protocells capable of Darwinian evolution. We have also uncovered a heretofore unexplored pathway for the collection of the building blocks of life into protocellular structures. Aqueous aerosols can travel long distances, acquire molecules, and transform into cell-sized vesicles upon entry into aqueous solution. Although further effort is needed to better define the mechanistic details of the transformation process, our work suggests that prebiotic aerosols were capable of tying the assembly of the building blocks of life to the formation of a protocell, a process that may have facilitated the emergence of the Earth's first cells.



CPS COLLOQUIUM SERIES

Wednesday, September 14, 2022

Join us at 3:30pm in CC 2150

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