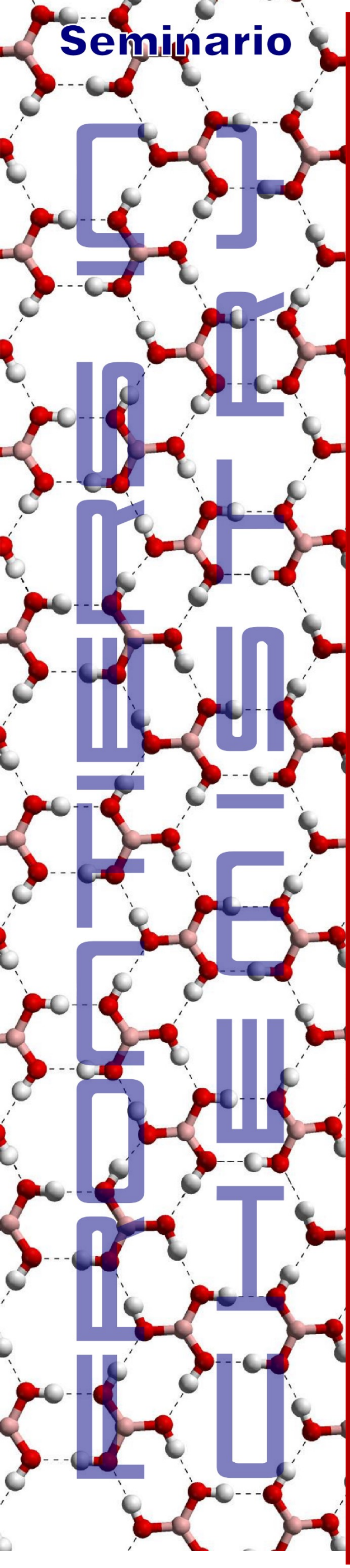

Università degli Studi di Padova
Dipartimento di Scienze Chimiche

Ciclo di Seminari 'Frontiers in Chemistry'

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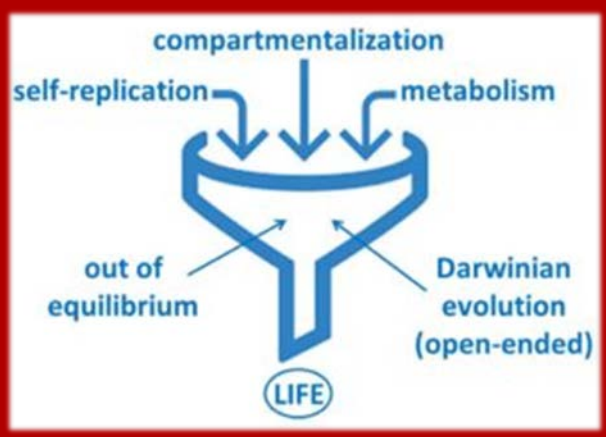
Mechanism of emergence: steps towards the de-novo synthesis of life

Giovedì 20 Aprile 2023, ore 15.00

Aula A 'Nasini' – Dipartimento di Scienze Chimiche

How the immense complexity of living organisms has arisen is one of the most intriguing questions in contemporary science. We have started to explore experimentally how organization and function can emerge from complex molecular networks in aqueous solution. We focus on networks of molecules that can interconvert, to give mixtures that can change their composition in response to external or internal stimuli. Noncovalent interactions within molecules in such mixtures can lead to the formation of foldamers of remarkable complexity. In contrast, molecular recognition between molecules in such mixtures leads to their mutual stabilization, which drives the synthesis of more of the privileged structures. As the assembly process drives the synthesis of the very molecules that assemble, the resulting materials can be considered to be self-synthesizing.

Intriguingly, in this process the assembling molecules are replicating themselves, where replication is driven by self-recognition of these molecules in the dynamic network. When such systems are operated under far-from-equilibrium flow conditions, adaptation of the replicators to a changing environment can occur, also when the replicators change their own environment. Replicators that are able to catalyze reactions other than their own formation have also been obtained, representing a first step towards metabolism, with replicators mediating the formation of their own precursors as well as of their own coacervate compartments. With these developments, the prospect of synthesizing life de-novo is becoming increasingly realistic.



Prof. Michele Maggini
Direttore del Dipartimento di Scienze Chimiche

Università degli Studi di Padova

Corso di Dottorato in Scienze Molecolari

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