ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

DIPARTIMENTO
DI FARMACIA
E BIOTECNOLOGIE

AVVISO DI SEMINARIO

Il giorno **17 luglio 2026**
alle ore **12.00**

Prof. Julien Henri

Professore Asscociato, Department of Computational Quantitative and Synthetic Biology, Sorbonne Université, Parigi, Francia
(ospite del Prof. M. Zaffagnini)

terrà un seminario in lingua inglese dal titolo:

Structural and synthetic biology of Calvin enzymes

in presenza:
AULA SPAMPINATO, UE5 – Via Gobetti 87, Bologna

e in streaming:
https://teams.microsoft.com/l/meetup-join/19%3aN09c0NIyEssBnF7ObCyDOQwkgDWm1qdd9f7F2nJV9fw1%40thread.tacv2/1631519544944?context=%7b%22Tid%22%3a%22e99647dc-1b08-454a-bf8c-699181b389ab%22%2c%22Oid%22%3a%225a941351-ef41-4aa4-8771-fa50a6d62ca1%22%7d

L' evento è organizzato nell'ambito del Corso di Dottorato in Biologia Cellulare e Molecolare

ABSTRACT

Photosynthetic carbon fixation is catalyzed by 11 enzymes forming the conserved Calvin-Benson-Bassham cycle. Sedoheptulose-1,7-bisphosphatase (SBPase) and Fructose-1,6-bisphosphatase (FBPase) contribute to the regeneration of the substrate of carboxylation, in a thioredoxin-f (TRX-f) sensitive manner through the reduction of inhibitory disulfide bridges. In an attempt to decipher the molecular basis of chloroplast SBPase and FBPase activities and corresponding redox regulations, we purified recombinant versions of *Chlamydomonas reinhardtii* proteins in order to determine their crystal structures. Comparison of SBPase in oxidized or reduced states revealed a conditionally disordered peptide that controls activity by switching oligomeric states. Meanwhile, recombinant FBPase proved to suffer from low stability in vitro. We hence applied computational redesign tools to improve FBPase coding sequence, effectively yielding a protein with increased thermostability (40°C gain) with constitutive high enzymatic activity over long periods of time. This variant FBPase helps us understand the multiplicity of redox regulations of the wild-type version and enables us to further improve enzymatic constants. Finally, we searched for the selectivity determinants of TRX-f/FBPase recognition. When synthetically grafted onto a generic TRX scaffold these determinants functionally recapitulated the recognition of FBPase, improving redox activation.

BIOGRAPHICAL SKETCH

Julien is a structural biologist and biochemist trained at the Université Paris-Saclay and now associate Professor at Sorbonne Université, where he co-leads the team Synthetic and Systems Biology of Microalgae with Dr. Stéphane Lemaire. Since 2013 he has worked on the structures of enzymes catalyzing photosynthetic carbon fixation in chloroplast and on molecular chaperones that assemble multiprotein complexes, using the green microalga *Chlamydomonas reinhardtii* as a model organism. He analyzes structure/catalysis relationships in active sites using X-ray crystallography guided by computational predictions, notably mapping the conformational effects of regulatory redox post-translational modifications, and describing the higher-order assemblies of enzymes including liquid-liquid phase separation into molecular condensates. Based on experimental structures, he aims at designing artificial variants of protein sequences with enhanced biochemical functions. The structure-function studies of Calvin enzymes are conducted in a decade-long collaboration with the Department of Pharmacy and Biotechnology and with the Department of Chemistry Giacomo Ciamician of the University of Bologna.