INSTITUT DE CHIMIE

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COLLÈGE DE FRANCE
1530

Nicolas WINSSINGER

EMERGING FUNCTION FROM BIOSUPRAMOLECULAR ASSEMBLIES

Mardi 13 novembre 2018 à 11h
Salle 5

Biography

Nicolas Winssinger is Professor at the University of Geneva (organic chemistry department) and a member of the NCCR Chemical Biology. He began his independent career in 2002 at the Institut de Science et Ingénierie Supramoléculaires, Strasbourg university and moved to his current position in 2012. Nicolas carried out his PhD under the guidance of K.C. Nicolaou (The Scripps Research Institute) and postdoctoral training with P.G. Schultz (NIH postdoctoral fellow). His research interests lie in bioorganic chemistry and chemical biology. An important theme in his lab is the use of chemical synthesis and natural product synthesis to aid in the development of chemical biology probes, with a particular emphasis on probes that inhibit their target through covalent interactions. These probes have been employed in a number of studies to dissect biochemical pathways and for the elucidation of new drug leads for a range of diseases. Another important theme throughout his research is the use of unnatural nucleic acid (PNA) to encode molecules, program spatial organization of ligands and direct reactions. His group has developed several new DNA and RNA templated chemical reactions that proceed in cellulo and live vertebrates, responding to endogenous RNAs. A long-term objective is to extend these principles towards complex systems which can emulate some of the fundamental features of living systems.

Emerging function from biosupramolecular assemblies

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Life is orchestrated by biomolecules interacting in complex networks of biological circuitry. An overarching goal in our lab is to integrate progress in the area of DNA-based circuitry and templated reactions into chemical biology applications and ultimately design programmable systems that can recapitulate characteristic functions of living systems. Several stepping stones towards this goal will be presented with self-assemblies that respond to environmental cues and lead to a chemical transformation output. A significant portion of this work is leveraged on Peptide Nucleic Acids (PNA) which are endowed with attractive properties for this endeavor as they are more robust and form more stable duplex than their natural counter parts.

Selected publications

(1) PNA as a Biosupramolecular Tag for Programmable Assemblies and Reactions, ***Acc. Chem. Res.*** 2015, ***48***, 1319-1331

(2) Allosterically Regulated Phosphatase Activity from Peptide-PNA Conjugates Folded Through Hybridization, ***Angew. Chem. Int. Ed.*** 2016, ***55***, 8595-8.

(3) Nucleic-acid templated chemical reaction in a live vertebrate, ***ACS Central Science***, 2016, ***2***, 394-400.

(4) Critical Analysis of Rate Constants and Turnover Frequency in Nucleic Acid-Templated Reactions: Reaching Terminal Velocity, ***J. Am. Chem. Soc.*** 2017, ***139***, 1444-1447.

(5) Dynamic Cooperative Glycan Assembly Blocks the Binding of Bacterial Lectins to Epithelial Cells, ***Angew. Chem. Int. Ed.*** 2017, ***56***, 6762-6766.

(6) Luciferase-induced photoreductive uncaging of small-molecule effectors, E. Lindberg, S. Angerani, M. Anzola, N. Winssinger, ***Nature Commun,*** 2018, ***9***, 3539.