

Young Career Focus: Dr. Thomas Boddaert (Paris-Sud/Paris-Saclay University, France)

Background and Purpose. SYNFORM regularly meets young up-and-coming researchers who are performing exceptionally well in the arena of organic chemistry and related fields of research, in order to introduce them to the readership. This Young Career Focus presents Dr. Thomas Boddaert (Paris-Sud/Paris-Saclay University, France).

Biographical Sketch



Dr. T. Boddaert

Thomas Boddaert studied chemistry at ESCOM-University of Cergy-Pontoise. He completed his PhD in 2009 at Aix-Marseille University under the supervision of Prof. Jean Rodriguez and Dr. Yoann Coquerel, working on the development of new domino/consecutive transformations in the field of organocatalysis. He then joined Prof. Jonathan Clayden at Manchester University (UK) as a one-year postdoctoral associate, working on the conformational control over the screw sense of achiral helical peptide foldamers. Late 2010, he returned to France for two additional postdoctoral years in the group of Dr. Jacques Maddaluno at the University of Rouen to study an intramolecular anionic rearrangement of organosilicate species in collaboration with Janssen-Cilag. In September 2012, he was appointed as an assistant professor at Paris-Sud/Paris-Saclay University (France). His current research interests focus mainly on cyclobutane derivatives, including their synthesis via photochemical approaches, studies of their chemical reactivity and their applications in the field of foldamer chemistry. In 2019, he received the Thieme Chemistry Journals Award.

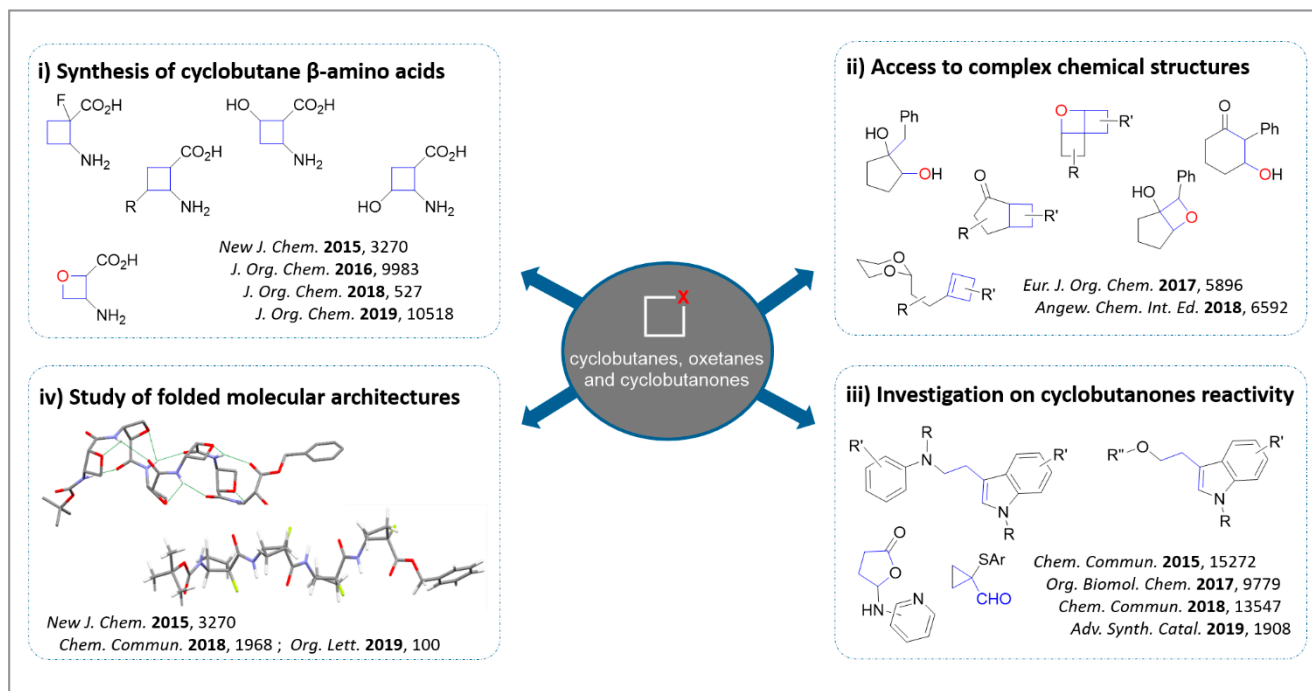
INTERVIEW

SYNFORM *What is the focus of your current research activity?*

Dr. T. Boddaert Cyclobutane derivatives are very versatile building blocks, thanks to the perfect balance between reactivity and stability. They can provide a source of chemical diversity due to their inherent ring strain as well as very interesting molecular scaffolds due to their specific behavior. Photochemical reactions can give an access to complex molecules that are difficult to obtain otherwise, such as our four-membered-ring compounds. Our research thus focuses on the development of new light-initiated reactions to prepare substituted cyclobutane and oxetane derivatives, but also to create molecular diversity through the combination of photochemical transformations in domino sequences. Our research is also centered on the reactivity of these four-membered-ring derivatives, which can be precursors of various functionalized compounds. Finally, the chemical behavior of cyclobutane moiety is being exploited to induce the robust global conformational organization of folded molecular architectures (Scheme 1).

SYNFORM *When did you get interested in synthesis?*

Dr. T. Boddaert While my interest in chemistry began during high school, my great passion for organic chemistry was born at the start of my further education thanks to my teachers. Indeed, two talented teachers (Dr. Jean Pierre Foulon and Dr. Gérard Cahiez) were able to share and pass on their love of organic synthesis. They delivered fascinating lecture courses in which they always included captivating practical details, anecdotes on the history of chemistry, personal chemical achievements... They taught me the crucial notions that I use daily as a researcher in organic chemistry, but at the same time they gave me valuable tools that I employ when I



Scheme 1 Research overview

am in front of students as a teacher at the university. I will be always very grateful to these two chemistry teachers and the others I had in the following years.

SYNFORM What do you think about the modern role and prospects of organic synthesis?

Dr. T. Boddart Today, society is unconsciously chemistry-dependent for drugs, materials, energy... and it will likely be the same in the future. Organic chemists will remain essential in these specific research fields but also in fundamental chemistry, to make new discoveries and to develop 'modern chemistry'. Indeed, while the pioneer organic chemists' aim was to establish new reactions and to increase the efficiency and selectivity of chemical transformations, the current and future job for chemists is to achieve similar results in an eco-compatible manner. Among environmentally friendly transformations, catalytic reactions using renewable catalysts, alternative activation modes and processes such as microwave irradiation, mechanochemistry, photochemistry and flow chemistry and multiple bond forming transformations (MBFT) via domino or consecutive sequences provide a promising response to the contemporary eco-compatible chemistry requirement.

SYNFORM Could you tell us more about your group's areas of research and your aims?

Dr. T. Boddart Our research interests are dedicated to the synthesis, the reactivity and the applications of four-membered-ring compounds. Functionalized cyclobutane scaffolds, prepared by photochemical approaches, are used as intermediates to prepare complex molecules and as building-blocks in well-organized molecular architectures. With these targeted applications, one of our current aims is to expand our library of functionalized cyclobutane β -amino acids, thanks to efficient, scalable and robust photochemical methodologies and to use them to construct the corresponding oligopeptides. With highly reactive intermediates, such as radical and/or excited species, light-initiated transformations are particularly compatible for MBFT processes. Our objective is to develop new domino, consecutive and/or multicomponent sequences which combine a photochemical step with thermal transformations or other photochemical reactions. Finally, the specific reactivity of cyclobutanones is still investigated to enlarge the potential of these derivatives as a source of chemical diversity (Scheme 1).

SYNFORM What is your most important scientific achievement to date and why?

Dr. T. Boddart One of our most important scientific results to date is an attractive synthesis of protected cyclobutane aldehydes and unprecedented tricyclic oxetanes from cyclopent-2-enones and alkenes in a selective manner via a domino process. While the cyclobutane aldehydes were obtained via a [2+2]-photocycloaddition then a Norrish-I cleavage followed by γ -hydrogen transfer, the tricyclic angular oxetanes were achieved by an additional intramolecular Paternò-Büchi reaction (*Angew. Chem. Int. Ed.* **2018**, *57*, 6592–6596). This achievement demonstrates the potential of photochemical transformations to access, both selectively and efficiently, original complex molecules from simple starting materials. It also highlights the possible combination of several photochemical transformations within a single domino sequence.

