Young Career Focus: Dr. Adrien Quintard (Aix-Marseille University, France)

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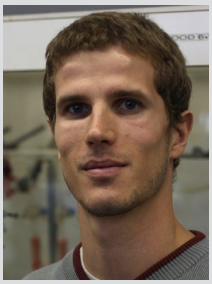
Background and Purpose. SYNFORM regularly meets young up-and-coming researchers who are performing exceptionally well in the arena of organic chemistry and related fields of research, in order to introduce them to the readership. This Young Career Focus presents Dr. Adrien Quintard (Aix-Marseille University,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

Biographical Sketch



Dr. A. Quintard

Adrien Quintard studied chemistry at the University of Toulouse (IUT, France) and then at CPE-University of Lyon (France). He completed his PhD in 2011 under the supervision of Prof. A. Alexakis at the University of Geneva (Switzerland). He subsequently moved to the University of Stanford (USA) for a first post-doctoral stay working with Prof. B. M. Trost. After moving to Aix-Marseille University (France) in 2012 for a second post-doctoral position, he obtained in 2013 an ANR research grant allowing him to start his own research program on the development of multi-catalyzed transformations before becoming in 2014 CNRS researcher. Recently, he was recognized by the young researcher 'Emergence' award from the organic division of the French Chemical Society and he was a recipient of a Thieme Chemistry Journals Award.

INTERVIEW

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

Dr. A. Quintard Optimal organic synthesis is crucial for our future through providing society with access to optimized drugs or materials and also for finding solutions to the energy crisis, for example. In an attempt to find solutions to this challenge of eco-compatible synthesis, our research is centered on the development of new catalytic tools for rapidly transforming easily available molecules into elaborate molecular architectures. To obtain the best possible synthetic sequence while limiting both steps and waste generation, we do not restrict our research to the use of a single catalytic activation mode. Instead, we try to find the best possible catalysts able to selectively activate the desired chemical functions while achieving maximum efficiency. As a result, by combining several compatible catalysts, we can design innovative cascades and rapidly access complex scaffolds. With these improved synthetic tools in hand, we are able to rapidly elaborate original frameworks with designed functions that should allow us to extend our research in the future to other fields, such as the study of biological interactions, for example.

SYNFORM *When did you get interested in synthesis?*

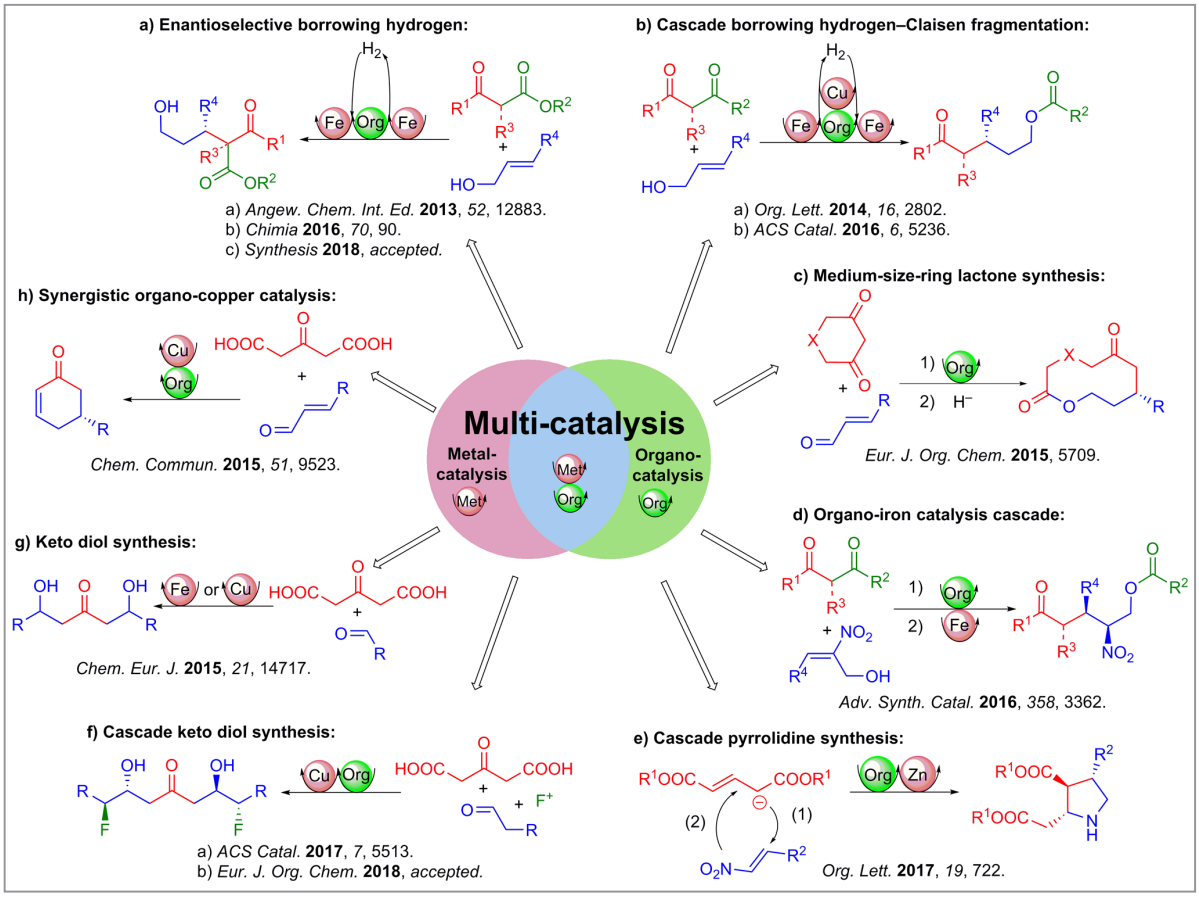
Dr. A. Quintard To be honest, after finishing high school, I was more interested in biology than in chemistry. However, despite my poor level in chemistry, I was lucky enough to enter an excellent technical university institute (IUT of Castres in the south of France) where the teachers shared their passion for organic chemistry. At 18 years old, discovering organic synthesis is exciting because you understand that you can build up new materials and drugs while playing, to try to create them with the best possible efficiency. This passion was confirmed during my subsequent internships where I had

the opportunity to discover the difficult but stimulating world of research, where the term 'playing' is perfectly appropriate to describe this three-dimensional Lego game chemists are playing.

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

Dr. A. Quintard The current trend is to considerably diminish the role of organic synthesis. Science is full of politics and people who consider that synthesis is a mature field, only here to assist biologists or physicists; they think that it is out of date and that it will soon be replaced by synthetic biology. Synthetic biology is an excellent tool but there are no Swiss Army knives able to perform all required transformations. For now, even though organic synthesis has outstanding potential and can create a wide range of complex structures relatively rapidly, we are still far from what can be considered as ideal synthesis, notably when looking at waste generation and time consumption. Many chemical architectures cannot be constructed on scale and cheaply because of the limitations of our current toolbox. For this purpose, we need to improve our understanding of the interactions between molecules and the way to activate and transform chemical functions, notably using catalysts with enhanced efficiency. These improvements at the fundamental level will lead to optimized eco-compatible syntheses and subsequently help physicists and biologists in their own research.

SYNFORM *Your research group is active in the area of stereoselective synthesis and natural products synthesis. Could you tell us more about your research and its aims?*



Scheme 1 Research overview

Dr. A. Quintard Our research is dedicated to the discovery of innovative methodologies and eco-compatible synthetic routes to access complex molecular architectures rapidly from simple building blocks. Towards this goal, we focus on the use of catalysis in a wide sense, notably using organocatalysis (aminocatalysis, chiral bases, thioureas) and metal catalysis based on abundant non-precious metals such as Fe or Cu. In order to go beyond the limitations inherent to the use of a single activation mode, a major part of our efforts focus on the development of multi-catalyzed processes allowing us to achieve the best possible reaction efficiency. Combined with cascade reactions, such an approach at the frontier between metal and organocatalysis allows the solving of key synthetic chemical problems and to considerably shorten some existing routes to crucial synthetic building blocks (Scheme 1).

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

Dr. A. Quintard Within our research program, the developments on enantioselective borrowing hydrogen is to our eyes among the most interesting. In this work, we have shown that a combination between an iron borrowing hydrogen catalyst and a chiral organocatalyst can promote the enantioselective functionalization of allylic alcohols (*Angew. Chem. Int. Ed.* **2013**, *52*, 12883–12887; *ACS Catal.* **2016**, *6*, 5236–5244). Apart from the considerable synthetic economies such a process brings to complex molecule preparation, it was also the first use of an iron catalyst in a borrowing hydrogen. Besides this hydrogen transfer processes, we have also shown more recently that we could rapidly construct valuable keto diols, key direct precursors of 1,3,5-polyols, a class of molecules of great interest. By a selective combination between an organocatalyst and a copper complex, a single cascade allowed the enantioselective fluorination of aldehydes and their in situ derivatization by the copper catalyzed aldolization, constructing up to four acyclic stereogenic centers in one single cascade (*ACS Catal.* **2017**, *7*, 5513–5517).