



Total synthesis: an enabling science

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Editorial

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Total synthesis is a topic strongly related to synthetic methodology developments and to natural product isolation or biosynthesis. Thus, thematic issues dealing with total synthesis in the *Beilstein Journal of Organic Chemistry* have naturally been published in these fields, such as "Transition-metal and organocatalysis in natural product synthesis" (edited by D. Chen and D. Ma) [1] or "Natural products in synthesis and biosynthesis" (edited twice by J. Dickschat) [2,3]. Previously, the early thematic issue "Indolizidines and quinolizidines: natural products and beyond" (edited by J. P. Michael) from 2007 [4] displayed some of the very first total syntheses ever published in the *Beilstein Journal of Organic Chemistry*, such as those of frog indolizidine alkaloids [5,6]. However, no thematic issue specifically related to total synthesis has been published before, and we thought it would be time to fill this gap. Although innovative developments are constantly needed to improve methods and strategy, keeping in mind the difficulty of performing transformations on highly functionalized compounds, the total synthesis of complex natural products is indeed mature in terms of efficiency, practicality, economy, and scalability. In short, it has become an enabling science.

Total synthesis is the science of constructing molecules from simple starting materials. It often deals with complex molecular

architectures that require a thorough retrosynthetic problem-solving analysis [7]. Total synthesis and the discovery of new synthetic methodologies have always been intimately related. Specific methodologies have often been developed to synthesize valuable compounds, while total synthesis has often been a pretext to demonstrate the value of a new synthetic reaction [8,9]. Old and recent achievements show that connections to other disciplines are important to the success of total synthesis and can be a source of new discoveries. Indeed, as a science allowing the preparation of useful functional compounds, it is strongly connected to biological and medicinal studies, while the development of natural-product-based tools for chemical biology often requires the construction of complex molecules [10,11]. Incidentally, the term "total synthesis" is not limited to natural products but also, sometimes, targets complex drugs [12,13]. Furthermore, it is possible to test biosynthetic hypotheses concerning natural products through synthetic approaches (biomimetic synthesis) [14]. In addition, total syntheses have also been achieved with enzymes, strengthening the links to biology [15].

Total synthesis is not limited to academic laboratories but rather also pursued in industry, where a particular efficiency and economy of tasks is of paramount importance [12], as illus-

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