

Editorial

A ‘Continuous’ Evolution of Chemistry in Academia and Industry



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Synthetic chemistry is a mature science. Its roots have a very deep and intimate connection with our societal progress. Indeed, the contributions of synthesis chemistry to society are visible to everyone: from pharmaceuticals, through agrochemicals and fragrances, to commodities chemicals.

To paraphrase one of the most influential chemists in the world, George Whitesides: “*nothing goes on forever*” [in the field of chemistry]. Nowadays, synthesis chemistry is facing several obligations to society, which are posing very fundamental questions, such as understanding **what synthesis chemistry must deliver for the future**. On the other hand, the same obligations determine the presence of opportunities which must be seized, for the future of society.

Challenges, especially in the field of synthesis chemistry, are certainly increasingly present. Among the key challenges, today’s synthesis chemists need to address the cumbersome task to improve sustainability, efficiency and productivity, in the way chemicals are discovered, developed and manufactured.

So, what is next must be addressed today.

What comes next is not only the result of what we want synthesis chemistry to deliver for the future, but how.

New technologies and techniques have been aiding process throughout the historical development of chemistry. Technologies such as continuous flow chemistry have impacted some areas of the industry (especially the petrochemical and commodities’ chemicals industry) but are definitely underexplored under many other contexts. Continuous flow chemistry has a long-standing history of it being among one of the most efficient technologies for production. There is no doubt that this technology has been rather neglected by the synthesis chemistry community, leaving the potential task of considering it an alternative tool only to engineers.

Chemists such as **Prof. Steve Ley** demonstrated an early interest in the technology and pioneered the emergence of the field within the chemistry community. Years of significant contributions resulted in the technology being well accepted in the research community and now represents an accessible tool in research laboratories all over the world. In this special issue, Prof Steve Ley and his coworkers at the University of Cambridge, UK, provide us with a perspective highlighting the role of flow chemistry in a highly digitally-connected world, suggesting areas where new opportunities may arise in the future. Networking, collaboration and knowledge-sharing are the source of innovation and the essential way to progress science – this and much more is disclosed by **Dr. Carlos Mateos** (Eli Lilly) in his review around the success of the flow chemistry programme, in the context of the Lilly Research Award Partnerships. **Dr. Anastasios Polyzos** and his team at the University of Melbourne, Australia, focus their manuscript on the use of flow photoredox catalysis to achieve mild and scalable processing conditions, and *also* to address the concept of sustainability. **Dr. Richard Bourne** and colleagues from the University of Leeds, UK, take us on a journey with their idea of automating flow chemistry processes, using a hybrid algorithm which could open opportunities to improve process robustness and understanding. **Dr. Francesco Venturoni** and colleagues at Novartis describe one of the major challenges when scaling up flow processes – fouling. The methodology implemented is showcased both in lab and plant. Our article, together with **Mukul Lal**, from Syngenta Crop Protection, describes how a continuous flow platform can facilitate the safe production of intermediates on kilogram scale.

Continuous flow chemistry is certainly not the solution to ‘everything’, but a solution to a very well defined set of issues. Issues such as safety, operational constraints and chemistry challenges, some of which we describe in our outlook.

The collection of articles in this special issue has the scope to highlight some of the current trends in the field of continuous flow chemistry, both in academia and industry, and we hope it will give you a taste of vision and (growing) expertise in the field!!!

Looking forward to what is next!

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The Editorial Board of CHIMIA warmly thanks Claudio Battilocchio and Edouard Godineau for their efforts in creating this ‘Continuous Flow Chemistry – Industry and Academia Perspectives’ issue with a range of articles highlighting the great potential of an important sustainable technology.