The search for new ways to assemble molecules continues to be an important driver for organic synthesis. The biological activity and exquisite structural diversity of many natural products stimulates invention by challenging today’s synthetic methodology. However, preparing such materials from small and commercially available building blocks inevitably involves more than one synthetic step. For most modern drugs and other complex molecules, it is not uncommon for syntheses to require at least 10 steps, and sometimes many more. In order to make molecules more efficiently and economically, our group has developed and used solid-supported reagents in a multi-step fashion without the use of conventional work-up procedures. Now we have extended these concepts to make use of advanced scavenging agents and catch-and-release techniques, and combined these with the use of continuous flow processing to create even greater opportunities for organic synthesis.

As important examples of these developments, we have recently completed the syntheses of the natural products grossamide and oxomaritidine entirely by using these flow chemistry methods. The syntheses required the construction of a fully automated continuous flow reactor system (using a simple pumping arrangement) with immobilized reagents packed in columns to effect the synthesis steps efficiently. These examples illustrate the rapid and flexible nature of the methods for preparing compounds on demand and at various scales. The future vision of this emerging field could well cause a paradigm shift in the way chemical synthesis is conducted.

Flow Technology: The Synthesis of Oxomaritidine