

Preface

The 1987 Nobel Prize in Chemistry was awarded to Donald J. Cram, Jean-Marie Lehn, and Charles J. Pedersen for “their development and use of molecules with structure-specific interactions of high selectivity”. At this time, the award was bestowed for the synthesis of molecules that mimicked important biological processes – what Lehn deemed supramolecular chemistry. In the two decades that have followed, this field has expanded greatly, and supramolecular breakthroughs in organic synthesis, molecular electronics, and materials science have now been realized. It is interesting to note, however, that in many respects supramolecular chemistry has remained close to its roots. The pioneering efforts that merited the Nobel Prize were based primarily on the synthesis of macrocycles. These were the crown ethers, the cryptands, the cavitands, and other host molecules that ultimately provide a welcoming and selective environment for a particular guest species, whether it be a neutral molecule, a cation, or an anion.

Both historically and in the present day, supramolecular chemistry beautifully marries two scientific disciplines: organic synthesis and physical organic chemistry. It is here that the most modern aspects of this field of chemistry share the spotlight. No longer is the objective simply to mimic biological systems such as enzymes, but rather, today’s supramolecular chemist is limited only by his or her imagination as to the role that a macrocycle might play in some well-orchestrated chemical scheme.

The goal of the present monograph is to tie together these seemingly diverse achievements under a common heading: the synthesis of macrocycles for use in supramolecular chemistry. To this end, the biological relevance of macrocycles continues to play a pivotal role, as illustrated by a chapter on macrocyclic peptides by Liskamp and co-workers. The emergence of ring-closing metathesis as a pre-eminent synthetic strategy for constructing naturally occurring macrocycles is described next by Prunet *et al.* Synthetic efforts toward macrocycles continue to be inspired by Nature, and these stories are recounted by de Mendoza and Ballester (hydrogen-bonding assembly), Isaacs and coworkers (curcubiturils), Böhmer and Podoprygorina (tetra-urea calixarenes), and Sessler and coworkers (anion-binding macrocycles). From here, supramolecular chemistry melds into materials chemistry, where shape-persistent macrocycles (Tykwinski and Sadowy), three-dimensional

architectures (Dalcanale and Pirondini), molecular containers (Fujita and Yoshizawa), and rotaxanes (Wisner and Blight) share the stage. While it is not possible to review comprehensively each of the above topics, we believe this monograph provides expert insight and advice, covering both synthetic endeavors and applications of the resulting products. Most of all, however, we hope that these 10 chapters will instill the inspiration to further expand the boundaries of this captivating field of research.

This book results from the substantial efforts of a number of people. Most importantly, we appreciate the contributions of the authors. In this era of dwindling time and funding, their efforts and expertise have provided a monograph that is both interesting to read and a scientific resource. We express our gratitude to Ms. Annie Tykwinski for the original illustration that became the cover of this book, and we would like to thank Drs. Manfred Köhl and Andreas Sendtko at Wiley-VCH, as well as the production staff, for their aid in preparing this monograph.

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François Diederich
Peter J. Stang
Rik R. Tykwinski
Zurich, Salt Lake City, Edmonton