Preface

Heterocyclic molecules play a significant role in life processes and have played a major role in industrial developments of the last century, for instance in the field of dyes, pharmaceuticals, pesticides, polymers etc. They comprise not only some of the most interesting and biologically important natural products like alkaloids, carbohydrates, nucleic acids, and antibiotics but include many practical drugs and a large segment of known synthetic organic compounds. Hence scientists have devoted a great amount of effort to find optimal synthetic approaches to a variety of heterocyclic compounds.

Among the most successful and selective synthetic processes are cycloaddition reactions, since they involve simultaneous or sequential formation of two or more bonds often with a high degree of stereoselectivity and regioselectivity. For instance, 1,3 dipolar cycloadditions, which are electronically equivalent to Diels–Alder reactions, are among the most-common 5-membered ring-forming systems. In addition they usually proceed with a high degree of stereo- and regio-control. It is therefore, not surprising that synthesis of many important classes of heterocycles, including those of useful biologically active molecules, have utilized cycloaddition steps in their formation. Furthermore, many heterocycles serve as intermediates in the synthesis of polyfunctional molecules.

Volume I of "Synthesis of Heterocycles via Cycloadditions" featured five chapters on the following topics:

- Isoxazolines from Nitro Compounds: Synthesis and Applications;
- Cycloaddition Reactions of Azides Including Bioconjugation;
- Enantioselective Cycloadditions of Azomethine Ylides;
- Heterocycles by Cycloadditions of Carbonyl Ylides Generated from Diazo Ketones;
- Heterocycles from Unsaturated Phosphorus Ylides.

In this volume we present four selected contributions by well-known authors, each an authority in his field. The first chapter is devoted to the use of oximes in cycloadditions which leads to formation of isoxazolines and isoxazolidines and from there to synthesis of macrolides like amphotericin and of other natural products and bioactive molecules. Furthermore, 4+2 cycloadditions of nitrosoalkenes are also included. This chapter complements the one in the previous volume which discussed access to isoxazolines via nitroalkanes.

The subject of the second chapter is how pyrylium and pyridinium betaines can be used in cycloadditions leading to interesting N- and O-bridged heterocycles and applications to synthesis of a variety of natural products. Reactions such as 6+3 cycloadditions are also included.

The third chapter deals with synthesis of heterocycles via cycloadditions catalyzed by indium derivatives and related Lewis acids. Metal-catalyzed cycloadditions play an important role in generation of heterocyclic compounds. In particular catalysis by indium salts, which can tolerate the presence of water, can be used in the synthesis of many types of heterocycles such as 3-membered ring aziridines, 4-membered rings by 2+2 cycloadditions, as well as various 5-membered ring heterocycles and 6-membered heterocyclic systems via hetero-Diels–Alder reactions.

The last chapter brings to light the formation of heterocyclic rings via higher-order cycloadditions such as 8+2 and 6+4 annulation reactions. In this manner bicyclic systems including azaazulenes can be constructed. I want to thank all authors for their excellent presentations and their splendid cooperation.

This volume is dedicated with love to my grandchildren Ariel, Amit, Matan, Tal, Hadas, and Tamar.

Ramat Gan, February 2008 Alfred Hassner

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