

Preface from the editors

The *Roempp Encyclopedia Natural Products* intends to provide the reader with rapid information on organic natural products and phenomena connected with them. This book is directed to chemical scientists, biologists, pharmacists as well as to interested laymen who wish to learn about e.g. the lacrymator in onions or the typical flavor compounds of beetroot. Teaching staff at high schools and universities will be motivated to incorporate the fascinating realm of natural products into their classes.

The *Roempp Encyclopedia Natural Products* focusses on so-called *Secondary Metabolites*, compounds which occur in certain organisms only, often serving beneficial functions for the species. They are separated conceptually from the so-called *Primary Metabolites* which are essential for maintenance of cellular processes. The latter are ubiquitous in practically all organisms and provide the building blocks for the biosynthesis of secondary metabolites. Examples of secondary metabolites include toxins and defence compounds, which plants and animals employ against enemies or competitors; pheromones and flower pigments provide insects with essential information. Nevertheless, the biological function of many secondary metabolites remains unclear, e.g. it remains an open question why the fly agaric produces the red pigments in its cap, for which it is known. Secondary metabolites show remarkable structural diversity. Even structurally very "unusual" compounds like isocyanides, nitro compounds and halogenated aromatic ring systems, which were formerly thought to be of synthetic origin only, can be found among natural products. This encyclopedia is a rich source of such substances, which are usually not included in textbooks. This knowledge deficit has certainly contributed to the wide-spread opinion, that "natural" chemicals are benign and "synthetic" ones are hazardous.

The editors of this encyclopedia had the difficult task of choosing a representative selection from the more than 170,000 known secondary metabolites. The original first German edition of this book, published in 1997, has been completely revised, updated and expanded by the editors with the addition of new entries. The literature has been covered until the end of 1999.

To keep the size of this book within reasonable limits, only primary metabolites that are related to secondary compounds have been mentioned. This applies especially to carbohydrates and nucleosides/nucleotides. Even macromolecular compounds and proteins are mentioned marginally only. Basic concepts and definitions that appear in standard textbooks are not covered as full entries. The main emphasis of this encyclopedia is on those types of microbial, plant or animal secondary metabolites which show interesting biological activities or are responsible for conspicuous properties of the organisms like color and smell. Our intention was to provide insight into the vast structural diversity of secondary metabolites which is becoming more and more important for the discovery of lead structures in pharmaceutical and crop protection research. Chemical ecology was another important focus. For certain phylogenetic groups of organisms, characteristic secondary metabolites are mentioned with respect to chemotaxonomic aspects. They can be found as specific entries under the compound names. Collective names like Actinomycetes, toadstools, insect attractants or macrolides also facilitate searching. The numerous cross references are designed to make the information readily accessible. Furthermore, the *Roempp Encyclopedia Natural Products* contains an appendix with an extensive index of Latin species names and a molecular formula index. The selection of compounds remains subjective and there are certainly important entries that are missing and should be considered for a subsequent edition of this book. The editors would very much appreciate your suggestions. Due to the restricted size of this book, the names of authors have been omitted in the literature references. The coverage of total syntheses is restricted to references to the literature. Special attention was given to provide correct stereochemistry and concise texts.

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Preface from K. C. Nicolaou

Although our ability to synthesize molecules has progressed dramatically over the course of the past several decades, organic synthesis is still in its infancy compared to the dazzling variety and complexity of molecules which nature can so deftly prepare. Taking the same number and types of constituent atoms, nature combines them with seemingly limitless variation, creating in the process molecular architectures which not even the most fanciful of chemists could be expected to conjure on their own. More significantly, nature's ingenious collection of molecular designs exhibits a dazzling array of biological properties, affording opportunities to probe important biochemical processes as well as to develop therapeutic agents to treat some of the most serious ailments afflicting mankind. With new molecular constructs isolated and characterized daily, the constantly enriched library of natural products provides a vibrant engine that will undoubtedly continue to drive forward our quest for understanding and improving the world around us. As one pages through the *Roempp Encyclopedia Natural Products*, these concepts come to life through a

well selected sample of nature's library of molecular diversity. More than a simple catalogue listing of structures, the editors provide thorough and meticulously researched information on the biology, biochemistry, and pharmacology of important natural products isolated from a myriad of organisms from all corners of the world. Whether searching for a historically important natural product such as the poison strychnine or a leading cancer therapeutic such as Taxol™, scientists and laymen alike are certain to find answers to their questions as well as key references, should their interest be piqued. This volume represents a fine addition to the reference literature, and hopefully it will be followed by a continuing series which will provide not only a detailed collection of important information, but also a source of inspiration for new generations of chemists and biologists.

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Preface from Satoshi Ōmura

Natural products, whether their sources are animals, plants or microorganisms, are sources of inspiration not only for organic chemists, but also for physical and biological chemists and scientists in a variety of other fields. They are the motivating power that drives creative thought processes in various scientific disciplines. The compounds included in this encyclopedia were selected from an enormous number, approximately 170,000, of natural products by 39 recognized German experts from the various areas of natural products chemistry. The compounds were chosen in a well-balanced way from the most significant classes of natural products such as antibiotics, alkaloids, pheromones, flavonoids, and ionophores. Secondary metabolites are given priority, but important primary metabolites are also described, though fewer in number. The stereochemical illustration of the structure of natural products seems to be the most effective way of drawing out creativity from scientists and even artists. In addition to the structure, various biological and physical properties are concisely described; the profiles of the compounds from discovery to application are also soundly arranged in this book. Useful synthetic derivatives and biosynthesis of natural products have been added. Thus the depth of coverage mirrors the breadth of natural products research.

One of the principal features of this book is that it serves as a reference to some important general terms related to natural products such as alkaloids, carotenoids, glycoproteins, and snake venoms. Moreover, historical coverage and overview texts, even headings like “screening”, can be found, indicating that this book is much more than a mere dictionary of natural products.

The original and review articles cited in this encyclopedia are not only related to the discovery of the compounds, but are also suitable for their comprehensive understanding.

The highly acclaimed original first German edition of this book was published in 1997. It was completely revised and updated by the editors and translated into English as an international version.

I believe that this encyclopedia is one of the most valuable books that people interested in natural products chemistry should have on hand, regardless of whether they are experts or newcomers in the field.

Satoshi Ōmura, Ph. D.
(June, 2000)



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