

# Pharmaceutical, Medicinal and Natural Product Chemistry

P. S. Kalsi  
Sangeeta Jagtap

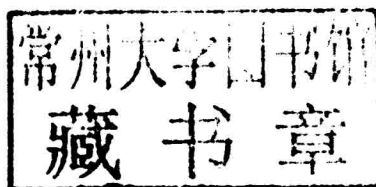


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# Pharmaceutical, Medicinal and Natural Product Chemistry



## **Dedicated to**

**Professor Dr. Anamik Shah**

**Professor of Medicinal Chemistry, Department of Chemistry, Saurashtra University, Rajkot  
and**

**President Society of Chemists and Biologists (Lucknow) for his devotional and outstanding  
contribution to the upgradation and development of  
teaching and research in medicinal and pharmaceutical chemistry globally.**



# Foreword

The wonder of nature, its biology and chemistry are endless, offering never ending challenges to unravel numerous fascinating mysteries. Though, mankind has made progress in the fields of technology & basic sciences, it is difficult to emulate nature's wonders, which it does at simpler conditions & scales, but with utmost precision and sensitivity. This, makes nature more and more mysterious and equally marvelous. The human body, its constitution, functioning, its diseases and disorders, its response to various xenobiotics (molecules from natural as well as synthetic origins) are the aspects of great research and investigations involving, different approaches and angles. Landmark observations and research findings are made continually, towards these objectives.

"Pharmaceutical, Medicinal and Natural Product Chemistry" written by Prof. P.S. Kalsi and Dr. Sangeeta Jagtap being published by Narosa Publishing House Pvt. Ltd., New Delhi, is indeed unique and informative in its style, contents and coverage.

A systematic probe into the chemical structures, and functional groups, in particular, besides the stereochemistry of various synthetic and naturally occurring drugs, their medicinal actions, synthesis/biosynthesis, chemistry involved in their interactions with enzymes and receptors, is made in simple and unique fashion. A plethora of examples has been provided for depicting these aspects and concepts. In the natural products chemistry, the biosynthetic pathways are very important. An elaborate understanding on acetate, shikimate, mevalonate pathways and the role and chemistry of acetyl CoA have been given.

The book has a chapter on Nutraceuticals, which is indeed an unique and important feature, not usually found in most of the medicinal chemistry textbooks. Chapters on flavanoids, alkaloids, terpenoids, carotenoids and steroids covering aspects on their structural elucidation, classification, stereochemistry, chemical reactivity, biosynthesis, therapeutic action and mechanism of action, their combination and synergetic effects with other bioactive molecules are indeed very informative.

Chapters 8 and 9 are somewhat unique as they cover drugs from marine natural products and toxins from various sources. The last three chapters, 11-13, respectively, deal with the most biologically and medicinally important heterocyclic ring systems; pyrimidine and its fused analog, purine; syntheses of various drugs from 23 different pharmacological categories and lastly; the production of drugs employing microbiological/biotechnological techniques.

Thus, this textbook is indeed an unique work piece in many ways; its style, concept, content, scope, examples covered, etc.

I have no doubts that this work of Prof. Kalsi and Dr. Jagtap will go in a big way as a standard reference for students, teachers and professionals dealing with various aspects of medicinal chemistry.

**Prof. Dr. K. S. Jain**  
Principal  
Sinhgad College of Pharmacy  
Pune - 411 041





# Preface

The modern approach to teaching and practice of both organic and pharmaceutical chemistry represents the integration of traditional principles with molecular biology. The new emphasis firmly demands the study of organic chemistry teaching to its application to biochemical aspects, drug development and pharmaceutical aspects.

The proposed organizational approach of the book builds from the principles of organic chemistry for example, study of functional groups, metabolic reactions, functionalization reactions and reagents and chemistry of natural products to their integration into pharmaceutical and medicinal chemistry.

The proposed book is likely to be modern, readable and an interesting blend of pharmaceutical and organic chemistry, and would be useful for graduate students from both disciplines.

The book has four principle aims:

- Explaining the principles of organic chemistry using biologically important molecules
- Study of the chemistry of Natural products laying emphasis on general methods of structure elucidation, structure, synthesis and biogenesis of some typical members form different classes of compounds
- Making the text useful for the students of pharmaceutical and medicinal chemistry to cover their organic chemistry component.
- To face and excel in interview/selection committee meetings in the subject of organic and pharmaceutical chemistry

The book covers the following topics of study: Some pharmaceuticals, their functional groups and medicinal importance. Terpenoids, steroids, alkaloids, anthocyanins, flavonoids, marine natural products, carotenoids, nutraceuticals, toxins used as drugs and pharmaceuticals, purines and pyrimidines etc. Biogenesis of these Natural Products/Medicinal importance of all the topics listed above is a typical aspect of the book. Role of natural products in development of medicinal chemistry and to lead compounds from different classes of drugs/biotechnology and drug developments. Synthesis of some drug molecule is also discussed.

**P. S. Kalsi**  
**Sangeeta Jagtap**



# Acknowledgement

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One of us (PSK) thanks his wife Jagdish who bore much of the brunt of writing this book, a large preoccupation all coped with.

One of us (SVJ) pays her gratitude to her husband Vijay and son Saurabh for their patience and moral support during preparation of this book. Thanks are also due to her parents Mrs. Prabhavati and Mr. Sarjerao Shingte for their good wishes.

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Last but not the least, the authors owe great thanks to AIU and particularly Dr. Veena Bhalla Deputy Secretary AIU for her dedicated expertise and kind consideration.

**P. S. Kalsi**  
**Sangeeta Jagtap**



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