

## Preface

Since the early days of modern physics, study of the dynamics, structure and interactions of atoms and molecules (between themselves and with external fields) has repeatedly changed our theoretical perception of the external world. In this sense, Atomic Molecular and Optical (AMO) Science has shown amazing resilience and freshness. In recent years, trapping of single atoms and ions with the concomitant development of atom optics, the realization of sub femtosecond lasers, successful implementation of BEC and fundamental breakthroughs in the experimentally realizable approaches to quantum computation, have all contributed to a new revolution in this established field. Huge theoretical as well as experimental programmes are now being taken up to understand, interpret and model these newly discovered phenomena and to predict and discover other novel ones. We are now in a stage where many more spectacular scientific results and technological applications of these new fields are well in sight.

With these thoughts in mind, a Topical Conference on Atomic, Molecular and optical Physics (TC- 2005) was held in Indian Association for the Cultivation of Science, Kolkata between 13<sup>th</sup>-15<sup>th</sup> December, 2005. The aim was the dissemination of the specialized knowledge acquired by the experts in various groups and the sharing of their expertise and experience. Accordingly, the talks in the conference were tentatively categorized as belonging to one or the other of a few emerging or currently emerged areas in the process of reaching maturity. Field-matter interaction and quantum control, the application of these techniques to quantum computation and communication and properties of Bose Einstein Condensates were discussed by various speakers. The conventional sub-fields of collision and structures continue to be of fundamental importance and were also included among the topics discussed. These talks, taken together, not only demonstrated the remarkable diversity of the range of problems currently under the purview of AMO physics, but also gave a fascinating glimpse of their underlying unity.

The present volume is primarily based on the talks delivered at the conference. We believe that this book will give the reader a snapshot of the present status of some important aspects of the topics mentioned above - both from a theoretical and from an experimental point of view. At the same time some of the articles can be read as topical reviews highlighting recent achievements. The volume contains articles on theoretical studies of control of molecules and nanostructures by intense fields, optical control of

information transfer, theoretical and experimental studies of atomic Bose Einstein Condensates, quantum mechanical electronic structure theory, ion atom collision, optically nonlinear material and quantum chaos. We hope that an audience consisting of physicists in various disciplines will appreciate the broad coverage and find the book useful.

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We are greatly indebted to all the authors who sent manuscripts of their talks for inclusion in this volume. It is a pleasure to acknowledge their cooperation. Finally we would also like to record our deep and grateful appreciation of the work of our students without whose help the organization of this conference would have been impossible.

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