Foreword

The six articles in the **Chemical Sciences** Section demarcate the broad contours of some of the emerging trends and main areas of activity in the subject. The diversity of chemistry as a discipline, including the close links with biological, materials and environmental sciences, have meant that key ideas and themes are often obscured by a wealth of detail, even for practitioners within the discipline. These articles are intended to provide an overview and foster a degree of intra- and inter-disciplinary communication and awareness. Consequently, they have been written to be accessible to a broad range of readers working in chemical and related sciences, rather than as in-depth reviews.

The lead article by **C N R Rao** provides a historical overview of chemistry in this century, tracing the emergence of key subdisciplines in the field and juxtaposing them with some of the iconic figures in the subject. In the context of this volume on current trends, his summary of the periodic reports of the National Academy of Sciences on chemical sciences is specially interesting.

Among the natural sciences, the ability of chemists to create the objects they study is unique and even today retains some of the charm of its alchemical origins. Synthetic chemistry, particularly organic chemistry, is the foundation of the pharmaceutical industry. Novel therapeutic strategies, lying at the interface of chemistry and biology, represent the state of the art in this area. These are discussed in the thematic review by **Santanu Bhattacharya** and **Raghavan Varadarajan**. Synthesis, characterization and design of inorganic materials have seen enormous advances in recent years, leading to the development of materials science as an independent discipline. The chemistry of materials has enormous implications in the areas of energy, environment, communication and information storage, as discussed by **S Natarajan** and **J Gopalakrishnan**.

Some of the most interesting recent developments in chemistry involve moving 'beyond the molecular frontier' into creating and understanding supramolecular and nanoscale assemblies of molecules[1]. The article by **Ashwini Nangia** discusses the art and science of supramolecular synthesis of organic molecules to create solid-state organic structures with a diverse range of functional properties. The ability of chemists to manipulate molecules is based on an understanding of the physical principles underlying molecular behaviour. The article by **George Thomas** demonstrates how an understanding of the quantum mechanical properties of inorganic nanostructures can be combined with the synthetic toolbox of a chemist to create organic-inorganic hybrid materials with a remarkable range of functional properties.

Recent experimental developments have made it possible to probe molecular systems on increasingly smaller length and time scales. Simultaneously, it has become apparent that many interesting phenomena in chemical systems originate from an interplay between processes occurring over a broad range of spatio-temporal scales. The experimental, computational and theoretical approaches that can integrate information across time scales, with reference to recent developments in protein structure and nanoscale self-assembly, are discussed in the article by **Biman Bagchi** and **Charusita Chakravarty**.

Clearly, this small set of articles cannot do justice to a large field and the authors and editors have been aware of several omissions which may perhaps be corrected in future efforts to present interdisciplinary overviews of this type. We hope, however, that the articles as they stand will be sufficient to suggest some of the main directions in which the chemical sciences are evolving today, with much of the activity concentrated in the interfaces with physics, engineering, materials science and biology.

Charusita Chakravarty
S Chandrasekaran
T K Chandrashekar
S Sivaram

[1] *Beyond the Molecular Frontier: Challenges for Chemistry and Chemical Engineering* (The National Academies Press, 2003).