

Preface

The present issue of Pure and Applied Chemistry contains twelve of the thirteen plenary lectures presented in the 10th International Conference on Physical Organic Chemistry held in the Technion - Israel Institute of Technology, Haifa, Israel on 5-10 August 1990. Unfortunately, Professor P.B. Dervan's lecture on "Sequence Specific Recognition of Double Helical DNA" did not arrive on time to be included in this issue.

Physical organic chemistry is a relatively young sub-field of organic chemistry. It emerged a few decades ago by pioneering studies which applied the methods and theory of physical chemistry to the study, mostly in solution, of organic reactions and their mechanisms. In the years that have elapsed since then, the impact of this new discipline on the way that we practise, understand and teach organic chemistry is enormous. Topics which appeared in the past in special books on physical organic chemistry are now incorporated in elementary organic chemistry textbooks, and computerized information services such as Chemical Contents now classify about 30% of the papers published in organic chemistry as belonging to the sub-section of physical organic chemistry.

Although the mechanistic study of organic reactions in solution is still one of the main activities of physical organic chemists, the scope of topics which are now regarded in the domain of physical organic chemistry has been greatly expanded in recent years. No longer are only the solutions the reaction media, but reactions in the solid and the gas phases are studied both in their own right and as probes for a better understanding of medium-independent phenomena occurring in solution. The strong tool of computational chemistry now accompanies and frequently precedes and guides the experimental work. Physical organic chemistry contributes significantly to disciplines such as bioorganic chemistry, organometallic chemistry, catalysis and material science.

The program of the Conference as reflected both by the plenary lectures and by the contributed papers, illustrates both the old and the new trends. The opening lecture delivered by J.D. Dunitz, was dedicated to the memory of the late Prof. David Ginsburg, one of the fathers of organic chemistry in Israel and the founder of the chemistry department in the Technion. This lecture discussed the packing of molecules in the crystals in the solid state. Selectivity in electrophilic heteroaromatic substitution, a classical topic of study in solution receives a new dimension through the gas phase and analysis in terms of a curve crossing reactivity model by M. Speranza. Models for understanding the reactivity and selectivity of organic reactions are in the center of physical organic studies. The curve crossing model, which is applicable to a multitude of phenomena, is presented by S. Shaik, whereas two approaches based on computations for the modeling of selectivity in several reactions are discussed by W.J. Hehre and compared with the experimental results.

Reaction intermediates and highly reactive compounds were always of interest to physical organic chemists and their generation and properties are amply represented here. A.J. Kresge describes the recently developed methods for the generation of thermodynamically unstable simple enols, and a study of their classical reactions. O.M. Nefedov illustrates the low-temperature matrix isolation and characterization, e.g., by infrared spectroscopy, of free radicals, carbenes and silicon analogs and G. Maier presents the isolation of highly reactive and strained compounds by similar methods.

Electron transfer processes are being extensively studied in recent years. The complex mechanisms of N-bromoamide reactions are presented by L. Ebersson and electron transfer photoreactions in rearrangements are discussed by T. Miyashi. The role of charge transfer complexes in organic and organometallic chemistry described by J.K. Kochi is an example of the use of fast spectroscopic techniques and of the contribution of physical organic chemistry to organometallic chemistry, which will be a major field for physical organic chemists in the future. Iron porphyrins are such organometallic derivatives and their reaction with dioxygen, including binding and catalytic functions, are presented by T.G. Traylor. The application of classical physical organic chemistry to molecular biology is illustrated by A.R. Fersht in the study of folding of proteins by structure-activity relationships and kinetics among other techniques.

These papers give the state of art in many sub-topics belonging or adopted by physical organic chemistry. We hope that they will serve as a stimulus for work by future generations of physical organic chemists.

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