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Book Review

V. Balzani and F. Scandola, *Supramolecular Photochemistry*, Ellis Horwood, Chichester, 1991, $123.95

It is a fascinating paradox of modern chemistry that we are driven to create ever larger molecules to answer ever simpler questions. Perhaps the best example of this phenomenon is the array of elaborate but beautiful systems used to study the most fundamental of chemical reactions, the transfer of one electron from a donor to an acceptor: over 30 years ago Marcus made the counter-intuitive prediction that if the electron transfer became too favourable thermodynamically, it would actually slow down. No convincing evidence for this effect was ever seen in bimolecular reactions in solution, despite much effort, because the fastest reaction that could be seen was diffusion-controlled encounter of the reactants. Yet in the 1980s, the combination of new picosecond spectroscopy techniques with the synthesis of systems containing covalently-linked acceptors and donors led to many observations supporting and refining Marcus' daring prediction. Here, then, is the resolution of the paradox: the molecules may be very large, but they consist of two or more individual components, each relatively simple and each with its own characteristic properties. The attraction of such supermolecules, or supramolecular systems, is that they allow us to probe the interactions between their component parts in a way that is uncomplicated by diffusion or (ideally) solvation effects and that gives us control over their relative orientations. In this way, one hopes to gain more fundamental understanding of simple processes. The concept of separate but interacting building blocks excludes complex molecules such as macrocylic antibiotics from the supermolecule class, but presumably would include proteins and nucleic acids.

Supramolecular chemistry has potential applications in many areas, including catalysis and sensors, but Balzani and Scandola wisely restrict themselves to photoinduced effects and the possibility of molecular-scale electronics. Even so, their task must have been daunting. The range of organic and inorganic, covalent and ionic systems to be covered is vast; in these difficult circumstances the book is probably as well organised as anyone could reasonably expect.

Several introductory chapters discuss the supramolecular concept in detail and cover basic photophysical and photochemical ideas; some prominence is given to Marcus' theory and the predicted 'inverted' region. Chapter 5 treats the natural photosynthetic reaction centre as a supramolecular system *par excellence* then describes the many synthetic systems inspired by it; organic and metal-based molecules are covered comprehensively. Chapter 6 similarly covers energy transfer, while Chapter 7 describes photochemistry that leads to covalent change such as *cis–trans* isomerism and ring opening–closing; the long-term potential here for useful photochemical switching is obvious but perhaps still tantalisingly impractical.

The remaining chapters cover ion pairs, donor-acceptor complexes, host-guest systems (particularly the use of metals to assemble and orientate the active

components) and 'other systems'. Finally photochemical molecular devices are considered as a long term goal.

Overall, then, this is an excellent way into a field that is expanding, exciting and spread thinly around a wide range of journals and disciplines. The coverage to 1989 is thorough, and the book will be good value for expert and novice alike.

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