where almost anything might be achieved with nano-sized machines. Think, for example, of the possibility of injecting nanomolecules into a human blood stream, designed to seek out a cancer and cut it out! The basic physics and chemistry are presented first, followed by the computational methods, the effects of statistical mechanics, quantum uncertainty, damage mechanisms, energy dissipation and the fundamentals of mechanosynthesis — an unusual subject which is likely to assume great importance in the future. The book essentially defines molecular nanotechnology. Appendices include symbols, units and constants, a glossary of terms and a subject index.

Electrochemical and electrocatalytic reactions of carbon dioxide, edited by B.P. Sullivan, K. Krist and H.E. Guard, Elsevier, Amsterdam, 1993, 298 pp., Dfl. 340 (about US$212.50). ISBN 0-444-88316-9.

The reduction of carbon dioxide to useful products is a major goal for humankind, after the plants have been achieving it for millions of years. It is also of importance to be able to recycle carbon dioxide in the atmosphere, possibly from fossil fuel stacks, converting it directly into useful products. This book explores the chemistry of carbon dioxide with these aims in mind.

A series of chapters focuses on the various aspects of this problem. Keene presents "Thermodynamic, kinetic, and product considerations in carbon dioxide reactivity" — a useful source of free energy and electrochemical potential information for the various processes of interest. Creutz discusses "Carbon dioxide binding to transition-metal centers", summarizing the complexes (known to 1991) with a theoretical description of the bonding involved. Ford presents "Catalysis of the water–gas shift reaction", which is an area of particular interest to this author. DuBois and coworkers explore "Electrochemical concentration of carbon dioxide". Here, the emphasis is on the possibility of using atmospheric carbon dioxide as the source of industrial gas in very large quantities and, hence, the need for its efficient concentration. The editors Keene and Sullivan tackle the "Mechanisms of the electrochemical reduction of carbon dioxide catalyzed by transition metal complexes". A careful assessment is presented of the myriad of possible reduction products which might be bound to a metal centre in a stable or transient intermediate state, and consideration is given to how the various possible reduction products might be attained. Frese, in a very extensive contribution, deals with "Electrochemical reduction of CO_2 at solid electrodes", which is a very useful survey of the energetics of reduction, and the product yields and distribution on a range of different electrode surfaces, both metallic and semiconductor. Sammells and Cook discuss "Electrocatalysis and novel electrodes for high

rate CO_2 reduction under ambient conditions", and also look at metal reduction processes, but extend discussion to unusual surfaces, such as proton exchange membranes and catalysts possibly permitting electrochemical reduction of CO_2 in the gas phase. Finally, Lewis and Shreve explore the "Photochemical and photoelectrochemical reduction of carbon dioxide", using photosensitizers and/or semiconductors.

The research area described in this book is very active but many problems remain to be resolved. This book is a very useful contribution to the further development of the field.

Charge transfer photochemistry of coordination compounds, by O. Horváth and K.L. Stevenson, VCH, Weinheim, 1993, 380 pp., DM238. ISBN 1-56081-564-7.

Great effort has been expended in the design of photoactive coordination compounds, mainly in the direction of solar energy conversion. This book builds upon the early work by Balzani and Carassiti (*Photochemistry of coordination compounds*, Academic Press, 1970) to bring this field up to date.

The first three chapters in the book provide the fundamental theory for light absorption and emission, and a discussion of the nature of the various possible charge transfer states. These are presented in a brief and rather incomplete fashion, since there exist other texts which cover the theory in much greater depth. Then follow 10 chapters, each dealing with the photoinduced redox reactions of metal complexes, organized by groups across the Periodic Table. Extensive spectroscopic data are presented, showing the effect of light on various species (photolysis). Photoproducts and quantum yields are discussed in depth. The book is moderately comprehensive for all the metal systems, except that it only surveys the enormous field of ruthenium polypyridines. The book will make very interesting reading for anyone interested in inorganic photochemistry and is highly recommended.

There is a subject index, a materials index (list of metal complexes considered, also partially indexed by ligand) and an addendum of more recent relevant references not covered in the text.

Metal ions in biological systems, Vol. 29, *Biological properties of metal alkyl derivatives*, edited by H. Sigel and A. Sigel, Marcel Dekker, New York, 1993, 448 pp. ISBN 0-8247-9022-7.

This is volume 29 in a series which began in 1973 and which was devoted to the then nascent field of metal ions in biological systems. The series has