Handbook of Raman Spectroscopy. From the Research Laboratory to the Process Line. Edited by *Ian R. Lewis* and *Howell G. M. Edwards.* Marcel Dekker, New York 2001. 1090 pp., hardcover $ 225.00.—ISBN 0-8247-0557-2

Almost 75 years after its discovery in Calcutta in 1928, the Raman effect is showing a remarkable many-sidedness that C. V. Raman could certainly not have thought possible. For about 40 years this method based on inelastic light scattering remained a rather esoteric art, practiced by a few very specialized physical or physicochemical laboratories engaged in fundamental research. Nobody then could have seriously imagined that this spectroscopic technique might be used, for example, as a routine analytical method for process monitoring or materials characterization. At that time the laboratory scene was dominated by mercury vapor lamps as sources, cumbersome spectrometers, and photographic plate detectors that were sensitized using jealously guarded secret recipes, but which nevertheless required exposure times of hours or even days.

The rapid instrumental and scientific developments of the following 35 years have radically changed that picture. This revolution was introduced by the arrival of the first lasers, since these, in particular gas lasers and ion lasers, were soon shown to be ideal monochromatic sources for light scattering experiments. Nowadays lasers emitting wavelengths extending from the ultraviolet to the near infrared can be used. In particular, compact semiconductor lasers and neodymium-YAG lasers can be tuned for specific applications.

With regard to detection sensitivity, new types of spectrometers have been developed to meet the demands of the changed situation (e.g., with double and triple monochromators of high light efficiency), and with highly sensitive photomultiplier detectors only minutes are needed to record a high-resolution spectrum.

A second revolution occurred about 15 years ago with the introduction of highly sensitive cooled CCD (charge-coupled device) detectors with large surface areas. Instead of recording a spectrum sequentially, as with a photomultiplier detector, these measure many spectral elements simultaneously, greatly reducing the time needed. Moreover, these detectors come close to achieving the ideal detection sensitivity corresponding to an extremely low noise level. Thus, as well as an ideal light source, one now also has an (almost) ideal detector.

The poor detection sensitivity that used to be cited as a serious disadvantage of Raman spectroscopy has now been largely remedied, by advances in the technique of resonance Raman spectroscopy and by new forms of Raman spectroscopy making use of various nonlinear electronic effects. Today it is even possible, under favorable conditions, to detect single molecules by Raman spectroscopy, thus far exceeding the sensitivity of IR spectroscopy, with which it is often in competition.

The range of applications of Raman spectroscopy has also been extended by several other important recent developments, such as Raman microscopy, which makes it possible to study extremely small samples. One can also analyze the surface of an extended inhomogeneous sample, either by using confocal microscopy to obtain very high spatial resolution, or by scanning across a surface using glass fibers. It is also possible to use specially developed interference filters or holographic notch filters in certain applications as an alternative to a dispersing spectrometer, provided that one suppresses the fluorescence that would otherwise interfere with the measurements. An important separate development is that of Raman spectrometers based on the interferometric principle, which generate a spectrum by Fourier transformation.

All these techniques are described in the book by authors with outstanding knowledge and experience. The compilation is an impressive and wide-ranging survey of the current state of development. It is especially suitable for nonspecialists (i.e., scientists with little previous knowledge of the fundamentals of this special spectroscopic method), who might, for example, wish to be able to choose the most appropriate analytical method from several competing alternatives to solve a particular problem, or who need an overview of the applications of Raman methods in a specific area. This rapidly growing and increasingly varied circle of potential users will find in these 26 articles valuable information and guidance for reaching decisions. Trends in Raman spectroscopy and likely future developments are discussed (e.g., the development of spectrometers and detectors for very specialized applications, software for automatic interpretation of spectra, libraries of spectral data). The comprehensive lists of literature references included with each article are an especially valuable resource, enabling the reader to dig more deeply into the topics discussed.

The articles can be roughly classified under the following categories: theoretical and experimental fundamentals of Raman spectroscopy; "state-of-the-art" techniques of Raman spectroscopy; examples of applications of the Raman method in current research, in areas such as insulators, microstructure of semiconductors of Groups II–VI, glasses, biology, medicine, chemical analysis, catalyst research, gases; applications in process control and quality control, e.g., of diamond-like surface coatings used in the production of computer hard disks and read–write heads; applications in special areas such as forensic science, art history, restoration of works of art, academic teaching.

I have slight criticisms, mainly subjective, about a few of the articles and about topics that are not covered, but these are insignificant compared with the book's many virtues. It is well worth buying.

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Handbook on Metalloproteins. Editored by *Ivano Bertini, Astrid Sigel,* and *Helmut Sigel.* Marcel Dekker, New York 2001. xxvii + 1182 pp., hardcover $ 265.00.—ISBN 0-8247-0520-3

Since the Reviewer received a copy of the „Handbook on Metalloproteins", he has consulted it countless times. There is no doubt that in this booming research area of chemistry, an overview was urgently required and eagerly awaited.

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This is also corroborated by the fact that another work with an almost identical title has appeared in print nearly simultaneously. The knowledge of the role of metal ions in biological systems has now reached the stage that allows a deeper understanding of the effect and regulation processes of bioinorganic functional units. Detailed insight into the occurrence of metalloprotein centers builds a basis for this understanding, and the current development in this area is collected in this Handbook.

The Handbook is ordered systematically according to the relevant elements. It comprises a short preface by the editors and 21 subsequent, independent chapters by prominent experts in which all essential metals present in metalloproteins are competently covered: Na, K, Mg, Ca, V, Mn, Fe, Co, Ni, Cu, Zn, Mo, W, and an additional short section on Cr. The especially important metals zinc, copper, and iron even have three or four chapters dedicated to them. The final Chapter 23 ties everything together and attempts to identify future developments in bioinorganic chemistry, which has bloomed so rapidly in the last half century. It is clear that topics such as the nature of the metal–ligand binding, dynamic aspects, conformational control, supramolecular organization, and the evolution of metalloproteins will play a prominent role.

On using the Handbook, the reader will appreciate the fact that the contributions from all 42 authors are homogeneously and uniformly structured and that the literature is cited in a standard manner, so that the book gives a good overall impression. Each chapter has its own Table of Contents and list of abbreviations and begins with a short, concise, general introduction to the fundamental coordination chemistry and to the bioinorganic relevance of the metal covered in the chapter. This is followed by a detailed description of the metalloproteins whose three-dimensional structure is known, that is, has been determined by X-ray crystallographic analysis. The available information on occurrence, characterization and function of the metalloproteins whose 3D structure is still unknown is summarized in the following section, and the fourth subchapter sketches the fundamental enzymatic catalytic mechanism and discusses the specific structure–function relation of the metal.

Although the Handbook is a successful collection of an incredible amount of information, the quality of some of the graphical material is unfortunately not optimal. It is also unfortunate that the editors have almost completely foregone the use of color—only a few color pictures are collected at the beginning of the book. Color pictures would have certainly been more attractive and instructive for the visualization of the coordination environment of the active centers of the metalloproteins as well as for the general representation of the protein structures.

The strong point of the Handbook is undoubtedly the structural description of the metalloprotein centers. Spectroscopic characteristics are mostly only briefly mentioned, and deeper insight into the electronic structure of the bioinorganic coordination unit, for example, is hardly conveyed. In most of these cases, the original references or specific review articles will have to be consulted. But how else could the complex process of water oxidation in Photosystem II be summarized understandably in three pages for anyone other than the expert? Anybody searching for references to synthetic model compounds will hardly find any. But biomimetic coordination compounds are clearly not the subject of this Handbook, and separate books could be written on that topic. The particular value of this book, as the title implies, is in its quality as a reference work. This book will be an invaluable source for readers who require a quick overview of the biological function and occurrence of an essential metal, the construction of a particular metalloprotein, or the relevant literature for a bioinorganic protein system. Each chapter includes a comprehensive reference section (almost 4500 references!) that covers the literature until 1999, in some cases, even 2000. Just as useful is the detailed Keyword Register at the end of the book, which leads directly to the required information or to the relevant literature.

It is unavoidable that such a reference book for an exceptionally active research area is in danger of being overtaken by current developments. New metalloprotein structures are being published almost daily. For example, in the short time since the publication of the Handbook, the structures of important metalloenzymes such as N_2O reductase with its Cu_4S center, the CO dehydrogenase with its $NiFe_4/S$ cluster, and even the Photosystem II of a water-oxidizing cyanobacterium have been resolved. In many cases, their active centers are different to those predicted on the basis of spectroscopic and biochemical evidence, or on the basis of model studies, and therefore incorrectly described in the Handbook. Although this does not diminish its value as a standard reference book for bioinorganic chemistry, there will be a place for an updated issue in the future.

The "Handbook on Metalloproteins" is not a textbook. Beginners and students are not the target group for this Handbook, and it cannot replace a classical textbook that emphasizes the fundamental principles of bioinorganic chemistry and functional relations. But scientists whose research, even if only marginally, involves bioinorganic chemistry will find this Handbook to be an excellent reference work and to contain a wealth of information. This book is warmly recommended for such scientists, and is an absolute must for libraries.

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Enzyme Kinetics. By *Hans Bisswanger*. Wiley-VCH, Weinheim 2002. xiv + 255 pp., hardcover € 119.00.—ISBN 3-527-30343-X

The life sciences are currently dominated by new disciplines such as "genomics", "proteomics", and "structural genomics". In the first two of these one aims to identify all the genes present in a cell (genomics) or all the proteins (proteomics), while in structural genomics the goal is to determine or predict the structures of all the proteins present in a cell. These research strategies are highly topical and yield many new insights, and are therefore receiving much attention. Thus, it may now almost be seen as rather old-fashioned to work on enzyme kinetics, a field in which the basic

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