## Bioinorganic Chemistry: A Practical Course

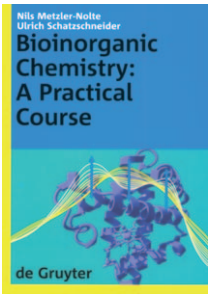
If I were asked to suggest a suitable short phrase to describe this 138-page book by Nils Metzler-Nolte and Ulrich Schatzschneider, I would choose "a child of our time". This book represents, in form and content, two currently important phenomena in chemistry: new modular curricula in teaching, and the importance of interdisciplinarity in research. The book has evolved from a laboratory course in bioinorganic chemistry that the two authors have given during the last few years for students of chemistry, biochemistry, pharmacy, and molecular biotechnology. It has developed nicely from a laboratory script to a real book, and now seeks to provide motivation (or help) for setting up related courses in other places. Specialized (some say "exotic") research fields such as bioinorganic chemistry have been taught in the past in the form of special laboratory courses, carried out under the guidance of a very specialized PhD student, in appropriate work groups. However, in modern times with a wide variety of bachelor and master studies, it is much more useful to have well-designed and well-organized courses covering larger areas of the subject.

Bioinorganic chemistry as a research field started out many years ago as a special topic of a rather small number of inorganic chemists or spectroscopists, but has developed in the last few years into a first-rate multidisciplinary area. Bioinorganic chemistry research contributes to fundamental understanding in other areas such as biology, has a wealth of medical and pharmaceutical applications, and motivates developments in analytical, preparative, or theoretical chemistry, as well as in spectroscopy. For most of today's chemists, bioinorganic chemistry is one of the subjects under which many problems are discussed. Bioinorganic chemistry is main stream, is indispensable in university curricula, and enjoys an excellent reputation among the students.

The book contains nine chapters. Eight of them (Chapters 2–9) present eight experiments of varying extent, explaining the relevant motivation and background, and referring the reader to adequate numbers of references. Usually, the experiments are subdivided into several individual tasks, and the detailed experimental descriptions are easily comprehensible. Most of the experiments are not trivial, but highly experienced lab assistants (lab assistants should always be highly experienced) and students with reasonable previous knowledge (from a post-advanced laboratory course in inorganic, organic, or biochemistry) should be able to deal with the difficulties. Each chapter has the same structure, which helps a lot in browsing for details. The first chapter provides an introduction describing the motivation for this book and its structure. The book cannot replace a suitable textbook of bioinorganic chemistry, and it is not intended to do so.

The experiments in Chapters 2–9 cover a broad range of subjects. Chapter 2 (activation and inactivation of small molecules by metalloenzymes or their model compounds) and Chapter 3 (carbon monoxide and nitric oxide as small-molecule messengers) are devoted to the "activation and physiological importance of small molecules", and use a manganese(salen) complex as a model for superoxide dismutase (SOD), as well as an NO-releasing iron complex. Chapter 4 (metallo-intercalators as DNA probes) and Chapter 5 (DNA manipulation using metal complexes) are concerned with the interactions of DNA with metal complexes. As in the previous chapters, the chosen examples are classics of complex chemistry: $[Ru(bpy)_2(dppz)]^{2+}$ as a metallo-intercalator is investigated using UV/Vis titration, while the manganese(salen) complex already mentioned is applied to scission of DNA strands (investigated by gel electrophoresis). In Chapter 6 (synthesis of metal–peptide bioconjugates) and Chapter 7 (preparation of metal–protein bioconjugates) the authors provide (practical) insight into a very recent area of bioinorganic chemistry, the metal conjugates, which is considered to be a hot topic (both now and in the future). In Chapter 6, metallocene carboxylates of Fe, Ru, and Co are linked to peptides within the context of conventional peptide synthesis (using solid-phase peptide synthesis), while Chapter 7 describes the modification of a naturally abundant protein using cobaltocene carboxylate. In Chapter 8 (electrochemical investigation of metal complexes) the ferrocene conjugates from Chapter 6 might be investigated by the electrochemical method of cyclic voltammetry (by comparing them to unsubstituted ferrocene). Alternatively, other complexes might be investigated, since the main objective of this chapter is to demonstrate the importance of electron transfer in biochemistry. To this end, the very important method of cyclic voltammetry is taught very competently and in detail. The last chapter (metal complexes with anti-proliferative activity) is concerned with the cytotoxic (anti-proliferative) properties of many metal complexes. Using HeLa cells (human epithelia cells of a cervix carcinoma) the experiment is aimed at building up a multiuse assay for the testing of various compounds (e.g., complexes from previous chapters, or also cisplatin). These experiments are probably the most sophisticated in this book; however, the subject is a "shouldn't miss" of bioinorganic chemistry.

Without hesitation I can recommend this book for all lecturers and learners dealing with bioinor-

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ganic chemistry. It is a very suitable guide for a laboratory course as a complement to lectures and seminars. A big advantage of such a "predesigned" laboratory course (in contrast to flexible or individual courses in work groups) is the high level of sophistication and quality of the experiments. The experiments cover important topics of bioinorganic chemistry, they are well worked out, and the descriptions are sound and understandable. Short but concise introductions and references for further reading serve to highlight the basic chemical or biochemical background. Therefore, this recommendation can be extended from chemistry or biochemistry to other (related) subjects such as medical and pharmaceutical science, analytical chemistry, physiology, and toxicology, all summarized these days under the popular term "life science".

There is one small "however", which arises from the inherent incompleteness of the book. Since it deals exclusively with the bioinorganic chemistry of metal complexes, some other important areas such as biomineralization and radioactive tracers are not covered. Thus, to avoid disappointment the book should instead be entitled "Bioinorganic Chemistry of Metal Complexes: A Practical Course".

However, when setting up any kind of "practical course", a selection of experiments has to be made, and the selection is mainly determined by didactic points of view and by the availability of spectroscopic and analytical methods. Usually the personal preferences of the course instructor (here the book's authors) also play a role. In the present book the selection is apparently influenced by the research interests of the two authors, who currently work at the University of the Ruhr in Bochum. For several years they have been among the most important researchers in at least two of the fields covered in this book. This ensures a high level of expertise in those fields for this laboratory course, although a broad range of subjects is nonetheless covered in the book. A far more severe problem could arise from the wide range and expensive nature of the methods that are described and are necessary for the experiments. They are all essential if bioinorganic chemistry is to be taught in full depth. Thus, either the institute/department must have a good infrastructure of available methods, or collaboration with colleagues in biochemistry or biology should be sought (that could turn out to be a good opportunity to do so).

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