Preface

During my academic life at the Department of Inorganic Chemistry of the University of Barcelona, I have taught Coordination Chemistry for several years. In my University, this course is optional, and offered to those students that, having passed the general (and essential) topics of Chemistry (Inorganic, Organic, Analytical and Physical Chemistry), decide to deepen in this field of Inorganic Chemistry. Since the beginning of my career as a Professor I missed a textbook for students on this topic that would help them both, on the theoretical aspects as well as on the more descriptive ones. A revision of the relatively modern text books reveals the presence of only one book written in English that may be useful for students in this respect. Its title is “Physical Inorganic Chemistry. A Coordination Chemistry Approach”, by S.F.A. Kettle (1996). This is indeed a very good book, however, – as may be inferred from the title – it fails to treat many important aspects of Coordination Chemistry.

The lack of a formal, more comprehensive, textbook, gave me the idea to do the effort to write a systematic book fulfilling the purposes stated above, in Spanish language. This book, with the title “Química de Coordinación” was published in 2000 (Ed. Omega-Universitat de Barcelona). The present new book is not a translation from the Spanish language to English of the above mentioned work, but rather a complete and updated revision. I have deliberately omitted some chapters (such as that devoted to Coordination Chemistry of lanthanides) and reduced some of the more complicated aspects related to Quantum Chemistry. For example, in the Spanish book, I wrote a separate Chapter on Spin-Orbit coupling, which I have now included in the Chapter on Crystal (Ligand) Field. Also, a very different perspective is now given in the Chapter devoted to Supramolecular Chemistry. I have now adopted a more restricted vision owing to the tendency of many authors (including myself) to use the term Supramolecular in our research papers in such a manner that the first meaning (from J.M. Lehn) has been completely changed and lost. Some other issues have been added in this English version; chapters devoted to polynuclear complexes, clusters with metal-metal bond, biocoordination chemistry or metal-organic frameworks (MOFs) have been included.

The present book – like the parent Spanish book – is addressed to students who already have a background in Inorganic Chemistry, Organic Chemistry, and Fundamentals of Spectroscopy, Quantum Chemistry and Group Theory. This book
has been, thus, thought for graduate students or for advanced undergraduate students.

An important aspect to be considered when trying to write a modern book on Coordination Chemistry is the treatment of this field made by almost all textbooks of general Inorganic Chemistry. Important concepts such as bonding, thermodynamic stability, kinetics and mechanisms, are generally well treated in graduate Inorganic textbooks. Thus, this new book is thought for readers that already have a minimum background on these subjects. However, there are some issues of modern Coordination Chemistry that are scarcely treated in textbooks of Inorganic Chemistry, such as Photochemistry, Magnetic properties of complexes (polynuclear systems are generally ignored), applications of Electronic Paramagnetic Resonance, Mixed-Valence compounds, Supramolecular Coordination Chemistry, the so-called Metal-Organic Frameworks (MOFs, of increasing importance), etc. All these issues are treated in this book in separated Chapters.

With this book I have, thus, tried to fill in many gaps that are currently empty in related books for graduate and undergraduate students. This needed to be accomplished keeping in mind unavoidable space restrictions. Neither the editor nor the author can propose to the students an excessive number of pages. For this reason, the more “classical” aspects of Coordination Chemistry have been relatively shortened, trying, however, to emphasize the most important ones. For example, I decided to join in a Chapter the part devoted to the thermodynamics and non-redox mechanisms. These subjects are well known by many students. On the contrary, I have emphasized the redox mechanisms in a separated Chapter, because they are a preliminary requirement for understanding the Mixed-Valence compounds.

In the spirit expressed above, I propose at the end of many chapters selected references to help readers interested in a particular topic, to find additional information. My honest advice is that the reader should explore these references to complete the discussion given in the text, mainly for some descriptive and graphical aspects, for which the original paper will always be the best source. I am thinking, for example, about the Chapters devoted to Polynuclear complexes, Clusters, Photochemistry, Supramolecular Coordination Chemistry or Metal-Organic Frameworks. In these Chapters the help of the referenced literature is of paramount importance. With this idea in mind I have tried to choose, when possible, the most recent literature, because the reader usually can find there other references to similar papers published previously. In my opinion this task is very pedagogical for the student. Furthermore, when possible, I have indicated references to Reviews, very useful for the reader to acquire a larger vision of a particular issue.

Finally, this book is not intended to encompass all aspects that are related to Coordination Chemistry, in its more general and wide sense. In many Universities around the world, some parts that can be “formally” considered as derived from Coordination Chemistry are separated matters in the curriculum proposed to students, such as Organometallic Chemistry and Bioinorganic Chemistry. I have embraced in this book the same general tendency.
Acknowledgments

A number of colleagues have read either chapters or parts of different chapters of the manuscript or have given me their opinion about the meaning of some problematic terms, ideas, papers published by them, etc. I can assure that their suggestions and criticisms have been invaluable. Of course all the errors and obscure passages that remain after all revisions have to be attributed to the author.

These colleagues and friends are (in alphabetical order):

Dr. Guillem Aromí, Departament de Química Inorgànica, Universitat de Barcelona (Spain)
Dr. Stuart R. Batten, School of Chemistry, Monash University (Australia)
Dr. Roman Boca, Department of Inorganic Chemistry, Slovak Technical University, Bratislava, (Slovakia)
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Dr. Pascual Román, Departamento. Química Inorgánica, Facultad de Ciencia y Tecnología, Universidad del País Vasco, Bilbao (Spain)
Dr. Jean-Pierre Sauvage, Laboratoire de Chimie Organique-Minérale, Université Louis Pasteur-CNRS, Institut Le Bel, Strasbourg (France)
Dr. Vassilis Tangoulis, Department of Chemistry, University of Thessaloniki (Greece)
Dr. Boris Tsukerblat, Department of Chemistry, Faculty of Natural Sciences, Ben-Gurion University of the Negev, Beer-Sheva (Israel)
Dr. Margherita Ventreri, Dipartimento di Chimica “G. Ciamici”, Università di Bologna (Italy)
Dr. Michel Verdaguer, Professeur Emérite, Université Pierre et Marie Curie, Paris (France)
I also acknowledge Drs. Guillem Aromí, E.Carolina Sañudo and Nuria Aliaga (Department of Inorganic Chemistry, University of Barcelona) for their continuous help in many questions concerning the English language. Their help has been unforgettable.

Most of the 3-D-structural diagrams in the book have been drawn using Crystal Maker 1.2.1 for Windows XP, with coordinates accessed from the Cambridge Crystallographic Base. However, Prof. S.R. Batten has gently supplied some very complicated structures on interpenetrated networks. An special mention to him, as well as another special mention and acknowledgment to Ms. Adelaida Pàmies, a very good friend, who designed and drew the most beautiful Figures (Borromean rings, Catenanes, etc) impossible to do – at least for me – with ChemDraw or Crystal Maker.

Special Acknowledgments

I would like to express, finally, a very particular acknowledgment to some special colleagues and friends. First I would like to invoke my first-cousin, Prof. Jaume Casabó, now emeritus Professor at the Universitat Autònoma of Barcelona. He gave me (at the early 1970s) a modern vision on Coordination Chemistry in a moment when in Spain, for political reasons, Science (in capital letters) was in urgent need of a renaissance. Jaume, with his pedagogical attitude, opened a new and different world of Coordination Chemistry to me.
During my life as a researcher I had the opportunity to work with many expert scientists, in different fields, but always related to Coordination Chemistry: Dr. René Poilblanc and Dr. Patrick Cassoux, in the Laboratoire de Chimie de Coordination, CNRS, Toulouse (France) (1980); Dr. Olivier Kahn (in memoriam) in the Université of Paris-Sud, Orsay (France) (1986). I would like to make a special mention of Olivier (with his colleagues in Orsay in the early 1986, Michel Verdaguer, Jean-Jacques Girerd and Yves Journaux) who helped me to enter in the not always easy field of molecular magnetism. I remember Olivier as a great scientist, friend and pedagogue, with enthusiasm and passion for spreading the science.

In Orsay, I met Dante Gatteschi, deeply Italian, but also universal. I have always liked very much to speak to Dante in Italian language. How many times we have spoken not only about magnetism and e.p.r., but also about football!

Later, I met Dr. Marc Drillon (Strasbourg, France), and Dr. George Christou (University of Indiana, Bloomington (USA) (1992). With them I learned many important issues on molecular magnetism.

I am indebted to my closer collaborators in the Department and, mainly, to my colleague and friend, Dr. Montserrat Corbella. She was my graduate and undergraduate student some years ago. I taught her the fundamentals of Inorganic Chemistry. Then, she became specialist in Bioinorganic Chemistry, mainly in Models on Biocoordination and she helped me with extraordinary kindness to write the Chapter devoted to Biocoordination Chemistry. Her clear ideas and enthusiasm were invaluable to me.

I am indebted to my wife, Maria Rosa, and my son, Jordi, who demonstrated great patience when finding me often – may be too often – busy with the writing of this manuscript.

Last but not least, I am also indebted to great musicians who “accompanies” me in the writing of the manuscript. The “Missa Solemnis”, the piano and violin concerts of Beethoven, the operas “Norma” and “I Puritani” of V.Bellini, “Tannhauser” and the final part of “Tristan und Isolde” etc, have filled my mind during the hard task of giving form, writing, revising, changing, abbreviating, drawing, etc, the manuscript. It is a good experience to be alone, trying to understand the “mystery” of the spin-orbit coupling, with the music of Beethoven or Mozart filling the ambient. You can try ... good luck!

Barcelona, January 2008
Joan Ribas