A Mine of Information

From Coello to Inorganic Chemistry. A Lifetime of Reactions. By *Fred Basolo.* Kluwer Academic/Plenum Publishers, New York 2002. xxii + 245 pp., hardcover $ 59.95.—ISBN 0-306-46774-7

This autobiography provides an engaging personal account of an immigrant coal miner's son who became one of the most influential chemists of the last century. The story begins in the small mining town of Coello in southern Illinois. It culminates with Basolo's election as president of the American Chemical Society and the award of its highest honor, the Priestley Medal. It is a tale of family, teachers, mentors, friends, colleagues, and students—the human aspects that shape a scientific career. As one who has had the privilege of knowing Fred for the past 25 years, I can attest to his genuine enthusiasm for family, students, friends, and inorganic chemistry.

The story begins just before the depression, with a happy childhood in a house with no indoor plumbing or heating! Festive occasions, such as celebrating the crushing of grapes each year, provide a glimpse of what it was like to grow up in a small Italian immigrant mining town in the 1920s. A loving mother tells her preschool child to just spell his name Fred, because Alfredo was too difficult. Were it not for key teachers in the local high school, and later at Southern Illinois Normal University, Fred might have returned to his hometown to teach high school science. Instead, he experienced an academic awakening at the University of Illinois, where he chose graduate work with the father of coordination chemistry in the USA, John Bailar, Jr. Many graduate students will find it interesting that even a great chemist fretted over passing his cumulative exams and struggled with a difficult synthetic target molecule for his thesis.

After receiving his Ph.D., it is the height of World War II, and Fred heads to Rohm and Haas for research related to the war effort. Reading in his spare time about Ingold's work on organic reaction mechanisms provides the inspiration for later seminal research on inorganic reaction mechanisms. Fred reconnects with his college work-study acquaintance, Mary Nutley, who becomes his lifelong partner (4 children and 11 grandchildren). When the war ends, Fred fulfills his desire to teach by joining the faculty at Northwestern University. Today's faculty might find it amusing that the new faculty housing provided for Fred and his family was a shared metal Quonset hut. There follows an excellent section on how—through a combination of collaboration (with Ralph Pearson), sabbatical research, and university support—Basolo began his classic work on ligand substitution mechanisms of metal complexes. He was also in the right place, just as US scientific research funding blossomed in the post-Sputnik arms race. This allowed Fred to build at Northwestern one of the world's leading centers for inorganic chemistry research.

On page 84 a research summary begins, with a warning by the author that it "may only be of interest to chemists". It describes work defining dissociative substitution in octahedral cobalt(III) complexes. Fred notes that it was their proposal of an S_{N1} conjugate base mechanism for the unusually fast substitution reactions of ammine complexes that first made Basolo and Pearson widely known. Their proposal contradicted an S_{N2} mechanism proposed for these systems by C. K. Ingold and R. Nyholm. As Basolo notes, they were up against giants of chemistry, and the future of the untenured instructors (Basolo and Pearson) hung in the balance. Basolo and Pearson's text *Mechanisms of Inorganic Reactions* remains the definitive tome on the reaction mechanisms of coordination complexes. The scientific discussion continues, covering linkage isomerization, square planar metal ion substitution, organometallic substitution, and oxygen-binding complexes. The less technical account resumes on page 117 with an insider's view of the National Academy of Sciences, the American Chemical Society, the Gordon Research Conferences, and various other organizations. This is followed by two chapters on "Countries and Chemists Visited" and "Foreign Guests Hosted". The accounts about Italy, China, Australia, and Germany provide a good feel for the culture and scientific establishment; however, most of the others are so brief that they will only interest the specialist.

The book concludes with a powerful retrospective and introspective chapter entitled "Emeritus Professor". It presents the balanced outlook of a man who is proud of his family, students, and scientific accomplishments. Not only has Fred provided a legacy of 60 Ph.D. students, but he has also inspired countless undergraduates. He is one of the few chemists to receive the American Chemical Society's highest awards in teaching (ACS Pimentel Award in Chemical Education) and research (Priestley Medal). We see the compassionate side to the famous chemist as he lovingly cares for his ailing wife, and we grieve with him when she dies in a tragic automobile accident. The tale ends with a man facing the frailties of old age as graciously as he led his life. In an era where scientific egos frequently exceed scientific accom-

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plishments, it is refreshing to read an autobiography which shows that nice guys don't always finish last.

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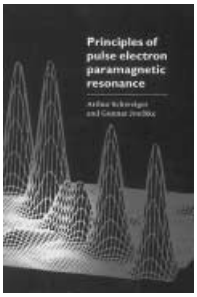
Principles of Pulse Electron Paramagnetic Resonance. By *Arthur Schweiger* and *Gunnar Jeschke*. Oxford University Press, Oxford 2001. 578 pp., hardcover £ 95.00.—ISBN 0-19-850634-1

Principles of Pulse Electron Paramagnetic Resonance is a new textbook by Schweiger and Jeschke on one of the most important recent developments in electron paramagnetic resonance (EPR). The time lag between NMR and EPR with respect to the use of pulsed techniques is largely due to instrumental factors related to the faster relaxation of electron spins compared to nuclear spins, but improvements in microwave equipment have brought pulsed EPR within reach for widespread use, and pulsed EPR spectrometers have recently become commercially available. Previously, pulsed EPR was more or less the exclusive domain of groups dedicated to instrumental and theoretical development. With the technical obstacles removed and an increasing number of successful applications demonstrating the potential of pulsed EPR, interest in pulsed techniques grew, but a deficit in theory became obvious: the classical EPR textbooks focus on continuous wave (cw) EPR, and pulsed techniques are only mentioned as a side issue. In the pre-Schweiger–Jeschke era, the sources for learning about pulsed EPR were limited to the original publications, several review articles and compilations of articles in books, and one monograph on electron spin echo envelope modulation (ESEEM).[1]



Therefore, a textbook that would fill the gap was sought in the EPR community. The book by Schweiger and Jeschke is designed to fill that gap, and it presents a new approach compared to the traditional EPR textbooks. Roughly the first half of the book is devoted to theory and background. Here a consistent use of the vector picture, a lucid introduction to the concept of phase, and careful explanations of how the applied pulses relate to the laboratory reference frame and the rotating frame, help the reader to understand how a sequence of microwave pulses affects the spin system. The product operator formalism is introduced for the first time in an EPR textbook. The description is clear and the physics behind the equations is spelled out. Figures illustrate the relevant points, and they often aid significantly to the understanding. Many of the figures appear for the first time in a textbook, and the authors have succeeded in selecting the most illustrative and didactic figures that have appeared in the original literature. Many simulations also help the reader to understand specific aspects.

But theory is not all, and, based on the authors' considerable experience, the book covers practical aspects thoroughly, including limitations and possible pitfalls of specific methods. These include the effects of the limited excitation bandwidth of the pulses, a notorious problem in pulsed EPR. The effects of such imperfections on the spectra, which can vary depending upon the nature of the experiment, are described. Also, in contrast to a purely theoretical approach, in many instances real examples with numerical values are given, offering the reader an opportunity to work with the equations using practical examples. All constants and symbols are listed, and SI units are used throughout.

A major portion of the second part of the book is devoted to techniques for determining hyperfine interactions between the electron and nuclear spins. Hyperfine interactions are an important signature of the electronic structure of paramagnetic centers, since they can be related to MO coefficients, and often allow one to determine the number and type of ligands surrounding a metal center. Beginning with the ESEEM method, the full arsenal of hyperfine selective techniques is discussed, including various pulsed electron–nuclear double resonance (ENDOR) methods.

As well as techniques for determining hyperfine interactions, the authors describe more or less all the currently relevant types of experiments in pulsed EPR, adding some that are currently being developed (although that distinction is not always clearly spelled out). Electron–electron double resonance (ELDOR) techniques are described in Chapter 13, as well as nutation spectroscopy, etc. While all these applications can be found in the literature, the detailed description in the book makes them much more understandable.

In Chapter 17 the factors that enter into the choice of the optimum field–frequency combination to perform a specific EPR experiment are described. This is an important issue in EPR, and from the discussion and the examples it becomes clear that the optimum can only be found by taking into account the field dependence of all relevant magnetic interactions in a given paramagnetic center, including, for example, that of the major relaxation mechanisms.

Towards the end of the book there are several chapters summarizing various recent developments (e.g., Chapter 16). Perhaps owing to their diversity, some of the didactic approach that makes the preceding chapters so appealing is missing here.

The final chapter of the book (Chapter 18) is a daring attempt to demonstrate a systematic approach to determining structure from EPR parameters. It seems unlikely that such an ambitious goal can be attained, and Section 18.1, perhaps inadvertently, confirms these doubts. It sounds like seeking the EPR equivalent of a universal guideline on how to synthesize any conceivable organic compound. Nevertheless, Chapter 18 is an excellent summary of practical conclusions drawn from the individual techniques. Especially where the authors re-enter their home ground and discuss procedures for determining the type and number of nuclei from hyperfine spectroscopy (Section 18.2.4), they give a clear outline of strategies and a systematic approach to deciding which techniques to use.

So, does this book fill the gap mentioned above? Obviously, the answer is affirmative. Will the book replace the

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