

Preface

# PROTAGONISTS IN CHEMISTRY



In this special issue of *Inorganica Chimica Acta*, we honor Robert J. Angelici as a “Protagonist in Chemistry” for his contributions to the advancement of inorganic chemistry through his innovative research programs and

his dedication to the education of students, especially in inorganic laboratory techniques.

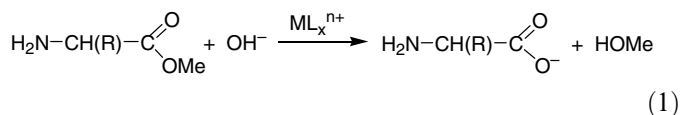
Bob was raised in Rochester, Minnesota, home of the Mayo Clinic, which was famous as a medical center even

in the year of his birth 1937. In this environment, science courses in the primary and secondary public schools were very strong, and many of Bob's classroom peers were children of medical doctors whose career goals often included the sciences. After graduating from Rochester high school, he attended St. Olaf College in Northfield, Minnesota, where his interest in inorganic chemistry was sparked by Prof. Albert E. Finholt. His enrollment in graduate school at Northwestern University was motivated, in part, by the possibility of doing graduate research with Prof. Fred Basolo who had published a book, "*Mechanisms of Inorganic Reactions*," with Prof. Ralph G. Pearson, in 1958, which was the year before Bob entered graduate school. The book described the fascinating early work on mechanisms of reactions of coordination compounds, which was a field that was still less than 10 years old. In the lab, Basolo was initiating studies of mechanisms of substitution reactions of metal carbonyl complexes. Andy Wojcicki, who studied  $\text{Ni}(\text{CO})_4$  and  $\text{Co}_2(\text{CO})_8$ , was Fred's first student to work in this area. Bob was the second and investigated the kinetics of CO substitution by phosphines in  $\text{Mn}(\text{CO})_5\text{X}$  ( $\text{X}$  = halogen) complexes. It was this foundation in kinetics and mechanisms that influenced many of Bob's future studies in quite different areas of chemistry. In Basolo's group at the time were other grad students, Harry Gray, Andy Wojcicki, and John Burmeister, who also went on to careers in research universities. In Bob's last year (1961–1962) in grad school, Basolo was on a sabbatical leave at the University of Rome. During this time, Tony Poë (now at Toronto) temporarily joined the Northwestern faculty to teach and to supervise Basolo's research group. In that year, Bob had applied for and was awarded a National Science Foundation postdoctoral fellowship for a year of research with Prof. E.O. Fischer at the University of Munich. So, following the completion of his Ph.D. requirements in September 1962, he and his wife headed for New York City where Harry Gray (then at Columbia University) arranged a festive send-off for the 7-day ship ride to Germany. The year in Munich was scientifically stimulating because Fischer's group was fully engaged in the new field of organometallic chemistry, and the first carbene complex was prepared about the time of Bob's arrival. His lab mates (H. Brünner, M. Herberhold, G. Herberich, and K. Öfele) and many of Fischer's other co-workers later took up university faculty positions throughout Germany. During the year in Fischer's group, Bob learned Schlenk techniques, which he and his group used for the synthesis of a multitude of air-sensitive organometallic compounds during the rest of his career.

While in Munich, Bob applied for faculty positions at universities in the States. It was a good time to be seeking an inorganic faculty position because the fields of coordination and organometallic chemistry were developing rapidly, enrollments were growing in US universities, and federal funding of research in the sciences was developing into a sustained effort. Although he did not interview in person on any campus, Bob received offers from several

universities and decided to accept a starting appointment at Iowa State University on October 1, 1963. In the same year, Jim Espenson was also hired at ISU as part of the inorganic faculty. One of Bob's first teaching assignments was to create an inorganic laboratory course for undergraduate chemistry majors. At the time, there were no laboratory texts that were suitable for an inorganic course that was designed to give students experience in techniques for the synthesis and characterization of inorganic compounds that were emerging from the up-and-coming fields of organometallic, bioinorganic, and solid state chemistry. The development of experiments for this course led Bob to write a book "*Synthesis and Technique in Inorganic Chemistry*," which was first published in 1969. The 2nd edition was published in 1977 and was followed by a Spanish edition in 1979. Greg Girolami and Tom Rauchfuss updated and revised the book in the 3rd edition which was published in 1999. It is quite amazing that this book has been a primary resource for college and university inorganic laboratory courses for already 39 years. The book was one of Bob's major contributions to the training and inspiration of new generations of inorganic chemists.

Developing laboratory experiments and writing a laboratory text is not the most direct route to achieving tenure at an American university. However, at the same time, Bob initiated research programs in two directions. His "bread-and-butter" project extended studies that he did as a graduate student on kinetic studies of carbon monoxide substitution in metal carbonyl complexes, which resulted in a series of papers that provided a useful understanding of factors that affect the lability of CO groups in a range of metal carbonyl complexes. At the same time, Bob began studies of metal-complex-catalyzed hydrolyses of amino acid (Eq. (1)) and peptide esters as models for esterase enzymes that contain metal ions. Prior to this work, there were only a few reported studies of metal-ion catalyzed ester hydrolysis, and these were done by organic chemists (one being Prof. Myron L. Bender at Northwestern University). Bob was one of the first inorganic chemists entering this field, which later became known as "bioinorganic" chemistry. During the next 19 years, with the support of NIH, his group published results of about 40 studies that characterized the mechanisms of these reactions and evaluated the catalytic activities of numerous transition metal and lanthanide complexes ( $\text{ML}_x^{n+}$ ).



In 1968–1969, Bob spent six months on a sabbatical leave with Prof. William P. Jencks at Brandeis University. Bill had a very successful physical organic program in mechanisms of model enzyme reactions, as well as enzyme-catalyzed reactions themselves. Bob was in a lab with

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