

## Fred Basolo (1920–2007): Dean of American Coordination Chemistry

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**Abstract:** This obituary-tribute for Fred Basolo (1920–2007), Charles E. and Emma H. Morrison Professor of Chemistry Emeritus at Northwestern University and 1983 President of the American Chemical Society, who died of congestive heart failure on February 27, 2007, discusses his life and work in chemical education, coordination chemistry, inorganic reaction kinetics and mechanisms, and service to science and society.

On Tuesday, February 27, 2007 Fred Basolo (1920–2007) (Figure 1), Charles E. and Emma H. Morrison Professor of Chemistry Emeritus at Northwestern University, died of congestive heart failure at age 87 at the Midwest Palliative and Hospice Care Center in Skokie, Illinois. Visitation was held on March 2 at the Donnellan Family Funeral Home in Skokie, and a funeral mass was said on March 3 at Our Lady of Perpetual Help Church in Glenview, Illinois. Interment was in All Souls Cemetery in Des Plaines, Illinois [1–7].

Fred was preceded in death by his wife, Mary, on February 5, 1997. He is survived by three daughters: Mary Catherine (M.C.) Kunzer (b. 1948) and husband John, Margaret Ann (Peggy) Silkaitis (b. 1957) and husband Gary, and Elizabeth Rose (Liz) Pionke (b. 1960) and husband Bob; a son, Fred Basolo, Jr. (b. 1950) and wife Marcia; and 11 grandchildren.

Fred followed his mentor John C. Bailar, Jr. in the role of dean of American coordination chemists. The award-winning 1983 President of the American Chemical Society, he made monumental contributions to inorganic chemistry, chemical education, coordination chemistry, inorganic reaction kinetics and mechanisms, and service to science and society.

We are particularly fortunate that Fred summarized his life and career in two books, an autobiography [8] and an annotated collection of his most significant articles [9]. Would that other prominent chemists of his caliber left posterity such a detailed record of their achievements!

John P. Fackler, Jr. approached Fred to write his autobiography as the first volume in Kluwer's new series, "Profiles in Inorganic Chemistry," an inorganic counterpart of Jeffrey I. Seeman's "Profiles, Pathways, and Dreams" series of autobiographies of organic chemists published by the American Chemical Society.

Initially reluctant to write an autobiography, Fred soon warmed to the task:

As I kept writing, I became more and more interested in the many things in my life that I had forgotten....It almost made me feel that I was again living those years of my life. Another reason for deciding to write my autobiography is to leave it for our children so that they can enjoy reading about the lives of their parents. Furthermore, at age 81 and

handicapped, I needed something to do that interested me and kept me busy [8, pp xi–xii].

According to his former doctoral student John L. Burmeister (b. 1938) (Figure 2),

In a very real sense, these books reflect a synergistic relationship between the two of us that paralleled the yin/yang relationship that existed between Fred and Ralph Pearson. I was always in awe of his encyclopaedic knowledge of inorganic chemistry, while he always held my writing ability in high esteem. In short, we made a good team. Given all of Fred's physical problems in his declining years, I also felt that it was important for him to keep intellectually engaged by writing these books. In like manner, I was delighted to see him and Fred, Jr. subsequently put Fred's web site [1] together. I truly believe that all three projects extended his life [10(a)].

### Early Life and Education in Coello

The youngest of three children, Fred Basolo was born on February 11, 1920 to Italian immigrant parents, "my two role models for life in general" [8, p 2] in the small-coal mining village of Coello, Illinois (population *ca.* 300), about 25 miles north of Carbondale. At Fred's funeral his oldest grandchild, John Michael Kunzer, related,

My grandfather's first name on his birth certificate is Alfredo, but he was having problems spelling it, so his mother told him, "Just write Fred" [11]. He never changed it, and for the rest of his life he pursued his work remembering excellence comes through living the simple lessons he learned in Coello [12].

Fred dedicated his autobiography [8], "In Loving Memory of My Beloved Wife, Mary and My Parents, Giovanni and Catherina Basolo" (Figure 3):

Regardless of early hardships, I have always considered my early childhood to have been the most enjoyable and most instructive period of my life [8, p 3].

Most of the miners, including the Basolos, were immigrants from the Piedmont region of northern Italy and spoke the "Piemontese" peasant dialect. Until he began to attend school, Fred understood but spoke little English. Conditions in the home were primitive—no central heating or plumbing, and his experiences watching his mother in the family kitchen made the cooking of Italian dishes one of his favorite hobbies. Later, Fred's brother, Martin, owned Coello's only grocery store, which he and his wife, Amelia, inherited from her family. The

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To George,  
 Thanks for offering to  
 review my autobiography. Also  
 thanks for always helping  
 me with questions on the  
 early history of metal complexes.  
 Best Wishes, Fred

**Figure 1.** Fred Basolo, Frontispiece from Autobiography with Fred's Handwriting. Reprinted with permission from *Chem. Eng. News*, April 2, 2001, 79 (14), cover. Copyright 2001, American Chemical Society. Photograph taken by Mitch Jacoby.



**Figure 2.** Fred Basolo (left) and John L. Burmeister (right), Wellesley College, Wellesley, Massachusetts, November 12, 1981. Fred received the James Flack Norris Award for Outstanding Achievement in the Teaching of Chemistry from the Northeastern Section of the American Chemical Society. Burmeister presented the introductory lecture. (Courtesy, John L. Burmeister).



**Figure 3.** Catherina (née Morena) Basolo (left) and Giovanni Basolo (right) (Fred Basolo's parents) in Front of Fred's Childhood Home, ca. 1933. (Courtesy, Jan Goranson).



**Figure 4.** Fred Basolo in Front of His Brother Martin's Grocery Store in Coello, Illinois. (Courtesy, Jan Goranson).

store passed on to their sons but eventually closed because of competition from supermarkets (Figure 4).

To quote Fred's grandson again,

My grandfather is the only person from Coello with a Ph.D., but it was in Coello he learned his greatest lessons. My grandfather called growing up in Coello "the most instructive period of my life" [8, p 3], and it was "the foundation that made me an honest, hard working, dependable, and credible person" [8, p 3]. He watched coal miners and their families survive the depression by helping one another and maintaining their spirit. He wrote that in Coello, "I learned how to respect and understand others" [8, p 1]. This is why I think he called Coello "God's Country," because there is nothing more holy than trying to understand others. My grandfather never said, "Look at where I came from" (*i.e.*, I overcame great odds) but always "Look at where I come from" (*i.e.*, I have achieved thanks to Coello). My grandfather loved going to Coello Homecomings, and I am sure he is playing bocce ball in heaven [12].

Fred's legendary concern for his students, colleagues, family, and everyone with whom he came into contact also may be traced to his early roots in Coello (Figure 5):

Learning about the common bonds all men share is why at Thanksgiving my grandfather would always have students and colleagues from around the world over for dinner. I remember those Thanksgiving dinners well because there were so many languages being spoken I couldn't understand the conversations. One of my earliest memories of my grandfather was when I was about five years old. He was visiting our family in South Bend, IN, and it was a very hot summer day. I was playing outside and he was hanging his laundry to dry (We had a clothes dryer, but for some reason he had to hang dry his laundry. I remember thinking this was odd, but I guess old habits are hard to change). A postman with sweat dripping from his forehead came delivering the mail. My grandfather told me to run inside and get this hard-working man a beer. My grandfather and this man sat, talked, and laughed as they drank their beer. It was on this day, while watching this African-American postman and my grandfather, who as a child grew up in a small town where he never saw a black person, that I learned all men are equal [12].

According to John L. Burmeister:

I can also shed some light on [this] amusing clothes drying story. I would bet my bottom dollar that it was a direct outgrowth of Fred's penchant for traveling light. Whether we traveled to meetings inside or outside of the US, Fred always seemed to manage with only a carry-on bag. When



**Figure 5.** The Basolo Family, (from left) Mary (Fred's older sister), Giovanni (Fred's father), Fred, Catherina (Fred's mother), Martin (Fred's older brother); child in front is Martin, Jr. (Fred's nephew), 1939. (Courtesy, Jan Goranson).



**Figure 6.** Fred Basolo as a Graduate Student, 1940–1943. (Courtesy, Jan Goranson).



**Figure 7.** Fred Basolo (left) and John C. Bailar, Jr. at the 6th International Conference on Coordination Chemistry, Detroit, MI, August 27–September 1, 1961. (Courtesy, Andrew J. Wojcicki).



**Figure 8.** Fred (left) and Mary (right) Basolo, the First Christmas after Their Marriage, 1947 [8, p 34]. (Courtesy, Jan Goranson).

I asked him about it, he explained that he had developed the habit of doing his laundry, when needed, in his hotel room, where he dried it overnight by hanging it up [10(b)].

The Great Depression began when Fred was about ten years old. Unlike his siblings, he was too young to work so he attended a four-room elementary school in Coello and then the Christopher Community High School, walking the two miles in all kinds of weather. His first contact with chemistry (He did not even know the meaning of the word.) was in high school, where his “beautiful young blond lady” [8, p 7] teacher told the class that she hated the subject, did not know much about it, and they were going to be largely on their own. Contrary to the common experience of successful chemists, who usually attribute their success to the motivation provided by an enthusiastic high school teacher, Fred found that her

approach to teaching chemistry gave me the freedom to concentrate on what interested me in the textbook and, even more so, to get very excited about the laboratory experiments [8, p 7].

### University Education

With the aid of a welfare program for college students (\$25 per month as payment for work on campus) Fred enrolled at Southern Illinois Normal School (SIN, now Southern Illinois University, from which he was to receive an honorary doctorate in 1984), where he became a chemistry major and earned his B.Ed. degree in 1940. He was the only person from Coello going to college and today is still the only Ph.D. from there. His parents expected him to return home to assume the stable and respectable position of a high school teacher. However, Chemistry Department Chairman James Neckers (1902–2004) advised him to go to graduate school. Fred's first reaction was, “What is graduate school?” [8, p 11].

A teaching assistantship (\$60 per month) enabled Fred to enter the University of Illinois (Figure 6), where he chose as his mentor John C. Bailar (1904–1991) (Figure 7), “a professor knowledgeable in organic chemistry doing work in inorganic chemistry which, to me, seemed a win-win situation” [8, p 14]. A good judge of character, Fred thought that Bailar “seemed to be a caring person, with a good understanding of people and their needs” [8, p 14], qualities for which Fred himself later became legendary. His choice was “one of the very best decisions I have ever made” [8, p 14], and Bailar became his second role model after his parents. Bailar was the father of American coordination chemistry [13], who, “more than any other single person, was responsible for the advancement of coordination chemistry in this country” [14]. As his fourth and most eminent doctoral student, Fred continued Bailar's work with his own students, and after Bailar's death in 1991 he inherited his position as the “grand old man of coordination chemistry in the United States.”

During his first year of graduate work Fred lived in a room in a private house, but during his second year he joined the Zeta chapter of Alpha Chi Sigma and moved into this chemical fraternity's house, which had previously been a sorority house, hence the absence of urinals in the washrooms [8, p 27]. During his last year of graduate work he was elected “Master Alchemist.” According to Rebekah Lynn Jones, the Zeta Corporation has accepted a bid for the fraternity house, which was vacated in May, 2007 [15].

Bailar had worked with octahedral cobalt(III) complexes, and he wanted to extend this research to complexes of planar





**Figure 9.** The Eleven Basolo Grandchildren, 2000. Left to Right: Back Row, Terry Silkaitis, Kevin Kunzer, Melissa Basolo, John Michael Kunzer; Middle Row, Katie Pionke, Trisha Basolo, Robbie Pionke, Angie Basolo; Front Row, Kristin Kunzer, Maggie Pionke, Timmy Silkaitis. (Courtesy, Jan Goranson).

platinum(II) and octahedral platinum(IV). For his dissertation research, Fred chose the preparation of *cis*-[PtCl<sub>2</sub>(NH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub>)<sub>2</sub>]Cl<sub>2</sub>, an optically active compound that would allow him to study the stereochemical changes that occur during ligand substitution reactions. His second publication [16], describing this research, elicited little interest until more than two decades later, when Barnett Rosenberg serendipitously discovered the anti-tumor activity of the related *cis*-[PtCl<sub>2</sub>(NH<sub>3</sub>)<sub>2</sub>] (cisplatin), still one of the most widely used anti-cancer drugs [17, 18].

Bailar suggested that Fred finish his work in three years so that he would not be drafted and have to return to Illinois to receive his degree. Fred received his M.S. degree in 1942 and his Ph.D. degree the following year at age 23. He spent the next three years working on governmental classified research on zirconium fire retardants and mica substitutes at Rohm & Haas Co. in Bridesburg, a Philadelphia suburb. His browsing in the R & H library aroused his interest in kinetics and reaction mechanisms and helped shape the course of his future career in chemistry.

#### Northwestern University, Marriage, and Sabbatical Leaves

In the Fall of 1946 Fred accepted a position as Instructor of Chemistry at Northwestern University (NU) in Evanston, Illinois, a suburb of Chicago. During his junior and senior years at SIN, where he worked in the student health laboratory carrying out urinalyses and hemoglobin tests, he had met Mary Nutely, a work-study staff member in the university doctor's office, who was having difficulty with her freshman chemistry course. Although he tutored her in the subject, she failed the course, but he reported "she never held it against me" [8, p 33].

Fred and Mary were married in a Catholic church in Longmeadow, Illinois on June 14, 1947 during his first year at NU. The "high-spirited Irish-Italian celebration" [8, p 34], at which Mary's mother played the organ, marked the beginning of his extremely long and happy marriage that was contemporaneous with his long and fruitful academic career (Figure 8). The couple had three daughters and a son, all of whom became educators and presented the Basolos with 11 grandchildren (Figure 9), the eldest of whom declared:

My grandfather knew his weaknesses. He always viewed the glass as half-empty. This is why he married a woman who viewed the glass as half-full. His wife Mary, like his mother, made his life simpler....My grandfather said she was "the very best mother and the very best wife" [8, p 36]. He admired the way the grandchildren were drawn to her. He admired her thoughtfulness, compassion, and devotion to family. He recognized her for being the true "provider" for the family. He attributed his success to her, and all of his moments were made better because of her. He took her to all of his award ceremonies so that everyone knew it was because of her that he had achieved. As he wrote in his autobiography about their wedding day, "I would like to say that had it not been for Mary, this autobiography would end here" [8, p 34]. I only saw my grandfather cry once and that is when his wife died. How do you say thank you to the wife who always made you better? You buy her the house of her dreams and when you have the opportunity to move to another state to take a prestigious new position, you turn it down. How do you say thank you to your children? You work everyday to provide for them. You turn off lights in the house, over-stuff lawn bags, and buy the cheap Carlo Rossi wine, so that you can save money to help give them more than you had growing up [12].

A Guggenheim fellowship enabled the Basolo family to spend a year (1954–1955) in Copenhagen, where he worked in the laboratory of Danish chemist Jannik Bjerrum [19], whose dissertation popularized the term ligand [20]. The Basolos also visited other European countries, including Italy, where they visited Fred's relatives. An avid golfer, Fred took the opportunity of their time in Scotland to play at the Royal and Ancient Golf Course in St. Andrews, where the game originated (Figure 10). Golf was Fred's lifelong passion, and according to one of his coauthors, Kazuo Nakamoto (b. 1922):

When I retired from Marquette [University] in July, 1991, Fred and his wife came to Milwaukee to attend my retirement party, and gave me a present of golf balls [(Figure 11)]. Although we were not good golfers, we loved the game of golf. In the mid-1970s, we started annual tournaments, "Marquette vs. Northwestern," and played at Petrifying Springs Golf Club, in Kenosha, WI near the Illinois/Wisconsin border [21].

During his year in Copenhagen Fred wrote several chapters of the book that was to earn an international scientific reputation for him and his NU colleague Ralph G. Pearson, later of hard and soft acid and base (HSAB) fame. Their now classic book, *Mechanisms of Inorganic Reactions* [22], introduced crystal field theory to chemists and showed its importance in explaining properties of coordination compounds as well as the kinetics and mechanisms of redox and ligand substitution reactions of metal complexes. This critically acclaimed landmark monograph has been compared to Alfred Werner's *Neuere Anschauungen auf dem Gebiete der anorganischen Chemie* [23], and Fred's fellow Bailar student Daryle H. Busch (b. 1928), who later (2000) became President



**Figure 10.** Fred Basolo at the 18th Hole of the Royal and Ancient Golf Course in Saint Andrews, Scotland. (Courtesy, Jan Goranson).



**Figure 11.** Fred Basolo (left) at Kazuo Nakamoto's (right) Retirement Party, July, 1991. (Courtesy, Kazuo Nakamoto).



**Figure 12.** Walter Hieber (1895–1976), “Father of Metal Carbonyl Chemistry.” (Courtesy, Jan Goranson).



**Figure 13.** Mary and Fred Basolo and Their Four Children (from left) Mary Catherine (M.C.), b. 1948; Elizabeth (Liz), b. 1960; Margaret (Peggy), b. 1957; and Fred, Jr., b. 1950) during Fred's Rome Sabbatical Leave (1961–1962). (Courtesy, Jan Goranson).

of the American Chemical Society, proclaimed that it was destined to become the “Bible of inorganic mechanisms” [8, p 82].

Fred and Mary spent four days during the summer of 1955 at the 3rd International Conference on Coordination Chemistry (3 ICC) at Amsterdam, where Fred heard the plenary lecture by Walter Hieber (1895–1976) (Figure 12) of the Technische Universität München, the “father of metal carbonyl chemistry.” In response to Fred's question about the mechanisms involved in the synthesis and reactions of these compounds, Hieber told him, “We do chemistry in my laboratory, not the philosophy of chemistry” [8, p 101]. Fred realized that this was a neglected field that he and his students could explore.

Fred's doctoral student Andrew J. Wojcicki (b. 1935) and one of us (HBG) dealt with the problem of handling toxic metal carbonyls by keeping a canary named Linus, supposedly more sensitive to fumes than humans, in a cage in the laboratory as a “canary in a coal mine.” After Linus died, they replaced him with a parakeet named Torpedo, who pecked HBG, infecting him with parrot fever (psittacosis), from which he recovered quickly, thanks to an early diagnosis and expert care given by the physicians at the Northwestern health center. HBG was not amused, however, when fellow graduate students sent him a box of crackers after learning of his parrot disease [8, p 104].

The Basolos spent Fred's second sabbatical year (He was a Senior NSF Fellow, 1961–1962.) at Vincenzo Caglioti's institute at the Università di Roma (Figure 13). During this sabbatical, Fred invited Anthony J. Poë (b. 1929), who was on his first sabbatical leave from Imperial College, London, to look after his research group of about a dozen graduate students.

Tony Poë relates,

Not having done any overseas travel, it was something of an awesome experience to look forward to moving myself, wife, and four children (the youngest only not quite 1 year old) to the States but that was where Fred's personal qualities began to show. He was extremely helpful in finding a house for us to rent, as well as passing on to us his very sturdy 1955 Chevy for the modest price of \$300, to be paid in monthly installments over the year! And the two or three (?) weeks we overlapped at Northwestern were made an extremely pleasant personal and academic experience through his warm introduction of me to his group and to his chemistry [24].

In addition to his work on the group's metal carbonyl research, Poë worked with Fred's student John L. Burmeister on his discovery of linkage isomers of  $L_nM-NCS$  and  $L_nM-SCN$  [25], the first case of linkage isomerism [26] since Sophus Mads Jørgensen's discovery of the xantho (nitro) ( $[Co(NO_2)(NH_3)_5]Cl_2$ ) and isoxantho (nitrito) ( $[Co(ONO)(NH_3)_5]Cl_2$ ) pentaammines of cobalt(III) [27]. Burmeister later described the discovery:

The genesis of this paper [26] may be traced to the moment in 1963 when, hunched over an IR spectrophotometer in a laboratory in Northwestern University's Technological Institute at 1:30 a.m., I watched a pen trace the confirming evidence that I had, indeed, synthesized the first inorganic linkage isomers of the thiocyanate ion. The impacts of this discovery were both immediate and long-range: My doctoral mentor, Fred Basolo, was roused from his slumber by a telephone call to



**Figure 14.** Ralph G. Pearson (left) and Fred Basolo (right). (Courtesy, Ralph G. Pearson).

share the joy that always accompanies scientific discovery, light appeared at the end of my Ph.D. tunnel, and, given the green light by Basolo, I initiated a research program that has focused on the coordination chemistry of ambidentate ligands to this very day, some 100 research publications later [28].

During his Rome sabbatical, Fred also wrote the first two chapters of his second book, *Coordination Chemistry*, a popular supplementary paperback textbook coauthored with former student Ronald C. Johnson (b. 1935), which was translated into seven languages [29].

### Inorganic Chemistry Renaissance

Organic chemistry flourished during both the latter half of the 19th century as well as all of the 20th century. However, after the pioneering work of Alfred Werner (1866–1919) [30] and Sophus Mads Jørgensen (1837–1914) [31], its older sister field, inorganic chemistry, languished in the doldrums until World War II, when what Sir Ronald S. Nyholm called the “Renaissance of Inorganic Chemistry” took place [32], a rebirth in which Fred played a prominent role.

A “Symposium on the Place of Inorganic Chemistry in the Undergraduate Curriculum” was held at the 116th National Meeting of the American Chemical Society, Atlantic City, NJ, on September 20, 1949 “to discuss present deficiencies in current curricula with respect to inorganic chemistry and to examine some of the solutions that have been adopted in an attempt to remedy the situation” [33].

In order to re-examine the problem Edward K. Mellon (b. 1936), assisted by Robert W. Parry (1917–2006), Fred’s former doctoral student Harry B. Gray (b. 1935), and Derek A. Davenport (b. 1927), organized a symposium, “Inorganic Chemistry in the Curriculum: What Should Be Left In and What Should Be Left Out,” jointly with the Divisions of Chemical Education and Inorganic Chemistry, held at the 180th National Meeting of the American Chemical Society, Las Vegas, NV, on August 25–29, 1980. The Proceedings in the form of eight articles and a panel discussion were

published in the November, 1980 issue of the *Journal of Chemical Education* [34]. Fred contributed two frequently cited articles to this issue [35, 36], which he followed up with another seminal paper [37]. Many chemical educators, ourselves included, have utilized this approach in our teaching. As a leading luminary in inorganic chemistry, Fred contributed many articles, checked numerous syntheses, and served as Editor-in-Chief of Volume XVI of *Inorganic Syntheses*, the popular series designed “to provide all users of inorganic substances with detailed and foolproof procedures for the preparation of important and timely compounds” [38].

### The Basolo–Pearson Collaboration and the BIP Group Meetings

At NU Basolo rose through the ranks—Instructor (1946–1950), Assistant Professor (1950–1955), Associate Professor (1955–1958), Professor (1958–1979), and Charles E. and Emma H. Morrison Professor of Chemistry (1980–1990). He served as Chairman of the Chemistry Department from 1969 to 1972.

As mentioned earlier, while working at Rohm and Haas, Fred became interested in studies of the kinetics and mechanisms of substitution reactions on carbon that were being carried out by organic chemists. It occurred to him that such studies could be made on inorganic coordination compounds such as those of cobalt(III) and platinum(II), with which he was already familiar. He had no experience with kinetics and mechanisms of chemical reactions, but he was fortunate in that fellow Instructor and physical organic chemist, Ralph G. Pearson (b. 1919), was performing such studies with carbon compounds.

In response to Fred’s effort to convince him to collaborate on similar studies on coordination compounds, Ralph initially said, “There is no interest in inorganic chemistry, so why should I waste my time studying such systems?” [8, p 81]. Furthermore, no NU graduate students were expressing any interest in inorganic chemistry. Fred did not give up, however, and eventually he was successful in “seducing” Ralph into becoming a physical inorganic chemist, and this dynamic duo became the Damon and Pythias of inorganic kinetics and mechanisms (Figure 14). Their first joint paper, a one-page communication, appeared in 1952 [39], and the rest, as they say, is history. According to Fred,

Ralph and I arrived at the right place at the right time, resulting in the publication of some 60 co-authored papers on the kinetics and mechanisms of ligand substitution of octahedral and square planar metal complexes. Neither one of us could have done what we did alone, but, by working together, we were very successful. The seminal results of our studies are now often used in bioinorganic chemistry research, and in studies on homogeneous catalysis [9, p 3].

Fred and Ralph and their students found that the base hydrolysis of cobalt(III) complexes proceeds by an  $S_N1CB$  (substitution, nucleophilic, unimolecular, conjugate base) mechanism. Sir Christopher K. Ingold (1893–1970) [40, 41], the Nobel-caliber “high priest of organic mechanisms,” and coordination chemist, Sir Ronald S. Nyholm (1917–1971) [42–44], claimed that this view was incorrect and published papers stating that the correct mechanism was  $S_N2$  (substitution, nucleophilic, bimolecular). In Fred’s words,



Had our polemic with Ingold and Nyholm, two of the giants



**Figure 15.** Fred Basolo (left) and Ralph G. Pearson (right) “discover” d-orbitals. (Courtesy, Ralph G. Pearson).

gotten tenure and our department may not now rank among the top four in inorganic chemistry in the U.S. We were very fortunate to have this exchange focus so much favorable attention on our department just at the time when inorganic chemistry in the U.S. was beginning to achieve the importance it now has [8, pp 90–91].

In view of the importance of their long and intimate collaboration, Ralph G. Pearson’s comments, which resurrect the state of the art at the time, are worth quoting at length:

Like many others, I owe a large debt of gratitude to Fred. In 1941 he persuaded me to join him in a study of the mechanisms of substitution reactions in coordination compounds. There was almost no work being done in this area. Henry Taube [(1915–2005)] had started to do a little on redox reactions, but there were very few people doing anything that might be called physical inorganic chemistry.

I had already started some work on substitution reactions in organic systems. Physical organic chemistry was already well developed, and the field was dominated by giants like [Edward D.] Hughes and Ingold, [Saul] Winstein and [Paul D.] Bartlett. It would have been hard for me to make much of an impression on this field. But, thanks to Fred, he and I became two of the fathers of physical inorganic chemistry.

Our talents were well matched. I knew a lot about studying mechanisms by means of kinetic studies. Fred also knew how to synthesize metal complexes, how to analyze them and how to identify them. We also had just enough in the way of instruments to do what we needed. These included a Cary UV-visible spectrophotometer, a conductivity bridge, and a Rudolph polarimeter.

Our first student was Earl Muetterties [(1927–1984)], who was a senior at Northwestern, wanting to do some honors research. But graduate students were hard to find. Inorganic chemistry was not popular at that time. It was considered “tombstone chemistry,” with a dash of sulfuric acid.

But we were lucky. The atomic energy program had already put some money into the chemistry of metal ions. The success of the Russian Sputnik had increased the interest. There were AEC graduate fellowships available, and Fred and I received a \$7000 grant from the AEC to support our work. Such grants were very rare in those

of chemistry, not turned out in our favor, we may not have days. But we now had graduate students, and very good ones.

We were also fortunate in our choice of research problems for starters. The first, of course, was substitution reactions of octahedral cobalt(III) complexes. The choice was dictated by Fred’s doctoral work with John Bailar at Illinois. Cobalt(III) complexes turned out to be the prototype systems for dissociation, or  $S_N1$ , mechanisms. We next turned to planar platinum(II) complexes, which were the prototypes for addition, or  $S_N2$ , mechanisms. The 16–18 electron rule was working!

Another development in physical inorganic chemistry was happening, and helped us in our interpretation of experimental results. It also increased the interest of the wider chemical community in inorganic chemistry. This was the appearance of crystal field theory, shortly to become ligand field theory, or molecular orbital theory applied to transition metal complexes.

In the 1940s and early ‘50s, the theory of inorganic chemistry was dominated by Linus Pauling [(1901–1994)]. His views were based on valence bond theory and mainly used hybrid orbitals and resonance structures to explain things. Actually, it didn’t work very well. Molecular orbital theory was much better at explanations and approximate calculations. Fred and I published the first edition of *Inorganic Reaction Mechanisms* [22] [The actual title is *Mechanisms of Inorganic Reactions*.—GBK] in 1958. In it we had an introduction to crystal field theory. We also showed pictures of *d* orbitals and made three-dimensional models of them [(Figure 15)].

This was brand new to most chemists. As a result, Fred and I were instrumental in spreading crystal field theory into inorganic chemistry. It had a great impact, since, as one person said, “Inorganic chemistry went from crystal ball to crystal field theory.”

We were also lucky that C. K. Ingold and R. S. Nyholm did some work on the mechanism of substitution reactions of metal complexes. Most of what they did was wrong, but Ingold’s reputation was so great that much interest in the subject was created. Chemists in other fields began to pay attention.

Fred was also a great teacher. I often quipped that he was a far better teacher than I was. Over the years he taught me much inorganic chemistry, but I was never able to teach him any physical chemistry. He made many other contributions to making inorganic chemistry one of the hot research areas of chemistry. Summing up, Fred Basolo was a worthy successor to John Bailar as the Father of American Inorganic Chemistry [45].

Fred and Ralph’s studies of ligand substitution reactions of octahedral cobalt(III) complexes, acid hydrolysis or aquation of cobalt(III) and chromium(III) metal-ammine complexes, base hydrolysis of metal-ammine complexes, linkage isomers, ligand substitution reactions of Pt(II) square planar complexes, synthetic oxygen carriers, and organometallic chemistry, including the indenyl kinetic effect are true chemical classics [46]. Fred also made incursions into the field of biological inorganic chemistry. In the words of his postdoctoral fellow David H. Petering (b. 1942),

Fred sent me off to Brian Hoffman to collaborate on the synthesis and dioxygen-binding properties of what became known as coboglobin, never asserting intellectual priority for this novel protein, which he might have called, "Co in a sea of organic crud" (Fred's joke that portrayed hemoglobin Fe as the jewel shining brightly against the drab background of C, H, and O) nor seeking to become a bioinorganic chemist when there was revealing inorganic chemistry yet to be done. Instead, Fred and his students continued their thorough study of the dioxygen-complexation chemistry of Co(II)-Schiff base chelates and, thereby, helped to ground our biochemical studies in a detailed understanding of related inorganic complexes. To some extent, Fred had to bend to the great interest within the biochemical community in his growing understanding of Co-dioxygen chemistry. But I think, if anything, these forays into the land of biochemistry were followed by the great joy of returning to his home soil of inorganic chemistry [47].

The Chemistry Department of Northwestern University was—and still is—famous for the strong interaction between its faculty and students. The informal Saturday morning Basolo–Ibers–Pearson (BIP) meetings [48], where graduate students or postdoctoral fellows presented their results on research in progress, are known worldwide and have become legendary. Fred's doctoral student Alvin L. Crumbliss (b. 1942) remembers:

Fred and Ralph Pearson often arguing over points, stimulating our thinking and sharpening our appreciation of experimental design and critical analysis. The BIP meetings were always held on Saturday mornings, as an indication that Saturday was to be treated as another working day, as it was by most of us....Many of the names in inorganic chemistry from Europe would make it a point to stop by NU to give a Friday colloquium talk, and then stay on for a BIP group meeting talk on Saturday morning. This often led to being invited to Fred's house for dinner with the speaker. Mary and Fred were both excellent hosts. The food was great and Fred's after dinner drink collection was memorable [49].

### Teaching Activities

Like his mentor John Bailar, Fred educated several generations of chemists (58 doctorates, 66 postdoctoral fellows, and countless bachelor's and master's degree candidates). About one-third of his students, inspired by his love of teaching, entered academia. The roll of his former students reads like a veritable "Who's Who" of inorganic chemistry and chemical education. Like Bailar's, Fred's success as a research supervisor and teacher owed as much to his enduring human qualities as to his considerable chemical knowledge.

His former students testify glowingly of his didactic skills. For example, John L. Burmeister:

My graduate mentor at Northwestern, Professor Fred Basolo, was a prototypical example of the Mentor Model....he never dealt with us through intermediaries, save for the year he was on sabbatical leave. We discussed our research progress and problems with him on a one-on-one basis, at his behest, at least once a week. We talked about a kaleidoscope of other subjects with him as well, learning a lot about his philosophy of life, in the process. We experienced his culinary and golf skills first hand (get-togethers at his home were frequent, and I never did beat him in a round of golf). In short, he became more than a professor to us—he became a lifelong friend [50].

Or Bob Angelici (b. 1937):

Fred was the one that taught me how to write a scientific paper. Having taken English composition classes in high school and college, I did not really know how to write a scientific paper, which is very different than a theme for English. So, I spent weeks writing a draft of my first paper. I thought it might be a little long, but overall I was rather pleased with it. A few days after I gave it to Fred, he returned it to me without a mark on it, but it was accompanied by a large stack of yellow hand-written pages. He had rewritten the whole paper! It must have taken many hours. I do not remember talking with him about his version or my version, but I realized what was necessary to write a concise, understandable, accurate, and interesting account of my studies. When I work with my own students who are writing their first papers, I pass on the lessons that I learned from Fred. It is not always an easy process for the student or me, but my expectations for a well-written paper are exactly the same as Fred's [51].

Or Al Crumbliss:

Fred was very flexible and tolerant in his way of directing his PhD students. Fred was a morning person....one of his pet phrases was "the morning is the mother of the day," only he first said it in Italian, or more correctly Piemontese, a peasant dialect. He would be in the office at 7:00 AM 6 days a week....Fred gave us a long leash; we knew he was there and that he cared, but he didn't get in our way of discovering new data and its meaning on our own....Fred was a man with an encyclopedia-like mind for chemistry, a quick smile and wink, and a hearty laugh [49].

Or coauthor Bill Trogler:

Fred delighted in preparing authentic Italian spaghetti dinners for his research group....His hearty laugh always made for a festive atmosphere, and Fred always was proud of how he managed to find our beverage, a local beer, for nearly nothing at the local Liquor Barn. At the end of the meal he would make a grand production bringing in a cake "he baked." Later his wife, Mary, would confess that Fred barely knew how to turn on the oven. After dinner, Fred would regale all with tales of his childhood in southern Illinois and the virtues of his father's bathtub "Italian" red wine (Fred always used a cruder term for Italian in this context). Grappa [unaged Italian brandy] would flow freely during these conversations, and Fred took pleasure in an unsuspecting graduate student imbibing to excess. At 10 pm sharp we would all leave, as Fred would be in his office by 6 am the next morning—another characteristic of his rural upbringing [52].

Or Ken Raymond (b. 1942), who wrote to Fred's daughter:

Your father, as you know, was a very devoted family man, and maintained that devotion and family attitude toward his students. Dinners at the family home, cooked by your mother, concern about personal matters of his students and an active interest and support of the professional lives of his coworkers were all hallmarks of his long career. I have tried to emulate these qualities in my own personal and professional life [53].

In his graduate course in coordination chemistry Bailar lectured on the history of the subject, and Fred condensed Bailar's lecture into a 50-minute lecture for his freshman class to illustrate how science advances. Fred presented this lecture every year for four decades to his students and worldwide to universities and high schools [54].





**Figure 16.** Mary (left) and Fred (right) Basolo in 1983 During the Year of His American Chemical Society Presidency. (Courtesy, Jan Goranson).



**Figure 17.** Fred Basolo, 1983 ACS President. Reprinted with permission from *Chem. Eng. News*, **January 3, 1983**, 61 (1), cover. Copyright 2001, American Chemical Society. Photograph taken by Mitch Jacoby.



**Figure 18.** Photograph taken when Fred Basolo received the Priestley Medal, 2001. Fred (sitting); (standing from left to right): Elizabeth Rose (Liz) Pionke, Margaret Ann (Peggy) Silkaitis, Mary Catherine (M.C.) Kunzer, and Fred Basolo, Jr. (Courtesy, Jan Goranson).

### Professional Activities

Fred was extremely active in the Gordon Research Conferences, International Conferences on Coordination Chemistry (ICCC), ACS Petroleum Research Fund Advisory Board, and North Atlantic Treaty Organization (NATO). He was elected to the National Academy of Sciences in 1979 and considered one of his most important NAS activities his participation in the book, *Opportunities in Chemistry*, colloquially known as the “Pimentel Report” [55]. Despite his numerous professional activities and his more than 380

scientific publications, he was never too busy to serve as editor of journals or volumes [56] or write letters of recommendation, award nominations, and forewords to books or monographs [57].

During the first of his speaking tours for the American Chemical Society, Fred found that “At each stop, my last slide would be forgotten in the projector and, as a result, my talks became shorter and shorter!” [8, p 126], an experience to which many of us can personally relate. In 1970 he was elected Chairman of the ACS Division of Inorganic Chemistry and in 1971 a member of its Executive Committee. Although he had not been very active in the ACS previously and therefore thought that he had little chance of being elected President, he agreed to having his name proposed as a petition candidate to oppose the other two candidates loyal to the ACS establishment, who would receive all the establishment votes. To his great surprise he was elected 1983 ACS President without any electioneering on his part (Figures 16 and 17).

After spending a year (1982) of “on-the-job learning as President-elect” [8, p 131], Fred used his office as President to remedy some of his longtime concerns. For example, in his attempts to combat chemophobia he agreed to discuss environmental problems with newspaper reporters, radio talk show hosts, and television anchor persons but only if he was given equal time to present the beneficial aspects of chemicals. He also made these views known to congressmen and congressional committees. In 1992 he received the ACS George C. Pimentel Award in Chemical Education, and in 2001 he was awarded the Priestley Medal, the ACS’s highest honor [58] (Figure 18).

Not all of Fred’s presidential efforts bore fruit:

I began my crusade to establish only one annual meeting per year, terminating all committees no longer needed, and changing the by-laws to put an upper limit (10 or 15 years) of time that a member could serve on national committees....I failed miserably with these three goals [8, p 132].

He concluded that

My year as President of the ACS was a rewarding experience for me. I learned that one cannot succeed in making major changes in an organization deeply entrenched in its policies. However,...some of what was done made significant contributions to chemistry [8, p 136].

Fred’s coauthor Jim Collman (b. 1932) later benefited from Fred’s disillusionment:

My final contact with Fred occurred...when I called him for advice. I had been asked to run for the presidency of the ACS, a position Fred had recently held. Fred expressed his disappointment in trying to reform the society. I was not very interested in running for this office, but Fred’s sound advice helped me to decide to decline the offer [59].

### Foreign Travels

Fred traveled to 42 foreign countries, where he met with colleagues and encountered unusual foods and customs. His zest for life and remembrance of the humble circumstances of his childhood made him take great delight in each new experience during these peregrinations. Two countries in particular were among his favorite destinations.



**Figure 19.** The President of the Accademia Nazionale dei Lincei (center) presents Fred Basolo (left) with the Academy's Certificate of Foreign Membership, 1987. (Courtesy, Jan Goranson).



**Figure 20.** Vice-Premier Fang-Yi, President of the Chinese Academy of Sciences (extreme right), discusses economic and scientific matters with Fred Basolo (second from left) in the Hall of the People, Beijing, November, 1979. (Courtesy, Jan Goranson).



**Figure 21.** Four Generations of Chemists at the 3rd Oesper Symposium Honoring Fred Basolo, University of Cincinnati, October 26, 1983. From left to right. Ralph G. Pearson, Harry B. Gray (3), Andrew J. Wojcicki (3), John C. Bailar, Jr. (1), Fred Basolo (2), Robert J. Angelici (3), Mark S. Wrighton (b. 1949) (4), and an Oesper Relative. Numbers in parentheses designate "generations." (Courtesy, Ralph G. Pearson and Andrew J. Wojcicki).



**Figure 22.** Monie A. Ferst Award Symposium Honoring Fred Basolo, Society of the Sigma Xi, Georgia Institute of Technology, Atlanta, Georgia, May 14-16, 1992. From left to right, Ronald C. Johnson (Ph.D., 1961), Alvin L. Crumbliss (Ph.D., 1968), Andrew J. Wojcicki (Ph.D., 1960), M. Fazlul Hoq (Postdoctoral Fellow, 1989), Fred Basolo, John L. Burmeister (Ph.D., 1964), Kenneth N. Raymond (Ph.D., 1968). (Courtesy, Kenneth N. Raymond).

Fred regarded Italy as a second home and traveled there "more times than I can recall" [8, p 153]. He lectured there in his "bad, but amusing Italian" [8, p 156]. In 1981 he was elected an honorary member of the Società Chimica Italiana, and he received honorary doctorates from the Università di Torino (1987), the Università di Padova (1991), and the Università di Palermo (1997). He also was awarded three Italian medals. However, he was proudest of his election in 1987 to the Accademia Nazionale dei Lincei (Italy's national academy of science), founded more than four centuries ago—in 1603—as the world's oldest scientific society [60] (Figure 19). He was one of only ten foreign members, five of whom are Nobel laureates.

Fred made seven trips to China, where, in November, 1979, he met with Vice-Premier Fang-Yi (the number three governmental official) (Figure 20), dined on such delicacies as snake soup, drank mao-ti, "which had an odor of kerosene" [8, p 163], and received an honorary doctorate and a medal. Because of his frequent visits, one of the professors at Fudan University told him, "Basolo, you are the Marco Polo of chemistry to China" [8, p 167].

### Honors and Awards

Among Fred's numerous honors, some of which have been mentioned previously, are the following: Senior NSF Fellow, Università di Roma (1961–1962); ACS Award for Research in Inorganic Chemistry (1964); NATO Distinguished Professor, Technische Universität München (1969); ACS North Regional Section's Citation for Excellence for Research on Substitution Reactions of Metal Complexes (1971); First Recipient of the Bailar Medal (1972); Southern Illinois University Alumni Achievement Award (1974); ACS Award for Distinguished Service in Inorganic Chemistry (1975); Dwyer Medal (1976); American Association for the Advancement of Science (AAAS) Fellow (1977); Honorary Member, Phi Lambda Upsilon (1977); Japanese Society for the Promotion of Science, Fellow (1979); U.S. National Academy of Sciences, Member (1979); Morrison Professor, Northwestern University (1980–2007); Società Chimica Italiana, Honorary Member (1981); James Flack Norris Award for Outstanding Achievement in the Teaching of Chemistry (1981) (Figure 2); NATO Senior Scientist Fellow, Italy (1981); ACS President-Elect (1982); Illinois House of Representatives Resolution No. 686 honoring him as a Resident of Illinois (1982); ACS Board of Directors, Member (1982); ACS President (1983); Ralph E. and Helen W. Oesper Memorial Award, University of Cincinnati (1983) (Figure 21); Chemical Society of Peru, Corresponding Member (1983); Award for Research in Inorganic Chemistry, Società Chimica Italiana (1988); IX Century Medal, Università di Bologna (1988); Harry and Carol Mosher Award (1990); Università di Padova Medal (1991); Distinción Bicentennial Medal, University of Los Andes in Merida (1991); Medals from the University of South Korea, Pohang University of Science & Technology (POSTECH), Korean Institute of Science & Technology (KIST), and the Inorganic Division, South Korean Chemical Society (1991); Chinese Chemical Society Medal (1991); Chemical Pioneer Award, American Institute of Chemists (1992); Monie A. Ferst Medal, Society of the Sigma Xi (1992) (Figure 22); Humboldt Senior U.S. Scientist Award (1992); Distinguished Visiting Professor, Ohio State University (1992); Gold Medal Award, American Institute of Chemists (1993); First Lecturer and





**Figure 23.** Basolo 70, Northwestern University, August 17–18, 1990. Front row from left: Alvin L. Crumbliss (3), Robert J. Angelici (4), Kenneth N. Raymond (5), Andrew J. Wojcicki (6), Ralph G. Pearson (7), Fred Basolo (8), Harry B. Gray (10). (Courtesy, John L. Burmeister),



**Figure 24.** Basolo 70, Northwestern University, August 17–18, 1990. Fred Basolo (fourth from left), Ralph G. Pearson (fifth from left). (Courtesy, Ralph G. Pearson).



**Figure 25.** George B. Kauffman (left) and Laurie M. Kauffman (right) Wearing Their Basolo 70 T-shirts. (Photograph by Randy Vaughn-Dotta). (Courtesy, Randy Vaughn-Dotta).



**Figure 26.** Basolo Award Medal for Outstanding Research in the Field of Inorganic Chemistry. (Courtesy, Jan Goranson).

Medalist, Joseph Chatt Award, Royal Society of Chemistry (1996); Josiah Willard Gibbs Medal, Chicago Section, ACS (1996); Member of the Hall of Fame, Southern Illinois University Department of Chemistry (1996); Obelisk Leadership Award, SIU (2000); Priestley Medal, ACS (2001). He also received a number of honorary degrees: D.Sc., University of Southern Illinois (1984); Lanzhou University, People's Republic of China (1985); Laurea Honoris Causa, Università degli Studi di Torino (1987); and Zhangshan University (1988). According to his grandson:

He won many awards for his teaching and research. Interestingly, my uncle found most of my grandfather's awards in his sock drawer. My grandfather taught me that you do not hang awards in your house because your work is never more important than your family and you teach to help others and never to win awards [12].

### Retirement

Looking forward to retirement, the Basolos moved into a smaller house, and Fred stopped taking graduate students in 1987 “because I felt one's mentor should be available for several years after his students have received their Ph.D” [8, p 211].

On August 17–18, 1990 a large celebration of Fred's 70th birthday and his retirement, financially supported by 16 corporations and societies and attended by almost all of his Ph.D. students and postdocs, took place [56] (Figures 23–25). Tony Poë introduced one of us (HBG), who presided during the event, which was known as Basolo 70.

Sufficient unused funds were left so that Fred's students and postdoctoral fellows created an endowment to establish an annual Basolo Medal (Figures 26–28) and Lecture. Ralph G. Pearson was selected as the first Basolo Medalist and Lecturer in 1991. Governor James Thompson proclaimed August 18, 1990 to be “Fred Basolo Day in the State of Illinois.”

Unfortunately, in 1991 Mary had an emergency quadruple heart bypass, after which she began to suffer from Alzheimer's disease. One morning, while driving her to the day-care center, Fred fell asleep at the wheel, probably because of a combination of some new medications and tiredness, and the car hit a tree. Mary succumbed to her injuries and died on February 5, 1997. Five surgeries on Fred's back damaged the nerves from his brain to his legs, and he became unable to walk without two canes, and he used a motorized scooter to get around in the NU Chemistry Building (Figure 29). Despite pain and shortness of breath, he came to his office in the morning, had lunch with his faculty colleagues, and left in the early afternoon:

Research was not just about creating new compounds but creating professional relationships to share the joys of chemistry and life. My grandfather would often take me to his office. I thought these trips were to show me what he had done and accomplished. I finally realized one Saturday the true meaning behind these trips. My grandfather took me to the new Nanotechnology building. I smiled as I saw his enthusiasm and pride as he rode his motorized scooter around the Nanotechnology building. He told me, “John Michael, I don't understand any of this. These people that built this are so much smarter than me.” Although he didn't understand nanotechnology, he was so proud that he was part of a university and network of professional colleagues that had built and created something so great [12].





**Figure 27.** Andrew J. Wojcicki, Fred Basolo, and Harry B. Gray (from left to right) at Northwestern University, 1994. Andy presented Harry with the Basolo Medal. (Courtesy, Andrew J. Wojcicki).



**Figure 28.** Fred (left) and Mary (right) Basolo at Northwestern University, 1994. Andy Presented Harry B. Gray with the Basolo Medal. (Courtesy, Andrew J. Wojcicki).



**Figure 29.** Fred Basolo on His Motorized Scooter, Department of Chemistry, Northwestern University, 2001. Reprinted with permission from *Chem. Eng. News*, April 2, 2001, 79 (14), 59. Copyright 2001, American Chemical Society. Photograph taken by Mitch Jacoby.

Despite the illness and pain of his last days, Fred never forgot his former students:

While his body failed, his mind remained active. He distributed to me and his other ex students many items over the last couple of years, obviously in anticipation of his death. Like the rest of his life, he was organized and thinking of others even as the end of his own life approached [53].

While suffering from afflictions that would have tested the patience of Job, he never felt sorry for himself:

Men from my grandfather's generation also have a difficult time saying "I Love You." Ironically, it was in his final years that he helped teach the meaning of these words. This previously strong man was confined to a wheel chair. He had become thin and frail. He was unable to garden or play golf. The love of his life, Mary, who had shared his life with him had been killed in a car accident. People had to help him in and out of bed, change him, feed him, and clean him. His final years did not turn out as he had planned. Through all of this though, he never said, "Why Me?" This very strong man allowed himself to become helpless and his body to deteriorate because he knew he was providing a service to God. He was allowing God to use his body to teach the ultimate lesson. That lesson is what "I Love You" means. When my grandfather was very ill one night, I told him "I Love You," and he said, "Those sounds make me feel good." He didn't say those *words*, but those *sounds*. "I Love You" has to be more than words. It must be something we can hear, see, and feel that touches our soul [12].

### Basolo's Legacy

Fred Basolo's life and career constitutes an inspiring Horatio Alger saga of an individual committed both to the practice of scientific research and to his profession. We have tried to summarize his contributions to chemistry and to give some insight into his personality, his warmth, sense of humor, charm, and intense interest in people that have endeared him to several generations of colleagues and students.

Always aware and proud of his roots, yet humble about his accomplishments, Fred wrote:

I can truthfully say that I marvel at what has happened to me during my life. Not in my wildest dreams could I have expected when growing up in the little mining village of Coello that, some day, I would become a successful chemist [8, p 221].

It was typical of him that he concluded the autobiography depicting his triumph and tragedy with the positive outlook on life expressed by his wife Mary: "Happiness Always" [8, p 221].

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  48. The acronym BIP (Basolo–Ibers–Pearson) was coined by Kenneth N. Raymond, who was a graduate student when the Saturday groups that met together were those of Basolo, James A. Ibers, and Pearson [8, p 83].
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  54. One of us (GBK) independently has used the same approach as Bailar and Basolo, using, as they did, samples of crucial coordination compounds. In his autobiography [8, p 84] Fred states that before beginning his now classic series of researches on the reaction mechanisms of coordination compounds, he read English translations of several of Werner's papers in Kauffman, G. B. *Classics in Coordination Chemistry, Part 1: The Selected Papers of Alfred Werner*; Volume VI in the "Classics of Science" Series, Holton, G., General Ed.; Dover Publications, Inc.: New York, 1968. In this, however, he must have been mistaken, for this book did not appear until more than a decade later.
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  61. Burmeister, J. L., Ed. Basolo 70: A Collection of Invited Papers on Coordination, Bioinorganic and Organometallic Chemistry in Honour of Professor Fred Basolo on the Occasion of His 70th Birthday Presented at a Symposium at Northwestern University, Evanston, IL, 17–18 August 1990. *Coord. Chem. Rev.* **1990**, *105*; Special 269-pp issue with 11 papers by former students.