

Chapter 9

Fred Basolo and the (Re)naissance of American Inorganic Chemistry

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It was an Australian/British chemist, Sir Ronald Nyholm, who first spoke of a “renaissance” of inorganic chemistry; but its emergence as a newly dynamic subfield, beginning in the 1950s, can be seen even more clearly in the US. While John Bailar is often credited as the “Father of American Inorganic Chemistry,” it is arguable that Fred Basolo, Bailar’s student at Illinois, has had the most lasting impact on the dramatic growth of the field in American academia. Justification for that assertion includes the remarkable representation of his academic descendants among inorganic faculty members of American universities; comments and reminiscences from the students he trained; and an examination of his seminal contributions in the form of both original research and textbooks, particularly the groundbreaking 1958 work *Mechanisms of Inorganic Reactions*, written with his Northwestern colleague Ralph Pearson, which played a central role in raising the intellectual stature of inorganic chemistry by bringing the study of mechanism to the forefront.

Introduction

In 1956, Ronald S. Nyholm gave an Inaugural Address on the occasion of his taking up the chair of inorganic chemistry at University College London following his move from Australia. The title of the talk, which was subsequently reprinted in the *Journal of Chemical Education* (1), was “The Renaissance of Inorganic Chemistry,” and it began:

“Those of us who are familiar with the state of inorganic chemistry in universities twenty to thirty years ago will recall that at that time it was widely regarded as a dull and uninteresting part of the undergraduate course. Usually, it was taught almost entirely in the early years of the course and then chiefly as a collection of largely unconnected facts. On the whole, students concluded that...there was no system in inorganic chemistry comparable with that to be found in organic chemistry, and none of the rigor and logic which characterized physical chemistry. It was widely believed that the opportunities for research in inorganic chemistry were dull and uninspiring; as a result, relatively few people specialized in this subject.”

Nyholm does not appear to have specified whether his characterization was meant to be applied worldwide, or only to the UK and Australia where he had worked and been trained; but there can be little question that it *was* in fact perfectly applicable to universities in the US as well, as I have documented elsewhere (2). A variety of evidence shows that the “dull and uninteresting” state of inorganic chemistry was just beginning to change around the time of Nyholm’s proclamation of a renaissance, which (for the US at least) described an ongoing — really just beginning — process, not a completed accomplishment. That claim is supported by reminiscences from a number of inorganic chemists whose career spanned or began during that period, as well as an array of quantitative metrics, including representation of inorganic faculty and students in chemistry departments, publications in *JACS*, presentations at ACS national meetings, and recognition in the form of ACS awards (specifically that in Pure Chemistry) and election to the National Academy of Sciences. All of these show a pronounced surge beginning around the 1950s or (in the case of awards) within 10-20 years thereafter, as the heightened status of the field became widely recognized among chemists.

The relative disrespect for inorganic chemistry actually dates back quite a long way, to the mid-19th century, when first organic and then physical chemistry came to take dominant positions. As the above Nyholm quote implies, inorganic chemistry was viewed largely as intellectually inferior, lacking “system...rigor and logic,” based primarily on phenomenological observations, and taught “in the early years of the course” — *i.e.*, essentially considered equivalent to general chemistry. The description of a course in the 1920 Caltech catalog reads:

“Inorganic Chemistry.—Lectures, recitations, and laboratory exercises in the general principles of chemistry. Much attention is paid to the cultivation in the student of clearness in thinking, accuracy in observation and inference, care in manipulation, and neatness in the recording of his work. Required in all courses, first term, freshman year.”

Clearly any intellectual content ascribed to the field was minimal at best. A few years later, in 1928, John Bailar, who is often credited as the “Father of American Inorganic Chemistry,” arrived at the University of Illinois at Urbana-Champaign (UIUC) as a junior faculty member. During an interview with Ted Brown for the Chemical Heritage Foundation archives (3), he commented:

Brown: [Y]ou came to Illinois to join the general chemistry teaching faculty which was synonymous with inorganic chemistry.

Bailar: Yes....Now, you should know that there wasn't much inorganic chemistry.

That attitude persisted for a long time. Ted Brown himself joined UIUC in 1956, having worked in physical chemistry for his Ph.D.; but he was informed by a helpful senior physical chemist that while his work would not be considered weighty enough to achieve tenure in physical chemistry, he might well succeed as an inorganic chemist — clearly indicating the lesser regard for and standards of the latter subfield (4). Other contemporaries recall similar experiences (2).

What explains the sea-change that began in the 1950s? Several different explanations have been offered, including the widespread adaptation of instrumentation and quantum mechanical methodologies — developments largely “external” to inorganic chemistry; but arguably the main driver was the increasing focus on topics that *did* confer some of the same intellectual cachet that had previously been granted only to organic and physical chemistry, specifically organometallic chemistry and, especially, mechanistic study. The strongest support for that contention comes from academic “family trees.” Analysis of inorganic faculty members in Ph.D.-granting US departments of chemistry in 1983 shows that fully *half* were descendants of just six “founding fathers” of those two areas in American inorganic chemistry: for organometallic chemistry Geoffrey Wilkinson, Gordon Stone, and Jim Collman; for mechanism, John Bailar, Henry Taube and Jack Halpern. And a very substantial fraction of that group consists of the line from Bailar's student Fred Basolo (Figure 1).



Figure 1. Fred Basolo in 1964. Photo courtesy of Northwestern University Archives, Evanston IL.

The Basolo Legacy

Fred Basolo's life and career have been amply documented in print, in a full-length autobiography (5) as well as reminiscences written with and/or by former co-workers (6–8), so I will only provide a few highlights here. He completed his Ph.D. work, which focused on (ultimately unsuccessful) approaches to synthesis of *cis*-[Pt(en)₂Cl₂]²⁺, with John Bailar at the University of Illinois at Urbana-Champaign (UIUC) in 1943; after a stint of war-time research at Rohm & Haas he accepted a position as Assistant Professor at Northwestern University in 1946. His initial experience was much like those of contemporaries described above: he was hired as an inorganic chemist but with the primary responsibility of teaching general chemistry to freshman, as there was little or no interest in inorganic chemistry among graduate students (5). Within a couple of years, though, he began attracting Ph.D. students to his program on inorganic mechanism (see following section). Over the course of his 60+ years on the faculty at Northwestern, Basolo mentored over 120 Ph.Ds and postdocs, many of whom (at least 25) spent most or all of their careers in Ph.D.-granting chemistry departments.

Following up on the statistic from the previous section — that half the inorganic faculty contingent in 1983 descended from one of the six groups identified as founders — we might ask, what do the statistics look like when extended up to the present? One might speculate that the dominance would have receded, as the scope of inorganic chemistry has expanded greatly, with new subfields becoming ever more important, such as bioinorganic, materials, nanochemistry. In fact the opposite is true: using the same methodology as in the earlier survey (2), I found that those same six lines account for about 77% of appointments during the period 1983-2003, and a truly striking 87% from 2003-2013! Clearly the diversification of inorganic chemistry has resulted not from topics being introduced from outside; rather those trained in the original traditions of mechanism and organometallic chemistry were the pioneers who spearheaded the move into those new frontiers.

And, to be sure, members of the Basolo academic genealogy have played a major role in those developments. Table 1 shows all of Basolo's academic descendants I have been able to identify (I'm sure a few have been missed) who held tenure-track positions in US Ph.D.-granting departments at any time during the period 1953-2013; there are 231 listed, out of a total of 1119 inorganic appointments during the same period: more than one in every five! A remarkable legacy just for sheer numbers, which becomes even more impressive considering the stature that many members of that cohort have achieved.

Table 1. Tenure-Track Faculty in U.S. Ph.D.-Granting Departments Descending from Fred Basolo. 1953-2013. Graduate Students Are in Roman Font; Postdocs in Italics.

| | <i>1st generation</i> | <i>2nd generation</i> | <i>3rd generation</i> | <i>4th generation</i> |
|-----------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| F. Basolo | O. Anderson | C. Schauer | Y. Koide | |
| | R. Angelici | <i>R. Nakon</i> | | |
| | | <i>P. Rechani</i> | | |
| | R. Archer | | | |
| | W. Baddley | | | |
| | J. Burmeister | | | |
| | <i>(I. Butler)</i> | <i>F. Shaw</i> | | |
| | A. Crumbliss | M. T. Caudle | | |
| | <i>H. Gafney</i> | | | |
| | H. B. Gray | <i>M. Abu-Omar</i> | <i>E. Ison</i> | |
| | | J. Alexander | | |
| | | <i>I. Bernal</i> | | |
| | | A. Bocarsly | | |
| | | <i>B. Bowler</i> | | |
| | | <i>P. Bracker</i> | | |
| | | K. Bren | <i>M. Liptak</i> | |
| | | <i>A. Butler</i> | | |
| | | <i>L. Butler</i> | | |
| | | <i>V. Catalano</i> | | |
| | | <i>J. Colon</i> | A. Marti | |
| | | W. Connick | | |
| | | <i>J. Cowan</i> | | |
| | | <i>J. Dawson</i> | | |
| | | J. Dempsey | | |
| | | I. Dmochowski | | |
| | | D. Dooley | | |
| | | R. Eisenberg | <i>W. Connick</i> | |
| | | | <i>R. Kirss</i> | |
| | | | C. Kubiak | <i>M. Johnson</i> |
| | | | | B. Lear |

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| | <i>1st generation</i> | <i>2nd generation</i> | <i>3rd generation</i> | <i>4th generation</i> |
|--|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| | H. B. Gray | | | F. Lemke |
| | (continued) | | C. Pierpont | R. Buchanan |
| | | | W. Ellis | |
| | | <i>P. Farmer</i> | | |
| | | G. Geoffroy | M. Bradley | |
| | | | C. Czekaj | |
| | | | W. Gladfelter | |
| | | | C. Mirkin | B. Holliday |
| | | | R. Pilato | |
| | | | <i>J. Sheridan</i> | |
| | | | <i>C. Sung</i> | |
| | | <i>W. Gladfelter</i> | | |
| | | <i>C. Hare</i> | | |
| | | <i>M. Hartings</i> | | |
| | | <i>D. Hendrickson</i> | <i>E. K. Barefield</i> | |
| | | | J. McCusker | |
| | | R. Holwerda | R. Johnston | |
| | | M. Hopkins | | |
| | | <i>J. Kim</i> | H. Shafaat | |
| | | <i>N. Kostic</i> | | |
| | | K. Lancaster | | |
| | | <i>C. Lieber</i> | P. Yang | |
| | | <i>Y. Lu</i> | X. Zhao | |
| | | K. Mann | | |
| | | <i>S. Marinescu</i> | | |
| | | <i>R. Mason</i> | | |
| | | A. Maverick | | |
| | | <i>D. McMillin</i> | D. Casadonte | |
| | | <i>T. Meade</i> | | |

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|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| H. B. Gray | D. Nocera | B. Bartlett | | |
| (continued) | | <i>T. Betley</i> | | |
| | | C. Chang | W. H. Harman | |
| | | | E. Que | |
| | | | <i>Y. Sun</i> | |
| | | T. Cook | | |
| | | <i>N. Damrauer</i> | | |
| | | <i>M. Dinca</i> | <i>A. Cozzalino</i> | |
| | | | <i>N. Shustova</i> | |
| | | | <i>C. Wade</i> | |
| | | <i>D. Freedman</i> | | |
| | | A. Heyduk | | |
| | | <i>M. Kanan</i> | | |
| | | S.-Y. Liu | | |
| | | E. McLaurin | | |
| | | <i>A. Odom</i> | | |
| | | <i>A. Radosevich</i> | | |
| | | J. Rosenthal | | |
| | | <i>M. Shores</i> | | |
| | | <i>J. Soper</i> | | |
| | | C. Turro | Y. Sun | |
| | | J. Yang | | |
| | | J. Zaleski | | |
| | <i>E. Pletneva</i> | | | |
| | <i>J. Rack</i> | | | |
| | <i>R. Richman</i> | | | |
| | R. Rosenberg | | | |
| | R. Scott | | | |
| | H. Shugar | | | |
| | <i>S. Shupack</i> | | | |

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| <i>1st generation</i> | <i>2nd generation</i> | <i>3rd generation</i> | <i>4th generation</i> | <i>5th generation</i> |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| H. B. Gray | <i>E. Solomon</i> | <i>M. Baldwin</i> | | |
| (continued) | | <i>T. Brunold</i> | A. Fiedler | |
| | | | M. Liptak | |
| | | D. Gamelin | <i>R. Beaulac</i> | |
| | | | K. Kittelstved | |
| | | | <i>E. McLaurin</i> | |
| | | A. Gewirth | | |
| | | <i>M. Kirk</i> | | |
| | | <i>N. Lehnert</i> | | |
| | | M. Neidig | | |
| | | <i>J. Penner-Hahn</i> | D. Tierney | |
| | | <i>D. Richardson</i> | | |
| | | <i>T. Westmoreland</i> | | |
| | | <i>J. Zaleski</i> | | |
| | <i>J. Telford</i> | | | |
| | <i>A. Stiegman</i> | | | |
| | F. A. Tezcan | | | |
| | H. Thorpe | | | |
| | D. Titus | | | |
| | W. Trogler | <i>C. Jensen</i> | | |
| | | <i>M. Maroney</i> | | |
| | | <i>J. Morrow</i> | <i>L. Buttrely</i> | |
| | | | | <i>R. Thomson</i> |
| | D. Tyler | A. Bruce | | |
| | | M. Bruce | | |
| | | A. Goldman | | |
| | | A. Stiegman | | |
| | | N. Szymczak | | |
| | S. Wherland | | | |
| | <i>J. Wilker</i> | | | |

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|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| H. B. Gray | R. Williams | | | |
| (continued) | M. Wrighton | H. Abrahamson | | |
| | | <i>K. Ahmed</i> | | |
| | | <i>M. Bradley</i> | | |
| | | <i>R. Buchanan</i> | | |
| | | A. Ellis | P. Dorhout | |
| | | | G. Meyer | F. Castellano |
| | | | C. Murphy | |
| | | | <i>G. Rosenthal</i> | |
| | | <i>C. Kubiak</i> | | |
| | | N. Lewis | T. Hamann | |
| | | | C. Lieber | P. Yang |
| | | | | Z. Zhang |
| | | | <i>M. Lieberman</i> | |
| | | | <i>S. Maldonado</i> | |
| | | | <i>R. Penner</i> | |
| | | | <i>M. Rose</i> | |
| | | | <i>M. Sailor</i> | |
| | | | <i>T. Vaid</i> | |
| | | <i>T. Mallouk</i> | <i>S. Keller</i> | |
| | | | R. Shaak | |
| | | | <i>A. Stein</i> | |
| | | <i>C. Mirkin</i> | | |
| | | <i>R. Sanner</i> | | |
| | | <i>T. Swager</i> | | |
| | | <i>D. Talham</i> | | |
| | D. Wuttke | | | |
| | <i>(R. Ziolo)</i> | K. Mertes | | |
| P. Henry | | | | |
| L. Interrante | <i>C. Czekaj</i> | | | |

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|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| D. Johnson | | | | |
| R. Johnson | | | | |
| <i>M. Morris</i> | | | | |
| M. Muir | | | | |
| R. K. Murmann | | | | |
| A. Poulos | | | | |
| K. Raymond | <i>A. Borovik</i> | C. Macbeth | | |
| | <i>J. Brumaghim</i> | | | |
| | <i>C. Carrano</i> | | | |
| | <i>S. Cohen</i> | | | |
| | <i>S. Cooper</i> | | | |
| | <i>A. Gorden</i> | | | |
| | W. Harris | | | |
| | K. Hodgson | J. Penner-Hahn | D. Tierney | |
| | | <i>R. Scott</i> | | |
| | | T. Tullius | | |
| | <i>S. Isied</i> | <i>M. Ogawa</i> | | |
| | V. Pecoraro | <i>M. Baldwin</i> | | |
| | | <i>M. T. Caudle</i> | | |
| | | <i>C. Cornman</i> | | |
| | | G. Dieckmann | | |
| | | G. Mezei | | |
| | V. Pierre | | | |
| | <i>D. Stack</i> | C. Goldsmith | | |
| | | L. Mirica | | |
| | J. Telford | | | |
| | <i>J. Van Horn</i> | | | |
| | <i>G. Wong</i> | | | |

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| <i>1st generation</i> | <i>2nd generation</i> | <i>3rd generation</i> | <i>4th generation</i> | <i>5th generation</i> |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| J. Reed | | | | |
| T. Richmond | B. Buffin | | | |
| | R. Harrison | | | |
| | (J. Kiplinger) | <i>E. Schelter</i> | | |
| <i>D. Rillema</i> | | | | |
| <i>J. Rund</i> | | | | |
| D. Sweigart | | | | |
| A. Wojcicki | <i>J. Alexander</i> | | | |
| | M. Farona | | | |

Opening up the field of mechanistic study played a key factor in Basolo's status as a progenitor of inorganic chemists, as we will see in more detail in the following section; but his style and talents as a mentor were at least equally important in making him a legitimate preceptor of chemistry, as attested by many of his junior coworkers. Here is just a sampling of accolades. John Burmeister (University of Delaware): "First and foremost, he mentored us one-on-one....I modeled my mentorship precisely after his...including golf with my grad students and post-docs." Al Crumbliss (Duke University): "What I remember most is that he treated us as individuals...each was different...He gave me the space to do what I needed to do myself to make things work. I try to handle my students in the same way." Ken Raymond (UC Berkeley): "While Fred was very engaged in the research his students were doing he was not one to be directing things on a day by day basis. That freedom to explore and the encouragement it generates to be independent is tremendously important in becoming a mature scientist." Harry Gray (Caltech) recalls that Basolo's personal charm and passion for his subject played a role comparable to that of the fascinating topic in convincing him to become an inorganic chemist. (All of these are included, with many other former coworkers, in Figure 2.) And these disciples (and many others) have clearly passed on that strong tradition of effective mentorship to their succeeding generations of students and postdocs.



Figure 2. Attendees at Fred Basolo's 70th birthday party in August 1990. Note in particular Fred Basolo (4th from right, 1st row), John Burmeister (3rd from left, 2nd row), Al Crumbliss (3rd from left, 1st row), Ken Raymond (5th from left, 1st row) and Harry Gray (2nd from right, 1st row). Photo courtesy of John Burmeister.

Basolo (and Pearson) and Mechanism

While at Rohm & Haas during WWII, thinking about his future career, Basolo recognized that the study of inorganic mechanisms was an interesting but hitherto untapped opportunity, as he later recalled (6):

“I was primarily interested in seeing what was being published by inorganic chemists in the U.S. Precious little was being published, and what was reported was of only marginal interest to me....I found that some articles on physical organic chemistry caught my attention. These described research on the kinetics and mechanisms of solvolysis reactions....The more I read such papers, the more certain I felt that inorganic chemists could investigate, in a similar manner, some of the ligand substitution reactions of octahedral and square planar metal complexes.”

He was fortunate to find Ralph Pearson, a physical chemist, on the faculty at Northwestern, and managed to enlist him as a collaborator (6):

“Ralph knew a great deal about the kinetics and mechanisms of organic reactions....Each time I brought up the subject of our collaboration on the kinetics and mechanisms of metal complexes, Ralph's response was ‘why should I work on inorganic chemistry, which is of little or no interest.’ However, I was finally able to convince him....”

Basolo and Pearson's (henceforth B&P) foray into inorganic mechanistic study truly opened up the field, beginning with a 1952 paper on the mechanism of substitution reactions of Co(III) complexes (9). Over the next 25 years they wrote some 60 joint papers, until the partnership (Figure 3) ended with Pearson's move to UC Santa Barbara; Basolo produced at least two hundred additional papers on mechanistic topics without Pearson's collaboration, both before and after his departure. This mechanistic work spanned a variety of topics in coordination chemistry, particularly substitutions, including identification of the S_N1CB pathway to account for the previously unexplained acceleration of hydrolysis reactions in base. Starting around 1960 the scope expanded to reactions of metal carbonyls and other organotransition metal complexes, thus bringing in the other major development of mid-century inorganic chemistry.



Figure 3. Fred Basolo (left) and Ralph Pearson, examining models of *d* orbitals.
Photo courtesy of Ralph Pearson.

Probably the single contribution that had the greatest impact, though, was B&P's joint textbook *Mechanisms of Inorganic Reactions*, first published in 1958 (10). In the preface to the first edition, they remarked that "the chemistry of non-carbon compounds has escaped from being considered by some a mass of

unrelated facts largely confined to the elementary undergraduate courses” as a feature of the recent renaissance of inorganic chemistry, very much in keeping with the intellectualization-by-mechanism factor proposed above. Overall, the text runs to about 400 pages discussing 770 references, organized as follows: an introduction to coordination chemistry; a discussion of theories of the coordinate bond, highlighting crystal field theory as the most useful to date; and individual chapters on substitution reactions of octahedral complexes; substitution of square-planar complexes; stereochemistry of octahedral substitution; isomerization (especially racemization) processes; oxidation-reduction reactions; catalysis by coordination complexes; and a catchall miscellaneous chapter that included absorption spectroscopy, acid-base properties of coordinated ligands; and isotopic exchange. Notably, the chapter on redox reactions was the shortest of all.

To put this in context, it is interesting to examine the coverage of mechanism in inorganic texts during the period surrounding the appearance of *Mechanisms*. Basolo notes (5) that when he began teaching an advanced undergraduate inorganic course he found the text by Emeléus and Anderson most useful; that would have been the first (1938) edition (11), written when the authors were both at Imperial College London. In the preface the authors proclaimed their “depart[ure] from the common practice of discussing the elements group by group...it is more illuminating to deal with related compounds and special topics.” and to emphasize “physical and physico-chemical aspects of inorganic chemistry.” Of the 15 chapters in this lengthy (530+ pages) tome only one is on a specific element (hydrogen); the lengthiest single chapter, around 100 pages, is titled “Coordination compounds and inorganic stereochemistry.” The mechanistic content, on the other hand, is essentially nil. Neither the word “mechanism” nor any potentially related topic (such as kinetics, substitution, *etc.*) appears in the index. The coordination chemistry chapter is almost entirely focused on structural issues; there are a few examples of reaction chemistry, notably how stereochemical outcome depends on the sequence of substitution at square-planar Pt(II), which led Tschernaiev (their spelling) to formulate the concept of the *trans* effect; but they do not mention the concept at all, limiting their presentation to the observations.

My examination of more-or-less contemporaneous inorganic texts available at the Chemical Heritage Foundation’s Othmer Library found that this was pretty much universal. The 1951 edition of *Mellor’s Modern Inorganic Chemistry* (12), the 10th edition of a work originally dating from 1912 (updated by Oxford inorganic chemist G. D. Parkes, Mellor himself having died in 1938) is primarily organized by periodic group; there is a chapter on “Chemical equilibrium and the velocity of reactions,” which sounds promising, but it covers mostly basic concepts, with few examples; substitution reactions are illustrated by the chlorination of methane rather than anything inorganic. Similarly, the 1950 edition of a text by J. R. Partington (13), a prolific author of works in both chemistry and history of chemistry, was billed in the preface as “essentially a new book” with the addition of extensive treatments of bonding theory, but nothing on mechanism; coincidentally (!) methane chlorination was chosen to represent substitution here as well. And a 1954 English edition (14) of the German text

series by Fritz Ephraim (which began in 1926) has nothing on mechanism either (except for a couple of references to autocatalysis, which are discussed entirely phenomenologically), indicating that mechanistic neglect was by no means limited to the Anglophone inorganic community.

A second edition of Emeléus and Anderson was published in 1952 (15), by which time the authors had moved to Cambridge and Oxford respectively. Although the authors acknowledged the “increased activity in the field,” their purpose was “to bring the subject matter up to date, without radical changes in the method of presentation.” Indeed, the chapter structure is mostly unchanged from the first edition, with the addition of new chapters “on valency, on the constitution of solid inorganic compounds, and on interstitial and non-stoichiometric compounds.” But nothing new on mechanism, except for a couple of pages on the use of radioisotopic exchange as a mechanistic tool.

Meanwhile, Basolo came to prefer a new text by Therald Moeller (16), a faculty member at UIUC, Basolo’s former Ph.D. institution. I have heard this characterized as “the first modern text” in inorganic chemistry, and some of the author’s comments suggest that reflecting his perception of a renaissance in the field was indeed what he had in mind. He proclaims *twice*, in the first two paragraphs of the introductory chapter, that “Inorganic chemistry is not general chemistry,” and says in his preface:

“More recently, however, the pendulum has begun another swing toward inorganic chemistry, with emphasis upon its physico-chemical aspects rather than upon its treatment in a purely descriptive fashion. The remarkable theoretical and technical advances which have been made and continue to be made are again raising inorganic chemistry to the position that it so richly merits. Unfortunately, however, instruction in inorganic chemistry has not expanded in a completely comparable fashion....This textbook of mine has resulted from an attempt to remedy this situation by bringing together in a single volume those selected portions of the tremendous body of available information which seem essential to a comprehensive understanding of inorganic chemistry”

(One may question Moeller’s reference to “*another* swing” and “*again* raising;” it is hard to identify a period when inorganic chemistry enjoyed relatively exalted status without going all the way back to before there really were any differentiated subfields of chemistry. Basolo himself argued (17) “Everybody talks about the renaissance of inorganic chemistry....Actually, I’m inclined to call it the “birth” of inorganic chemistry because renaissance means that you’re coming back to something that has already been done.” Be that as it may, “naissance” is an uncommon usage, so we will stick to “renaissance.”)

In spite of all that, there is no more mechanism in Moeller’s text than any of the others surveyed above. The word “mechanism” does not appear anywhere in the preface, table of contents or index. There are only 15 or so mentions of the word in the entire 966 page text, and those are all quite generic. A typical example

is “The exact mechanisms of such reactions are unknown,” which suggests he recognizes that the topic *would* be of interest, if information were available at the time of writing. There may not have been much, but surely there was *some*.

However, after the appearance of the first edition of *Mechanisms*, things changed dramatically. The third edition of Emeléus and Anderson, published in 1960 (18), was considerably altered from the previous versions — most prominently in the treatment of coordination chemistry. Whereas the earlier texts had a single chapter — relatively long, to be sure — on “Coordination compounds and inorganic stereochemistry,” this edition has *four* separate chapters related to that topic, titled respectively “Werner theory and inorganic stereochemistry;” “Constitution and valency problems;” “Stability and characteristic reactions of the coordinate complex;” and “Metal carbonyls and other π -bonded complexes.” And the last two of these are very explicitly focused on mechanisms, with subheadings including “Mechanism of octahedral substitution;” “Substitution in square-planar complexes;” “Electron transfer reactions;” “Electrophilic attack” and “Nucleophilic attack” (on metal carbonyls and π complexes). The majority of the references in these sections date from after the previous (1952) edition; but there are a good number of earlier ones as well, including some of Bailar’s papers on the mechanism of octahedral substitution.

Perhaps most tellingly, the discussion of stereochemistry of substitution in square-planar Pt(II) features a scheme that is virtually identical to that shown in the first and second editions; but whereas in those editions there was no attempt to explain the observed patterns, here they *do* account for them in terms of the *trans* effect, citing Chernyaev’s (most common spelling) original 1926 paper (19). Clearly, then, Emeléus and Anderson’s new-found enthusiasm for mechanism must be ascribed not only to the amount of new material, but also to the recognition that the topic had become central to the direction the field of inorganic chemistry was taking: a recognition that was certainly inspired to a very large extent (as shown by the organizational scheme they adopted as well as an abundance of citations to Basolo’s work) by the recent publication of *Mechanisms*.

In 1967 B&P published a second edition (Figure 4) of *Mechanisms* (20). In the Preface they observe that whereas the frequency of publications in chemistry as a whole had roughly doubled over the nine years since the first edition, that for inorganic mechanistic studies had nearly quadrupled. The second edition is about 1.5 times as long as the first in page count, and contains at least twice as many references, the vast majority of them dated post-1958; even at that, B&P comment that they had been forced to be quite selective in their choices of references, with a strong focus on English language publications. The topic whose treatment received the greatest expansion was redox mechanisms, reflecting in large part the influential work of Taube and his students. B&P also took note of other inorganic mechanism texts (21, 22) that followed, and were surely inspired by, the first edition of *Mechanisms*. From then on it would be very hard to find an inorganic textbook, especially one published in the US, that did not have mechanism as a major area of focus. (A more extensive historical survey of texts is in progress and will be published at a later date.)

In sum, it is abundantly clear that Fred Basolo must be considered as a major preceptor of 20th century American inorganic chemistry. His impact in terms of the numbers and stature of his academic descendants, as well as the influence his research and seminal textbook on the direction the field has taken since the middle of the century, are unexceeded, and to some extent unmatched, by any other figure in the field.

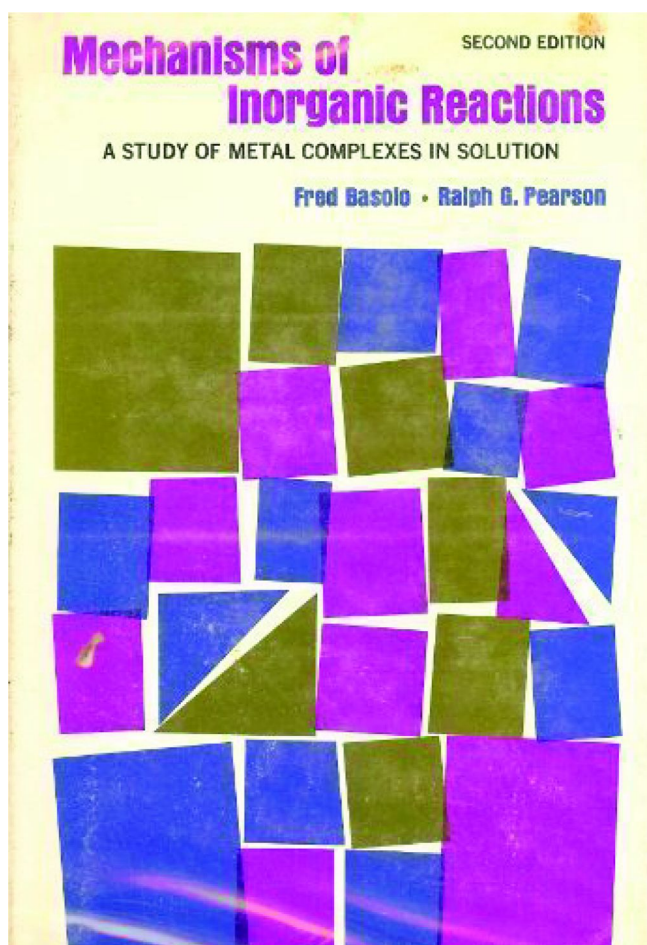


Figure 4. Cover of the 2nd edition of *Mechanisms*. Source: John Wiley and Sons, 1967.

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