



Preface

William Thomas Carnall, known to his many friends as Bill, died at age 76 in an automobile accident on June 22, 2003. His passing saddens those of us who fondly remember his cheerful smile and keen sense of humor. He will be missed as a scientist, colleague, leader of scientific research, mentor, and role model. In particular, he was a leading figure in the systematics and understanding of lanthanide and actinide optical spectra. This issue, “*f*-element Spectroscopy and Coordination Chemistry” is a tribute to the research career of William T. Carnall.

In a remarkable series of papers that he and his colleagues published in the 1960s, the first detailed accounting of the energy-level structure and transition intensities of the $4f$ states of the lanthanide series aquo ions was presented. His subsequent work on lanthanide ions in a variety of hosts, on trivalent actinide ions through einsteinium in lanthanum trichloride, and on tetravalent, pentavalent, and hexavalent actinide ions defined much of what is known about the *f*-state energy-level structure of these important species and the trends exhibited by their associated crystal field parameters. Under Bill's leadership, Hannah and Henry (Hank) Crosswhite calculated and compiled the matrix elements and programs needed to calculate the energy level structure of the f^n ions and to fit experimental spectra. Bill generously provided these programs and matrix elements to all who had need for them. Today these matrix elements provide the basis for several widely used fitting routines worldwide.

Bill did his graduate work at the University of Wisconsin with Professor John E. Willard and then in 1954 joined the staff of Argonne National Laboratory, where he was frequently the catalyst for important new research. For example, his efforts and direction resulted in the first observation and interpretation of isotope shifts in the gas phase spectra of plutonium hexafluoride. He was a fellow of Sigma Chi and a member of the American Chemical Society and American Nuclear

Society. Bill was a senior chemist and group leader of the Heavy Elements Chemistry Group in the Chemistry Division when he retired.

At the March 2004 American Chemical Society meeting held in Anaheim, California, a symposium entitled “*f*-element Spectroscopy and Coordination Chemistry: The Impact of William T. Carnall's Research Career” was held to honor Bill's scientific career. Thirty-eight papers were delivered at that symposium, which was sponsored by the Division of Nuclear Chemistry and Technology and partially supported by Petroleum Research Fund Grant 41114-SE. The contents of this special issue are drawn from those papers given at this symposium and also from papers by others who were not able to attend.

Befitting Bill Carnall's range of interests, these papers cover a wide variety of topics. Appropriately, we begin this issue of papers submitted to honor Bill Carnall with the personal recollections of Professor Brian Judd of his interactions with Bill over a period of 11 years when Professor Judd visited Argonne National Laboratory at regular intervals for discussions of spectroscopic work. Other topics are ultra-high resolution studies of lanthanide ions in solids, the use of luminescent lanthanide ions as optical probes, synchrotron radiation studies of lanthanide ions, free ion and crystal spectra of actinides, the interplay of charge transfer bands and *f* ion spectra, *ab initio* calculations, and more.

We owe a debt of gratitude to Bill for his pioneering work and for his enthusiastic willingness to help others in the f^n spectroscopic area. This issue is one way we can show our appreciation of his work and his inspiring leadership in this area of science.

J.V. Beitz, N.M. Edelstein, G.K. Liu, L.R. Morss
*Chemistry Division, Argonne National Laboratory,
CHM 200, Room M 157, Building 200, 9700 South Cass
Avenue, Argonne (Lemont), IL 60439-4814, USA
E-mail address: gkliu@anl.gov (G.K. Liu)*