

Personal recollections of interactions with Bill Carnall

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I first became aware of Bill Carnall as a graduate student in the late 1970s. The 1977 “Blue Report” by Carnall, Crosswhite, and Crosswhite on the energy levels of Ln^{3+} ions in LaF_3 was a touchstone for analysing data for other crystals, until it was superseded by the even more comprehensive 1988 report (and 1989 paper, *J. Chem. Phys.* 90 (1989) 3443–3457) by Carnall, Goodman, Rajnak, and Rana. The latter work is still the most reliable and comprehensive analysis of the energy levels of the entire lanthanide series in a particular host. As a student in New Zealand my main contact with people in the field was the papers, reports, and occasional letters.

One reason these reports and papers were readily available to me was the fact the Brian Wybourne was a professor in my department. I mention Brian for two reasons: He also died in 2003, a few months after Bill, and he was a key collaborator in the 1960s. Brian graduated from Canterbury in 1960 and was an Assistant Professor at Johns Hopkins University until 1963, when he took a position at Argonne. I recall Bill describing how he sought out Brian, who was working in a different part of the Laboratory. Brian assisted in an early analysis of the spectra of actinide ions in LaCl_3 and later worked on the first of a series of important papers on the solution spectra of lanthanide ions. After publishing his book *Spectroscopic Properties of Rare Earths*, Brian moved back to New Zealand in 1966, where he was a professor of physics until he moved to Poland in 1991. By the time I was a student, Brian’s main interests were in group theory, rather than rare earths, but he still took an interest in developments and, importantly for me, had an excellent collection of papers and reports.

I first met Bill at the Rare Earth Research Conference in Florida in 1983. Bill was genuinely helpful in many ways. I benefited from him inviting me to Argonne, introducing me to various people, and giving me useful

advice in many areas. It was Bill who persuaded me to travel to a conference in Poland by train, which seemed quite an adventure in 1984, but worked out well in the end. One of Bill’s strengths was the collaborations that he forged with various theoretical and experimental workers. I only collaborated with him on one paper, but it was enough to see the passion and honesty that he brought to bear on his science. He was the ideal collaborator, one who would make very sure that he understood what I was telling him, and then check that what he wrote was what I meant.

I have two strong images of Bill. One is from the time when he was still working at Argonne. Whenever I visited he would apologise for not coming to lunch, and instead go jogging in the forest. He always looked so happy and healthy. My last memory is from a 1999 conference at Argonne. Bill had been retired for several years, but turned up to meet old friends and see how the field had been progressing. The conference location, at the APS synchrotron, emphasised the new, but it was clear that Bill’s was still an important foundation for many current developments. While he was far too modest to express it in words, I’m convinced that Bill was happy in this knowledge.

Janusz Drożdżyński

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My first contact with William Carnall was through the use of his publications as a scientific source. Ever since my first analysis of uranium(3+) spectra I have continued to take advantage of his work, as he and B.G. Wybourne [1] in 1964 were the first to identify a number of the lowest LSJ multiplets of the U^{3+} ion and also to obtain good starting values for the “free ion” parameters. I met him for the first time in 1971, when as a Fulbright–Hays fellow I had the opportunity to work with John G. Conway in the Lawrence Radiation Laboratory (presently LBNL). After laborious trial and error calculations, we could finally identify the

remaining LSJ multiplets of the U^{3+} ion. Because, at that time, Bill was the only person able to check the correctness of our calculations, I went for a short visit to Argonne, and, indeed, he not only found a small technical error, but also calculated for us the U^2 matrix elements for band intensity analyses. When the project was finished [2], John Conway asked me what else I would like to study. I replied spontaneously, “Crystal-field calculations of $U(3+)$ ions.” “At present, it may not be easy,” he responded with a smile. Indeed, it required another 8 years until Crosswhite et al. [3] reported the first complete crystal-field analysis of a U^{3+} system. This paper paved the way for further studies, though it would be an additional 15 years until such analyses were undertaken [4,5]. Recently [6], we revised and completed this paper and also expanded the investigations on, among others, laser selective excitation and emission spectra of U^{3+} ions doped in various host crystals with a very high [7,8] or very low [9,10] site symmetry of the ion, as well as on host crystals doped with two different ions [11]. I would like to emphasize here that from among a very large number of Bill Carnall’s papers I have shown the enormous scientific importance and inspiring influence of only two of them.

I visited Bill again in 1988, when we started a joint research project on the chemistry of uranium(V) compounds. Bill revisited me several times and I also had the opportunity to show him and his wife, Velaine, some of the most interesting places in Poland. They exhibited an unusually, cordial interest in all aspects of our life. During the martial law years (and the food shortages then), Bill and Velaine were among the first to send us parcels. The last time we met was in 2002, when we went for a short visit to an international conference in Łądek Zdrój, where in a special place designated to commemorate outstanding persons a tree was planted in his honor. His unique intellectual abilities, nobility, cordial friendliness and devotion will remain in our memory not only because he was a scholar but also because he had great moral authority. Bill Carnall will certainly find a permanent place in the history of chemistry.

Christiane Görller-Walrand and Linda Fluyt:

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It is with much respect that we address these words of honour to Professor W.T. Carnall. Of course we are proud that we could share some scientific work with

such a prominent scientist. Two shared NATO Research Grants afforded travel support, so that some 22 years ago we were able to experience his hospitality at Argonne National Laboratory. His worldly minded vision of distributing computer programs made by his group (Hannah Crosswhite) and offering his knowledge to apply them are examples of how scientific work can both be interesting and enjoyable.

We think that his peaceful way of successful hard working was inspired by his healthy way of living and enormous respect for nature.

Robert A. Penneman

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My personal dealings with Bill Carnall began many years ago, starting with his coming to visit Los Alamos in the early days when my group had the world’s supply of the then rare element, americium. We used ozone to avoid adding any extraneous oxidant, peroxydisulfate, etc., to solutions. He came out to use our apparatus, and then to make and take back an ozone generator for his own use at ANL.

We visited many times when I went through Chicago, and I saw him in Germany when he spent some time working there. He was a person of rare warmth and ability.

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