Foreword

'The Child is Father of the Man'
William Wordsworth (1770–1850)

This book is dedicated to the work of Joseph Chatt. In this Foreword I should like to place Chatt's contribution in the perspective of chemistry when he entered the field, recognising that it was a very different field from that of the present day. Using the quotation above of another who was brought up in Cumberland, Wordsworth, I believe that his initial training in chemistry was an influence, perhaps the most important, on his attitude and approach to the subject. Chatt always talked with affection and gratitude of his mentor F. G. Mann. Mann was shy, but a remarkable chemist who viewed chemistry as a single subject and not as three branches: organic, inorganic and physical. He was a very careful and precise chemist who enjoyed producing crystals of high purity. It is reputed that the micro-analytical group in Cambridge often used his compounds to test their apparatus. Another characteristic that I found with F. G. was that he was never prepared to accept the immediate answer to any problem in his chemistry and viewed all reasonable alternatives. These are some of the characteristics that Joseph Chatt also exhibited.

The School of Chemistry in Cambridge was led by Sir William Pope, an organic chemist who was interested in the optical activity of elements other than carbon. F. G. Mann was his research assistant, and although Chatt was officially registered as a student with Pope his training was with Mann. It is of interest that by this time much of the work being carried out in the Cambridge laboratories was inorganic in nature but it was still classified as organic.

Joe Chatt was one of the leading inorganic chemists of his day. However, as was common at that time, his initial training was primarily in organic chemistry. His initial research project involved the preparation and bridge-splitting reactions of some dipalladium halogen-bridged phosphine complexes. The preparation of metal complexes of this type arose because Mann was interested in the use of phosphines in the preparation of optically-active phosphorus compounds and the platinum metals provided useful means of purifying and crystallising the phosphine compounds. After his initial work on these compounds, Chatt changed his research direction to a study of the stereochemistry of related arsenic compounds. This work led to the preparation of phenylene-1,2-bis(dimethylarsine), a compound utilised in coordination chemistry to great effect by Ron Nyholm. It was also during his period in Cambridge that Chatt became

acquainted with the olefin–platinum compounds that were to be of major interest when he started his independent career in inorganic chemistry.

On graduating, his interest in pursuing academic work was interrupted by the war and he was recruited into the scientific Civil Service. He was given initially a problem involving the preparation of organic nitro-compounds similar to TNT. This was an attempt to produce better explosives, an idea that originated with Robert Robinson, the leading British organic chemist of the day. However, the compounds proved to be of no major improvement on the explosives then available. Chatt's career then followed a chequered path within the Government service, from Swansea to Woolwich Arsenal, a major scientific laboratory in London, to a position as Deputy Chief Chemist at Peter Spence & Sons Ltd at Widnes in the North of England. This company was concerned with the production of aluminium chloride and oxide. However, he was not happy in these appointments and sought to return to an academic post in inorganic chemistry.

To appreciate Chatt's position at this time it is perhaps important to place the study of inorganic chemistry in perspective. Before the Second World War, it was very much the Cinderella of chemistry, often of minor concern in University chemistry courses. The subject was either omitted from the courses or taught by staff who had little interest in the subject, particularly from the point of view of research. Thus M. G. Evans, a leading physical chemist of his day and holder of the Chair of Physical Chemistry in Manchester, excluded any major teaching of the subject from the chemistry degree course.

When it came to the research in inorganic chemistry, which was not very extensive in the UK, the primary interest was in the study of the non-transition elements, with a particular emphasis on the similarity of the chemistry to that of related organic compounds. In many instances comparison with the carbon compounds was the prime aim. Thus there was a considerable interest in the chemistry of boron and silicon compounds and the relationship to their carbon analogues. As the compounds of these elements are particularly sensitive to water, and often to dioxygen, the main work involved the use of vacuum line techniques. In addition, the preparation of volatile compounds allowed the application of a range of physical methods that at that time were developed mainly to deal with volatile compounds. Methods for the determination of the structures of compounds in the solid and liquid states were not well developed. The X-ray structure of even relatively simple compounds could take years to complete. Paradoxically, Chatt thus obtained a very good training in an area of transition-metal chemistry, under the cloak of research in organic chemistry, when such chemistry was not being studied in any inorganic department. As his research work showed, this proved to be an extremely good training for the study of what was to become the coordination chemistry of the later transition elements.

The activities in the war brought about significant changes of emphasis in the study and role of chemistry, particularly of inorganic chemistry. The atomic-bomb project led to the preparation, isolation and study of the chemistry of the transuranic elements. This focused on a completely new area of inorganic chemistry. New techniques for the isolation and handling of chemical

compounds were developed and, in collaboration with physicists, new approaches to many problems were discovered. In particular, techniques such as ESR spectroscopy were developed which opened up the whole area of resonance methods.

This work led to a complete reassessment of inorganic chemistry, and, in particular, of the structural aspects of the subject, as chemistry, both inorganic and organic, was in those days dominated by the isolation and determination of the structures of compounds. It clearly took a while for these changes to be appreciated in the university system but it was with this changing approach to inorganic chemistry that Chatt took up his first university appointment as an ICI Fellow at Imperial College in 1946. This Fellowship was part of a scheme designed by ICI to make appointments in University departments for the best researchers until permanent staff appointments were available. However, Chatt found the environment at Imperial unsatisfactory and transferred to a new enterprise for fundamental research that was also being set up by ICI in a country house, The Frythe, just north of London. This laboratory, the Butterwick Laboratory, was subsequently called the Akers Laboratory. This was a great opportunity that was fully appreciated by Chatt. Initially there was an attempt to include him in the organic section, reflecting the view of the establishment as to the status of inorganic chemistry but Chatt put up a strong fight to have a separate inorganic section. This gave him the opportunity to research, for the first time, his own ideas and he chose to look at the chemistry of metal olefin and acetylene compounds. Chatt's work in these laboratories was at a time when there was the beginning of a surge of interest in inorganic chemistry in the UK and Europe in general. At this time Nyholm was also starting his work in coordination chemistry at University College in London. These two workers initiated what has been referred to as the Renaissance of Inorganic Chemistry in the UK. There was an air of expansion within the universities, and in chemistry this particularly applied to inorganic chemistry. It is perhaps important to recognise that in 1946 for the UK only 4% of the potential student cohort went to university and there were less than 30 universities or their equivalents in the country. If we compare this with the present situation of nearly 40% of the cohort and more than 100 universities, the changes have been enormous, and within the field of chemistry this is particularly true for inorganic chemistry.

The work described in this volume illustrates the wide range of contributions that Chatt made to inorganic chemistry, with over-spill into organic chemistry and biochemistry. His work attracted world attention and a large number of the most eminent inorganic chemists visited and worked in his laboratories, both at The Frythe and in Sussex. He attracted large numbers of postdoctoral workers, many of whom went on to make their own mark within chemistry and have contributed to this volume. On a purely personal level, in 1952 I debated long between an offer to work at The Frythe and a university appointment, finally deciding to take the university post.

The work carried out at The Frythe pioneered the basic chemistry that pervades much of organometallic chemistry today, with its overtures into catalysis. The work carried out at the University of Sussex was a major study in the

nitrogen fixation problem and led to fascinating developments in the chemistry of dinitrogen transition metal compounds.

Joseph Chatt was at the forefront in the development of inorganic chemistry, from what may be considered 'the dark ages' to the present day. His influence, both through his studies and the researchers with whom he worked, will be with us for decades. In addition to his many contributions to chemistry, Joseph will be remembered by many as a nice man and a good friend.

Lord Lewis of Newnham