Preface

In 1953 I was in my second year at the University of Otago, Dunedin, New Zealand. Dr. Ted Corbett lectured on organic chemistry but his interest in the subject was very broad. One morning he talked about the organic chemistry of arsenic, and I was hooked. From a very early age I knew that I was going to be a chemist, but I did not know what sort; so this was a very significant event. In 1956 I went to Cambridge, England, to study for a PhD with Professor H. J. Emeléus who suggested that I work on the preparation of a new class of arsenic compounds that contained fluorocarbon groups. I was happy to take up the challenge. In 1958 I accepted a position in Canada at the University of British Columbia in Vancouver, and started my independent research with a series of papers that built on my PhD work, and apart from a few side excursions, the chemistry of arsenic has never been far from my thoughts.

My objective in writing this book is not to elaborate on the vast chemistry of the element, but to try to reveal to the general reader how the element and its compounds have become embedded in our social fabric, for good and for ill. I believe no other element comes close in this regard and use the word socio-chemistry to describe this interface between society and chemistry.

The average person has only one idea about arsenic – it is poison – and this reputation has a sound base. Some arsenic compounds are very toxic and have been used with criminal intent from the time of the ancient Romans to the present day (Chapter 5). This aspect of arsenic's nature has been reinforced in the fiction of authors such as Dorothy Sayers and Agatha Christie, and in Kesselring's play *Arsenic and Old Lace*. The very mention of the "A-word" promotes fear and anxiety. The accidental presence of arsenic in British beer around 1900 made thousands very ill, and prompted an inquiry by a Royal Commission leading to the first laws governing food contamination.

There is a parallel story to be told about the use of arsenic in human medicine in many cultures. This peaked in the western world in the early 20th century, with Ehrlich's discovery of salvarsan, an arsenic-based cure for syphilis, that

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gave rise to the field of chemotherapy. Salvarsan and related compounds were eventually displaced by antibiotics such as penicillin. Arsenic trioxide has staged a comeback, however, and is being used as a successful treatment for a form of leukemia (Chapter 1).

Arsenic compounds were widely used in agriculture and wood preservation during the 20th century. Although most of these applications have been abandoned or curtailed, the main market for arsenic remains as a wood preservative (Chapter 2). Much has been written about the historical use of arsenic-based pigments to colour wallpaper and the belief that it caused widespread illness and many deaths, but re-examination of these accounts suggests they are at best urban myths (Chapter 3). The myth was propagated in the 1980s in attempts to account for sudden infant death syndrome (SIDS) and the death of Napoleon Bonaparte (Chapter 4). In addition to convicted murders such as Herbert Armstrong, Madeline Smith and the Grandmothers of Nagyrev, there is also a connection between arsenic and musicians, such as Tchaikovsky, authors such as Karin Blixen, scientists such as Fritz Haber and Charles Darwin and kings such as George III.

Arsenic compounds were first successfully used as chemical-warfare agents in World War I. They were subsequently deployed against unprotected native populations in Morocco and Ethiopia. These agents were manufactured and stockpiled during WWII, but the Japanese were the only nation to use them. Some compounds saw service again in the Vietnam War. The problem of disposing of the stockpile remains with us (Chapter 6).

The topic of arsenic in the environment is discussed in Chapters 7 and 8. Arsenic is all around us: in our soil, our water, and our food, and our bodies have adapted to its presence. The arsenic in our food and water does not generally pose a problem. Although it is usually found at higher concentrations in seafood, these particular arsenic compounds are not toxic. However, the natural presence of high concentrations of arsenic in drinking water currently threatens the lives of millions of people in India, Bangladesh, Mexico and elsewhere, and the developed world has been slow to respond with aid. The situation in Bangladesh and West Bengal has been declared the "largest mass poisoning of a population in history."

Sometimes, our own activities, such as mining and pesticide manufacturing, lead to high local arsenic concentrations in soils, slag heaps and mine tailings which, when located close to human activities, can produce human health risks. In evaluating these risks we need to realise that not all arsenic compounds have the same properties, so they are not equally toxic; and also, not all arsenic compounds are equally available to human metabolic processes when ingested. Proper consideration of these aspects of arsenic's nature can greatly reduce the emotional and financial costs of dealing with the element and its compounds when the need arises.

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To Sandra