Preface

Industrial chemicals play a large and often poorly appreciated role in many aspects of life. While members of the general public may realise that many plastics are manufactured by the chemical industry from petroleum-derived feedstocks, they are probably unaware that before such plastics are incorporated into products there may well be a need for addition of stabilisers and/or plasticisers, which are also industrial chemicals. Similarly, while they appreciate that the lubricating oil in their car engine probably derives from the fractionation of crude oil, they are far less likely to appreciate the large numbers of chemical additives which are key to ensuring engine life and a lengthy period between oil changes. It is perhaps because of the widespread ignorance of the general public over the beneficial aspects of chemicals use that they have sometimes been influenced by the environmental pressure groups who tend to focus solely on the problems which can arise through human exposure to such chemicals and through dispersal within the environment. A particular current example is that of flame retardants. Many of the flame retardant chemicals currently in use are of very high bromine content and consequently are highly persistent in the environment. In the absence of obviously superior and environmentally benign alternatives, society is faced with a difficult trade-off between protecting people from the risks of fire and protecting the environment from highly persistent and bio-accumulative chemicals. Policy decisions in such an area are never easy since the benefits and disbenefits are so different in character that is very difficult to determine which outweighs the other, and ultimately for most people this will be a matter of personal opinion.

Given that there are very clear examples of the damaging effects which chemicals can have upon human health and the environment, it is perhaps surprising that for the vast majority of chemicals there is currently little regulation of their manufacture and use beyond that applied to the manufacturing plant under the Pollution Prevention and Control regime. For certain types of chemicals, most notably those used as pesticides, there are positive approval procedures which means that a new pesticide cannot be marketed before it has been formally assessed by an independent body in terms of its human toxicity and environmental effects. However, for the vast majority of chemicals there are currently no such restrictions and the main requirement on the manufacturer is to label the bulk chemical and to provide safety datasheets to the intermediate user. The presumption has been that chemicals can be manufactured, distributed and used unless they are shown to have serious consequences for the manufacturing workforce, the users or the environment. One such example is the use of alkyllead additives in petrol, which started in the 1920s and only ceased in Europe in 2000 as a result of concern over the adverse health effects of population exposures to lead from this and other sources.

Unfortunately, concern for the environment has rarely been seen as an important aspect of product stewardship by the manufacturers of industrial chemicals. For this reason many countries both individually and in collaboration have adopted procedures for assessing the risk posed by industrial chemicals, with a view to implementing either voluntary or compulsory risk management measures where the risks to human health or the environment are considered unacceptably high. Such assessments are typically based upon three criteria, *i.e.* the persistence in the environment, the bio-accumulative tendencies and the toxicity of chemicals to environmental organisms. It is perhaps surprising that for a very large proportion of high production volume chemicals, the basic data from which to assess these key properties is lacking, which has stimulated both new programmes of measurements, but also numerical means of estimating environmental impacts based upon key physico-chemical properties. In very many cases, there are few if any environmental measurements of specific industrial chemicals, and conceptual models have a very important part to play in estimating environmental distributions and concentrations.

While activity in this area has been very high on both sides of the Atlantic, a large stimulus has been provided within Europe by the European Commission's proposal known as REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals), which aims to set a new regulatory regime for both existing substances and newly manufactured chemicals. These proposals have proved controversial, with industry claiming that they will place an undue financial burden on manufacturers, therefore reducing the competitiveness of European industry, and wildlife groups, while welcoming the general thrust of proposals, concerned about the very large amounts of animal testing implied by the need to evaluate toxicity of large numbers of chemicals.

This volume of Issues follows the pattern of many other volumes in the series by including detailed technical articles concerned with certain aspects of a problem along with more discursive opinion-based articles by leading people within the field. The first chapter, by John Garrod of the Department for Environment, Food and Rural Affairs of the UK government, deals with the current regulatory regime for environmental chemicals, summarising the very large volume of regulation currently in place as well as the new proposals from the European Commission. The following chapter by Elliot Finer is more discursive, placing the current procedures and new proposals into a broader context and setting out the benefits and dis-benefits of tighter regulations for the risk assessment and control of chemicals. This is followed by a chapter by Peter Floyd of Risk and Policy Analysts Limited, taking a forward view on how such regulations may develop into the future. It appears that progression of the currently developing methods is largely inevitable.

Having dealt with the legislative, administrative and societal aspects, the volume turns to technical issues and a chapter by Paul Harrison and Philip Holmes of the Institute for Environment and Health describes the means for assessing risk of chemicals to human health, while the following chapter by Lorraine Maltby of the University of Sheffield takes a similar look but in terms of assessing risk to the environment. The last two articles focus more upon the physico-chemical properties of chemicals and their implications. Peter Campbell, Peter Chapman and Beverly Hale deal with risk assessment of metals in the environment. This is a topic requiring particular attention

to physico-chemical properties since the speciation of metals in environmental media is key to their distribution and biological effects. The final chapter by Don Mackay, Todd Gouin and Eva Webster describes the methods which Professor Mackay and colleagues have pioneered over several decades for assessing the environmental partitioning and persistence of chemicals based upon their physico-chemical properties. Such methods are applicable primarily to organic chemicals and thus this chapter complements that by Campbell and co-workers.

We believe that this volume is timely in view of the current discussion internationally over the extent to which assessment and risk management measures are required for industrial chemicals. Furthermore, we are delighted to have engaged some of the foremost workers in both the technical and policy areas to contribute articles to this volume setting out their view of their technical fields which are key to the future development of the subject.

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