

## Chapter 1 Perceptions

*Science is the great antidote to the poison of enthusiasm and superstition.*

Adam Smith, economist (1723–1790)

### **A mistake**

Radiation is seen as a cause for exceptional concern and alarm, though few people have any personal experience of its dangers. Is this view justified, and how did it come to be held?

Prior to the Second World War there was a degree of relaxed public acceptance of radiation, principally because few knew anything to suggest otherwise. That changed with the arrival of the Nuclear Age.

The destruction of the Japanese cities of Hiroshima and Nagasaki by nuclear bombs in 1945 was a military and political success that avoided a land invasion of Japan, which would have been immensely costly in lives for both sides. As a technical scientific enterprise, it was a triumph – no project depending on fundamentally new physical developments on such a scale had ever been attempted before.

As an exercise in the public understanding of science, it was a disaster whose consequences still persist. The message that came through was very clear – what happened was both extraordinarily dangerous, and incomprehensible to all but a few. The extreme apprehension generated in the population was self-sustaining. Sources of fear inhibit free enquiry, and few in the population ever questioned the extent of the danger. In the decades of the Cold War that followed, this fear was a useful weapon in international politics, and its basis was not doubted, even by those in a position to do so. And then there was Chernobyl – a further failure of public understanding. In the public mind the fear of nuclear war had infected views on civil nuclear power.

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Most people simply wanted to distance themselves from anything nuclear.

More questions should have been asked, although some of the answers could not have been given in earlier decades. There are three concentric concerns, related like the layers of an onion, as it were. The first and innermost is to understand the effect of radiation on human life. This is a scientific question, not dependent on the other two. The second task is to educate public opinion and formulate safety regimes in the light of the solution to the scientific question. The final problem is to discourage nation states and terrorists from exploiting radiation as a source of fear by threatening and posturing. This depends critically on the second task, establishing robust public opinion and a regulation regime that can face up to international arm twisting.

In the last 50 years these problems have been confused. During the Cold War era, international politics exploited public fear and ignorance of radiation, while only recently has the scientific evidence and understanding become established to answer the prior scientific question. In the absence of a clear picture of the biology and of adequate human-based evidence, radiation safety guidelines and legislation became established on a reactive basis. Public concerns were handled by imposing draconian regulation on radiation and nuclear technology, in the expectation that this would provide the necessary reassurance. But the very severity of the restraints only increased public alarm and people were not reassured.

But now in the new century there have been two changes. Firstly, the scientific answers that were lacking previously are now largely available. Secondly, new nuclear power plants are urgently needed so that the use of fossil fuel can be reduced – this does not change the safety of radiation but it does affect the importance of setting matters right as soon as possible. So the purpose of this book is to explain the science in fairly accessible terms, together with some of the evidence, and to offer a rough but justified estimate of the level of new safety regulation.