

5. Scientific literacy and the public understanding of science

- 5.1 An understanding of the nature of science is vital when society needs to make decisions involving scientific findings and issues. How does the public judge? It may not be possible to make judgments based on the public's direct understanding of a science, but important questions can be asked about whether scientific processes were followed and scientists have a role in answering such questions.
- 5.2 As experts in their particular fields, scientists are well placed to explain to the public their issues and findings. Outside their specializations, they may be no more qualified than ordinary citizens to advise others on scientific issues, although their understanding of the processes of science can help them to make personal decisions and to educate the public as to whether claims are scientifically credible.
- 5.3 As well as comprising knowledge of how scientists work and think scientific literacy involves being aware of faulty reasoning. There are many cognitive biases/fallacies of reasoning to which people are susceptible (including scientists) and these need to be corrected whenever possible. Examples of these are the confirmation bias, hasty generalizations, *post hoc ergo propter hoc* (false cause), the straw man fallacy, redefinition (moving the goal posts), the appeal to tradition, false authority and the accumulation of anecdotes being regarded as evidence.
- 5.4 When such biases and fallacies are not properly managed or corrected, or when the processes and checks and balances of science are ignored or misapplied, the result is pseudoscience. Pseudoscience is the term applied to those beliefs and practices which claim to be scientific but do not meet or follow the standards of proper scientific methodologies, i.e. they lack supporting evidence or a theoretical framework, are not always testable and hence falsifiable, are expressed in a non-rigorous or unclear manner and often fail to be supported by scientific testing.
- 5.5 Another key issue is the use of appropriate terminology. Words that scientists agree on as being scientific terms will often have a different meaning in everyday life and scientific discourse with the public needs to take this into account. For example, a theory in everyday use means a hunch or Nature of science 12 Chemistry guide speculation, but in science an accepted theory is a scientific idea that has produced predictions that have been thoroughly tested in many different ways. An aerosol is just a spray can to the general public, but in science it is a suspension of solid or liquid particles in a gas.
- 5.6 Whatever the field of science—whether it is in pure research, applied research or in engineering new technology—there is boundless scope for creative and imaginative thinking. Science has achieved a great deal but there are many, many unanswered questions to challenge future scientists.