

Science scares 2: what's in a name?

Last time we looked at some scare stories that arise from misunderstanding of science. This time we focus on just two words that rightly raise some concerns but often generate more fear than they should because of their associations in many people's minds.



The first is 'nuclear'. The really negative image here is of nuclear weapons: their threat hung over the years of the Cold War between the western nations and the Communist USSR and continues today in political tensions and a desire to prevent their wider availability, especially to terrorist groups. The bombs dropped on Japan at the end of World War 2 were devastating and horrifying at the time, but far more powerful weapons have been developed and stockpiled since then. I'm sure most of us would wish them all away.

Nuclear weapons represent a deliberately uncontrolled release of some of the huge amount of energy that holds together the ingredients of atomic nuclei, the dense tiny centres of atoms that make up all the elements of the physical substances around and within us. Some atomic nuclei, especially the heavier ones such as uranium, are naturally unstable and change into other nuclei with the release of energy. If this is carefully controlled, the energy can be peacefully and constructively used, and this is the basis of nuclear power stations. These, of course, generate not only electricity but also strongly polarised opinions: while nuclear energy has much in its favour compared with burning fossil fuels, it does raise issues of security and safety, as we saw in the major incidents at Chernobyl and Fukushima, as well as the problem of dealing with the radioactive waste products. This is one of many examples of science and technology that are morally neutral in themselves, but can be used for both good and evil.



Unfortunately the negative aspects make 'nuclear' a scary word. But it actually just means something to do with a nucleus: atomic nuclei have other interesting and useful properties



too, and there are other kinds of nucleus (it just means core or centre) – we can talk of a nuclear family without implying the parents and children are radioactive! Some atomic nuclei can behave as tiny magnets and this leads to a scientific technique called nuclear magnetic resonance (NMR), a way of exploring the surroundings of these atoms in a material. It's widely used in physics, chemistry and biology. In medical applications its main target is water molecules in

the body, which give different NMR effects for different tissues and can be used in all sorts of diagnoses. It uses large magnets together with radio waves, and many people have experienced and benefited from this. It's completely harmless if you don't have any metal implants in your body. To avoid scaring people, however, the N word is avoided and it's called magnetic resonance imaging (MRI) instead.

The second scare word is 'genetic', which means to do with genes, the inherited sections of our DNA that control the production of proteins and other ways in which our bodies work. We considered the 'genetic code', the information content of DNA, in an earlier article. Scientists also talk about genetic disorders (inherited problems), genetic manipulation, and genetic engineering. This gives the impression of interfering with natural processes. While such intervention has been made for generations in medical and surgical procedures and most of us have no objection to the use of operations, medicine and anaesthetics, tinkering with DNA at the molecular level worries many, because it raises images of unnatural creatures, designer babies, and 'playing God' with life. Concern is expressed about genetic modification of food crops, especially in the UK and EU, though traditional plant (and animal) breeding is also a form of genetic modification, albeit it slower and less finely controlled: the fruit, vegetables and particularly cereals we eat now are very different from those of much earlier ages.



Just as with nuclear energy, genetic engineering is morally neutral in itself: it is an ability we can put to good or bad use. Developing food crops that are resistant to diseases, give better nutrition or higher yields, or without harmful side-effects is a good thing, and making them less susceptible to pest damage is preferable to widespread use of chemical agents that have other undesirable impacts – it will be difficult to feed a growing world population without such changes; but deliberately making crops infertile so that new seeds have to be bought every year from the rich multinational companies controlling the industry is morally questionable or worse. Much objection to some recently developed medical genetic procedures is fuelled by lack of understanding, misinformation, or inflammatory and



misleading descriptions. These new techniques raise serious ethical issues; because something becomes technically possible does not mean it should be done. Unfortunately a society that is losing its acceptance of values such as objective truth and universal standards in favour of individual choice and relative truth is poorly equipped to address those issues, and science cannot generate its own ethics without other input; where should they come from?

Next time we'll make the science scares into a trilogy with a third episode.

Bill Clegg

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