"Science can make claims to a 'best buy' mode of reality, but this will be stamped with an unclear sell-by date."

S is for Science

As medics we get perilously close to equating science with truth. But science and truth seemed to drift apart in the 20th century. We like to think that science proves things. This is a mistake. In the 1930s Karl Popper rejected arguments that 'pass from single statements ... such as the results of observations or experiments, to universal statements, such as hypotheses or theories'. Instead of proving theories (verification) Popper offers us *falsification*. If I have observed many white swans I cannot conclude that all swans are white, as I have not seen all swans. But a single black swan will falsify the hypothesis that all swans are white. Although one can never succeed in constructing universal truths from a series of observations, at least one can produce hypotheses and seek to falsify or disprove them. If a hypothesis has survived many attempts to falsify it, I cannot claim that it must be true, but I can claim that it is, at this time, the best available hypothesis.

In the 1960s Thomas Kuhn demonstrated that scientific theories do not evolve gracefully as improvements of previous knowledge, but occur as revolutionary events. Kuhn sees scientific theories simply as provisional models, which he calls 'paradigms'. Kuhn takes the Copernican revolution as his definitive case. The Ptolemaic universe, with the Earth at the centre and the Sun and planets rotating around it, was adequate as a common-sense view of the universe. But medieval scientists had increasing problems fitting actual observations into this model and the Ptolemaic system eventually broke down.

Kuhn separates science into 'normal' science and 'revolutionary' science. He describes normal science as 'puzzle-solving': like a crossword puzzle the overall frame is set by the scientific paradigm being used and the task is to use clues to fill in predetermined boxes. The vast majority of scientific research is normal science. However, over time more and more observations occur that cannot be explained by the paradigm. The paradigm will therefore suffer a crisis and eventually be overthrown and replaced. No paradigm should therefore be equated with truth. If science is a jigsaw there's no picture on the box and we don't even know the shape or how many pieces.

Kuhn is on to something, but there has been criticism of his full-blooded concept of

a revolution. The parts of a scientific theory that account for its time-limited success are normally retained within the framework of a new theory. Psillos states that:

'... the best way to defend realism is to use the generation of stable and invariant elements in our evolving scientific image to support the view that these elements represent our best bet for what theoretical mechanisms and laws there are'.

Science can no longer make absolute claims to truth. Science can make claims to a 'best buy' model of reality, but this will be stamped with an unclear sell-by date. All our models are human constructs that will be influenced by cultural and historical perspectives. If you think medicine is a science then this month's reading is a must!

CPD further study and reflective notes

The notes in Boxes 1 and 2 will help you to read and reflect further on any of the brief articles in this series. If this learning relates to your professional development then you should put it in your annual PDP and claim self-certified CPD points within the RCGP guidelines set out at <http://bit.ly/UT5Z3V>.

If your reading and reflection is occasional and opportunistic, claims in this one area should not exceed 10 CPD credits per year. However, if you decide to use this material to develop your understanding of medical philosophy and ethics as a significant part of a PDP, say over 2 years, then a larger number of credits can be claimed so long as there is evidence of balance over a 5-year cycle. These credits should demonstrate the impact of your reflection on your practice (for example, by way of case studies or other evidence), and must be validated by your appraiser.

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Box 1. Reflective notes

- 'With science we care' — how much medicine is science? What else might it be?
- List some 'medical facts' that have changed since you started medical school. Does this matter? How should it affect our attitude to our current practice?

Box 2. Further reading

Primary source: Chalmers A. *What is this thing called science?* 3rd edn. Milton Keynes: Open University Press, 1999. An excellent and clear introduction, well worth reading. Very cheap secondhand copies are available online.

Further study: Kuhn T. *The structure of scientific revolutions*. Chicago, IL: University of Chicago, 1962.

Psillos S. *Scientific realism: how science tracks the truth*. London: Routledge; 1999. An excellent state-of-the-art text, but quite technical.