

completely crazy for taking another look.

The irreducible tension in science is to maintain enough “social control” over new ideas and spending to ensure science isn’t engulfed by seas of possibilities, while leaving room for new ideas. Tossed on the waves of these possibilities are people such as Martin Fleischmann (cold fusion), Eric Laithwaite (anomalous gyroscopes), Albert Einstein (relativity), Linus Pauling (vitamin C), Alfred Wegener (plate tectonics), Thomas Gold (origin of oil), David Duesberg (non-viral causes of AIDS), and Subrahmanyan Chandrasekhar (black holes). The list goes on and on. Such ideas eventually wash up on one shore or the other, but only 20:20 foresight will tell you which one.

However, sometimes what looks like “outsider science” has content of quite a different sort. Take the measles, mumps and

## “The MMR case was presented as a genuine scientific controversy”

rubella (MMR) vaccine and autism affair in the UK. Andrew Wakefield, the doctor behind the furore, published some evidence in *The Lancet* suggesting a link between autism and measles-related virus particles in the gut. But these particles were never linked to MMR vaccine. There was word-of-mouth testimony from some parents, but no link between MMR and autism has ever been proved. Wakefield simply speculated about a relationship at a press conference – and no one has ever gone further than to hypothesise about it.

This case was presented to the public as a genuine scientific controversy, and, to my discomfort, the MMR story as told by many social scientists is one of struggle between wise parents and uncomprehending, authoritarian medical authorities. There have been (and will be) many real struggles of that sort, but this was not one of them. The only usable scientific evidence was epidemiological – and that pointed to the safety of MMR. Because it is so hard to prove a negative, none of this shows that there is not a hidden link between MMR and autism lurking below the statistics. But there is no evidence to show there is.

The energy it took to deal with Wakefield’s claims, and to persuade parents to vaccinate their children at all after the scare, could have been much better spent. Wakefield was not behaving as a scientific outsider: he was simply not providing scientific evidence at that press conference.

In addition to the difficulty of proving a negative, scientists are also very unwilling to face up to the social and financial logic that drives their choices. A tentative claim about, say, telepathy, can provoke a sort of fundamentalist zeal among some scientists refuting the claim, which in turn undermines their claims for science as an exemplar in a divided world. They should say merely this: “Well, it’s not inconceivable, I can’t absolutely prove you wrong, but my time is better spent doing things I judge to have more potential.”

Scientists, then, are not always their own best friends when it comes to helping others navigate the loss of absolute certainty about our world. I am also not sure how it helps if they assume omnipotence in the name of science, as Richard Dawkins did recently when he insisted that scientists must be atheists. And Stephen Hawking has been turned into a new kind of religious icon, with his books taking the place of the incomprehensible Latin Bible in our homes.

Here science becomes “revealed truth”, obscuring the long hours of tedious work, the experiments open to reinterpretation (and failure), and theories with their infinities and arbitrary variables that can never quite be tamed. The Dawkinses and the Hawkings threaten to make the hard-won victory of science over religion a pyrrhic victory by replacing old faiths with new.

If science is essentially ordinary life albeit conducted in extraordinary circumstances, it must contradict literal interpretations of texts that clash with its findings, but it should not claim the right to address deeper questions of existence.

The biggest danger for science is that in missing its footing on the tightrope of certainty, it crashes to the ground. In the social sciences, this danger is best represented by the romantic value today placed on the instincts of the general public: the folk are said to be as wise, or wiser, than experts. It is a political necessity and responsibility in a democratic society to take account of the technological “preferences” of the people, but this should never be confused with technological or scientific “wisdom”. That road leads to a society none of us would want to inhabit.

There is no easy and sure scientific way to sift every claim, but there are good and bad judgements. That is the safety net protecting us against scientific populism. This populism is a way of evading the hard search for the grounds of knowledge by giving equal weight to everyone’s frame of reference. We must keep hold of the idea that judgement, though never perfect, is generally done better by those who know what they are talking about. ●

# Watch out for the UFOs

How do you tell the difference between a robust challenge to established thinking and an idea that’s plain off-the-wall, asks Bob Park

EVERY year I receive a large number of unsolicited, self-published books and articles about science by authors I have neither met nor heard of, and whose names do not appear in standard directories of scientists. They have found a flaw in Einstein’s special theory of relativity, discovered a way to tap the zero-point energy of the universe, or exposed a government cover-up of the truth about UFOs. If they are right, the world needs to know – and it is possible that they could be. We have to be prepared to rewrite the textbooks.

So do I struggle through all their work on the off-chance they are onto something everyone else has missed? No. Life’s too short, and the warning signs are too obvious. I rarely need to look past the title page. Science is on a roll. Who has time to read stuff that is almost certainly wrong?

Science relies on the astonishing ability of the human brain to detect patterns in the information collected by our senses. The brains of our ancestors, evolved in a Pleistocene wilderness, enabled them to figure out that you have to turn the log over to find the grubs. Incredibly, that same brain can compose sonnets and solve differential equations.

Pattern recognition is the basis of all aesthetic enjoyment, whether it is music,

## Profile

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poetry or physics. As we become more sophisticated in what we do, we learn to recognise ever more subtle patterns. Unfortunately, the brain that makes the link between the tides and the phases of the moon may also connect a comet to victory in battle. Science is about spotting real patterns.

Richard Feynman described science as “what we have learned about how not to fool ourselves”. Science depends on openness: we expose our scientific findings, including the details of how they were obtained, to the scrutiny of the scientific community. This sounds like a prescription for chaos, but the result is the opposite because it reinforces the idea that science is conditional – always subject to being replaced by better information. This can be frustrating to non-scientists, who ask why science can't make up its mind, but the alternative is dogma. Openness provides a mechanism for self-correction, setting science apart from

other ways of knowing. Science is, in fact, the only way of knowing. Anything else is just religion, which is all about authority.

So, science rejects authority. Anyone can play, including “outsiders”. Perhaps the most fundamental of all natural laws, that of the conservation of energy, was first recognised in 1842, not by a physicist but by a doctor studying human metabolism. This law might yet be disproved, but of the half-dozen attempts to challenge it every year, some are merely foolish, most are fraudulent, and all have been wrong. Whenever claims by outsiders are rejected, the charge is invariably that the establishment is resisting change.

Famous insiders can be a little cranky too.

**“Science is the only way of knowing. Anything else is just religion”**

There's a thin line between recognising subtle patterns and apophenia, the experience of seeing patterns where none exist. Apophenia is often associated with brilliant Nobel laureates like the American chemist Linus Pauling, who in his later years imagined that massive doses of vitamin C cured disease.

Even so, the pillars of modern science may yet have some cracks. Quantum mechanics has transformed science, yet it is still not understood. Einstein's field equations may also have big problems. Meanwhile behavioural science, once sneered at as “soft”, is now the hottest new frontier, revolutionised by fMRI imaging technology and genomics.

The scientific process, in short, takes account of cracks, shortcomings and changes. Cranks, on the other hand, are a threat mainly to unwary investors. For scientists, they are a sort of background noise, annoying but rarely interfering with genuine discourse. ●

