On the face of it, scientific misconduct should not occur. Science is about the truth and so must be concerned with careful experiment and observation, and meticulous reporting of results. If there is no concern for truth, there can be no science.
Sadly, it’s now clear that many forms of fraud and misconduct do appear in science. Experimental results are faked or ‘massaged’ to make them look better. Results are stolen or copied. Two scientific journalists – William Broad and Nicholas Wade – estimated that there are probably millions of cases of fraud buried in scientific literature. A chain of high-profile scandals has led, among other things, to a congressional enquiry in the United States, the resignation of a Vice-Chancellor in Australia and the formation of official bodies like the Office for Research Integrity, to investigate claims of misconduct.

The Reasons for Misconduct
Why does scientific misconduct happen? I suggest that there are three main reasons. First, there is the brutal simplicity of career pressure. If your career – and the welfare of your family – depend on your reporting successful results from an experiment, then your motives for faking results are pretty obvious: if the experiment simply won’t work, you would feel tempted to report the expected results anyway.

Second, there is passionate belief in a particular theory. Imagine that you strongly believe in a particular theory or viewpoint. You have argued for your viewpoint in conferences and publications. You do experiments to support your viewpoint. However, the experiment is a difficult one and you simply can’t get the ‘right’ results. If you admit this, you may look a complete fool. Again, the temptations are obvious.

Finally, there are commercial pressures. All businesses are expected to show a profit and, in some of them, the pressure to produce results can be agonising. Pharmaceutical companies spend hundreds of millions of dollars to put one drug on the market. If a new drug fails a single safety test, the consequences could be catastrophic – not just for profits, but for the employment of thousands of people. In those circumstances, it’s easy to see how pressure might build up within a company to fake a particular set of results. After all, experiments are never completely reliable, are they?

What can be done?
Since this is a complicated problem, it follows that solutions will not be simple. The first line of defence starts at the education level. I remember, as a schoolboy, facing my first case of fraud. An outstanding student had to do a titration and he was colour-blind.

So I was persuaded to stand beside him and tell him what colours I saw in the titration flask. I duly did this, but when I looked at his recorded results, they were an awful lot more tidy than those I had been reporting. He was massaging the data as he went along.

Perhaps the first line of defence is to stress to all students that science is cumulative. A bogus set of results can blight an entire field of study for years. In areas like safety testing, it can lead to death and suffering on a monstrous scale – look at thalidomide. So a key idea has to be built into science courses at all levels; in science, we take pride in doing the job meticulously and doing it right. If we don’t, then at some time in our lives, we might cause dreadful destruction.

A second line of defence might be some sort of policing. It is very tempting to say that all scientific results should be replicated. Someone else should repeat the experiment and see if the same results emerge. The problem with that is sheer impracticability. If we do every experiment twice, we effectively double the costs of science, which is financial suicide. However, there is a good deal to be said for some level of checking. If we submit results to journals or reports to government agencies, we are certifying that the results are correct. This being so, there can be no objection in principle to random checks on data for several years after submission. All scientists would learn to keep their data in a safe place for that long and to be able to dig it out on request.

Another strong deterrent to misconduct is the pillory. I am not talking about the old punishment, in which the miscreant’s head and hands were locked into a board, and he was then pelted with eggs and rubbish. I’m talking about the method used by the Office of Research Integrity in the United States.

They investigate allegations of fraud and then publicly state the results. They name names so by going to their website, you learn that a named researcher, of a specific university, has admitted to faking the results in four papers and as a consequence will not receive any research grant money for a period of three years. And, in case you think that is a rather light punishment, remember that the employing organisation might want to take some action as well. Indeed, they would be foolish if they didn’t. And that action is likely to involve a rather large boot.

I hope it is clear that there is no one simple answer to the problem of fraud and misconduct in science. Like any other large enterprise, science has its share of unscrupulous people and also has temptations to misconduct which can sometimes be overwhelming. Perhaps we can each do two constructive things: we can take pride in our own work and we can be alert for cases of fraud and misconduct if we see them.