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Science Fictions: Exposing Fraud, Bias, Negligence and Hype in Science by Stuart Ritchie review

Much of what we take for scientific truth is riddled with error, argues this polemic

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A book that attacks scientific hype, among other abuses, Science Fictions is not exactly tentative. Stuart Ritchie, a psychologist at King's College London, claims that science is failing to keep itself honest and that, as a result, much of what we take for truth could be riddled with error. The scientific system is so "badly broken", he says, it amounts to "a deep corruption within science itself".

Some of the most shocking examples are of outright fraud. Take the dermatologist William Summerlin, who in 1974 claimed to have grafted a section of black mouse skin onto a white mouse. He had solved the problem of transplant rejection! Only, it turned out, he had solved it with a marker pen.

Or how about the once lionised Korean biologist Hwang Woo-suk, who declared in 2004 and 2005 that he had cloned human embryos and created human stem cell lines that could be used to repair any organ? Only there were no cloned embryos and no stem cell lines. There was just some image manipulation software.

Ritchie gives the title of the "most damaging scientific fraud of all time" to the claim by the former doctor Andrew Wakefield that autism can be caused by the MMR vaccine. The idea lingers like a sewer smell even though Wakefield has been proved not just wrong but, in Ritchie's words, "fraudulent right from the beginning". All 12 of the autistic children studied in his 1998 Lancet paper had details of their cases misrepresented or altered to fit the theory. And he had undeclared financial interests, including a patent application for a single measles vaccine.

The Wakefield scandal shows the potential consequences of bad science: more than 140,000 people died from measles and its complications in 2018 alone.

Dangerous science is not just biomedical. A key piece of evidence for government austerity programmes was a 2010 paper by two American economists, Carmen Reinhart and Kenneth Rogoff. It claimed that states whose ratio of debt to GDP rises above 90 per cent choke their own economic growth.

Unfortunately the data spreadsheet contained a typographical error that had the accidental result of discounting the debt of a number of countries, including Australia and Canada. Once it was corrected, the magic 90 per cent figure vanished.

"Meta-scientists" have discovered in recent years that these are not one-off cases. In 2016 Dutch researchers created an algorithm that could detect statistical errors and applied it to 30,000

scientific papers. Nearly half had an error, and for 13 per cent of the papers it was serious enough potentially to invalidate the findings.

Ritchie is fascinating — if you're into statistics — on the alarming phenomenon of "p-hacking", whereby if research data turns out not to be statistically significant it is pushed and pulled around until something pops up that is. He is also good on "underpowered" studies, where data samples are too small — too few mice are studied, for instance, or only 12 autistic children. Sample sizes can profoundly distort what can be found. Scientists spend too long, he warns, "chasing an effect that's like the giant shadow projected by a moth sitting on a lightbulb".

The material on statistics is drier than the cases of outright fraud or negligence, but it is more important. Much of Ritchie's book amounts to a report on the "replication crisis" that has engulfed science in the past ten years or so. Put simply, scientists have found that extraordinary numbers of studies, many of them foundational, simply do not give the same results when they are run again.

Psychology and medicine have been the hardest hit (or perhaps the most open). Maybe half of all historical psychological research, Ritchie writes, has evaporated. Medical researchers have scrambled to replicate their own studies, often with woeful results. One attempt to replicate 53 landmark laboratory studies of cancer drugs succeeded with only six of them. And the crisis has spread to other disciplines. In neuroscience, 10 per cent of studies were discovered to have been compromised by a single faulty setting in a common software package used with fMRI scanners.

Isaac Newton famously said he saw further because he was "standing on the shoulders of giants". Present-day scientists have started to wonder how many of their giants have feet of clay.

The book does have its faults. Ritchie's tirades against the commercial publishers of scientific journals and the systems of academic reward and peer review are long-winded, one-sided and not exactly new. And he fails to give enough credit to a scientific system that has, after all, uncovered all the abuses he details here. The Open Science movement is fairly long-standing and largely welcomed.

Ritchie is also playing a dangerous game. If science is as structurally flawed as he sometimes says it is, why should anyone believe in, say, climate change or vaccination? Or seatbelts, or the roundness of Earth? Revolutionary ardour is an appealing pose, but intellectuals have been caught out when the mob takes them at their word.

Ritchie acknowledges the problem, but argues that scientists need to be more transparent about their weaknesses if they are to earn and "deserve" trust. They must be "humbler about what we do and do not know".

I think most scientists try to do that already. Science is undoubtedly flawed. That does not mean it is broken.

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