

Scientists hold key to winning fight against 'fake news'

May 25 2018, by Navaneeth Mohan

On March 27, 2015, astronaut Scott Kelly rode a rocket to the International Space Station. Waving up at him from Earth was Mark Kelly, his mustachioed twin brother. While they were 400 vertical kilometres apart, NASA scientists studied how the human body reacts to the stresses of long-term space travel.

Scott was the test subject; Mark served as the control.

Over the course of the [one-year mission](#), NASA extensively examined the twins' physiology, gut bacteria and even their [genetic code](#) – sure enough, NASA saw the toll of space stress on Scott.

"Physical stress can certainly bring about molecular changes," said Western Biology professor David Smith, a genetic researcher. "If I sat on the couch and ate chips, while my twin brother ran the Boston Marathon, you would certainly see differences in our molecular makeup. In the case of Scott and Mark, what NASA found was significant, but not a paradigm shift."

However, NASA's sloppy wording of their findings, followed by reporting from a non-critical media, beamed the research into the realm of science fiction. "[Space travel changes our genes](#)" said one news report in March. "[NASA astronaut's DNA no longer matches his twin](#)" reported another.

These articles quoted NASA's January 2018 report which stated Scott's

genetic [code](#) differed from Mark's by 7 per cent. That's not just an improbably claim – it's an impossible one, with identical twins. In anyone, twin or sibling or unrelated human, a 7-per-cent change in genetic code would mutate that person into something not human-like.

"What NASA meant by genetic code was, in fact, [gene expression](#)," Smith said. "If only the journalists had quoted scientists, this incident of fake science could have been averted."

Smith, whose specialty is genomic and molecular evolution, is passionate about science communication and mentors students in science writing projects. His essays have appeared in various journals and magazines.

So what is the difference between genetic code and gene expression?

Your genetic code is a blueprint for your body's functioning. The cells in your liver and heart contain the same code. Yet, these cells differ in their functioning because of differences in the deployment – the active expression – of the cell's genetic code.

"If every gene in your cells were being actively expressed, your kidneys would be growing eyes," Smith joked.

In short, gene expression refers to the level of activity in a segment of the genetic code. The level can vary from 0-100, and can respond to environmental factors. For example, temperature fluctuations trigger changes in the gene expression of some insects and cause them to moult their shell. The insects' genetic code doesn't change, but their genes are firing at a different level of intensity.

Mark and Scott Kelly, then, are analogous to the insect before and after moulting.

"Changes to gene expression are certainly less sensational than a mutational event. Besides, 'gene expression' doesn't roll off the tongue as easily as 'genetic code,'" Smith said.

The snowball didn't stop rolling there. NASA noticed that Scott's telomeres – the end caps of chromosomes – had grown longer than Mark's. Telomeres become shorter with age and stress. So when the stress of [space travel](#) had seemingly lengthened Scott's telomeres, contrary to expectation, scientists admitted they were perplexed.

Yet, this report, written by a British professor of musculoskeletal health, couldn't help but prod Einstein's grave and speculate Scott had aged more slowly because of relativistic effects. A [high school physics](#) calculation would reveal Scott had aged five milliseconds more slowly than Mark – a time span so minuscule it would have had no impact on the length of their telomeres.

Before NASA could step in and correct its January report, the post was shared and re-tweeted all over the world. "It took three months for NASA to make the edits," Smith noted. "Was NASA looking to sensationalize this news?"

NASA promised this generation will produce the first person to walk on Mars. In the hope of building a better future, space exploration has been heralded as a solution for [population boom](#), [resource deficiency](#) and [world peace](#). With manned missions costing taxpayers millions of dollars, the public trusts NASA. That two-way channel of trust is mediated by journalists.

Scientists who convey the information in the first place need to make sure their data is sound – and their communication about it, clear.

"In the Trump era of climate-change deniers, anti-vaccine activists and

flat-earthers, public trust in scientists has been shaky. It is worrisome to see one of the world's foremost research institutes teeter on fake news," Smith said. "Mistrust between public and scientists will have repercussions in the future of science, health and environment."

Provided by University of Western Ontario

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