

# Books & arts



DREW ANGERER/GETTY

US President Donald Trump (left) and infectious-diseases expert Anthony Fauci at a press briefing on the coronavirus.

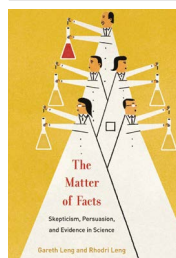
## Beware the illusion of certainty: it can be weaponized

What happens when facts face personal, political and commercial pressures? A book on the workings of science explores. **By Sarah de Rijcke**

**T**he pandemic is an existential moment for the use and abuse of knowledge. Witness Anthony Fauci, director of the US National Institute of Allergy and Infectious Diseases and the quintessence of scientific expertise, having to keep his cool in regular televised press briefings alongside US President Donald Trump, the personification of fact-free politics.

The coronavirus is forcing rapid changes in research prioritization, funding, evaluation, dissemination and communication. This unprecedented situation makes *The*

*Matter of Facts*, penned pre-pandemic, timelier than ever. Written by father and son Gareth and Rhodri Leng, it is a fascinating



**The Matter of Facts: Skepticism, Persuasion, and Evidence in Science**  
Gareth Leng and Rhodri Ivor Leng  
MIT Press (2020)

interdisciplinary exploration of how scientists produce and use evidence. The COVID-19 crisis underscores their core message that science is a mostly productive cycle of rigorous scrutiny by experts, not a rational progression towards immutable facts. What is established one day is reconsidered the next – as anyone outside academia can now observe in real time. Science is powered by uncertainties, error margins, competition, disclaimers, collaboration and stress. In dark times, all of that can be weaponized.

Gareth, an experimental physiologist,

## Books & arts

and Rhodri, a researcher in science, technology and innovation studies, bring together insights from a range of fields that analyse the workings of science. They explore from a philosophical perspective how scientists weigh forms of evidence. They use scientific studies to understand why researchers lack incentives to replicate findings. And they turn a scientometric lens on features of the literature such as public bias, selection bias and confirmation bias.

Drawing on – mostly male – theorists including Karl Popper, Thomas Kuhn and Bruno Latour, the Lengs show that, far from being engaged in a disinterested activity, scientists are in the business of persuasion. They write narratives to convince colleagues of their claims, or to overthrow conventional wisdom. Evidence becomes a rhetorical device: scientists might torture their data to say the right things, fail to mention evidence that contradicts their claims or add circuitous arguments that spin their evidence. Put more positively, evidence is credible only when embedded in a persuasive story. It does not speak for itself.

The authors dive into one of Gareth Leng's research interests – the hormone oxytocin – to lay bare the mechanisms of discovery. In a delightful historical chapter, they show how oxytocin's perceived role shifted from chemical promoting quick birth to 'love hormone' of maternal care, to 'cuddle hormone' of partner bonding, to 'trust hormone' influencing social behaviour. The substance first described by Henry Dale in 1906 bears little resemblance to our current understanding; all its roles are entwined with conventions and interpretation.

### Disruptive culture

Another section starts as a fairly composed description of the emergence of scientific journals. It quickly turns into a passionate reproach to the commercialization of publishing and its disruptive effect on science. Corrupt journals and oligarchic publishers appear as villains, and disparaging scientists as their victims. The impact factor, once an innocent tool for librarians, is now a distorting measure that can make or break careers. On the basis of purely anecdotal material, the authors deconstruct how the culture of journal publishing is affecting science on the ground.

They describe a well-researched phenomenon that I have elsewhere called "thinking with indicators". This is what happens when scientists design and adjust their research to ensure a good score, or pick research questions to improve their chances of getting tenure. It is problematic when other criteria of quality – originality, long-term progress, broader relevance – become 'unthinkable'. The Lengs correctly implicate the publishing industry. But publishers are part of a complex web that also includes funders, institutions, evaluation systems and broader political and

social structures. This systems perspective is sometimes lacking in *The Matter of Facts*.

That aside, the book spotlights major flaws in science, including various forms of bias, lack of transparency and rigour, excessive competition, commercialization and vanity publishing. These pre-date COVID-19. The crisis has exacerbated some; others have evaporated as scientists rush to solve life-or-death problems.

This moment calls for a global collective vision of the structure of science. It is unclear who will articulate such a vision. The Lengs

help us to understand why: the value ascribed to discovery is determined by a cocktail of reason, rhetoric, conviction and power. Evidence has little purchase when denial is what wins votes. Perhaps field hospitals in parks, prisoners digging mass graves and the collapse of global supply chains will change the calculus?

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THE SIMONS FOUNDATION

Maryam Mirzakhani made breakthroughs in fields such as dynamics.

## Mathematical hero: the movie

Documentary celebrates the first woman to win a Fields Medal. **By Davide Castelvecchi**

**M**aryam Mirzakhani broke into the exclusive club of top mathematics prizewinners in 2014. It was a momentous occasion: whether because of committee biases or the gauntlet of systemic obstacles and social pressures, no woman had previously won the discipline's most coveted award, the Fields Medal, established in 1936. Now, it seemed

### Secrets of the Surface

Director: George Csicsery  
Zala Films (2020)

<http://www.zalafilms.com/secrets>

that the pipeline of female talent was finally beginning to deliver.

George Csicsery's *Secrets of the Surface* is the first feature-length film on Mirzakhani.