BOOK REVIEW

SCIENCE FICTIONS: EXPOSING FRAUD, BIAS, NEGLIGENCE AND HYPE IN SCIENCE

Reviewed by Martin Adamčík[1]

SUMMARY OF THE CONTENT

A shocking and captivating book about a topic every researcher, educator and decision maker should know, it first shakes you to the core, then explains all that is objectively known to be wrong with how we currently conduct scientific research, finally suggesting some possible solutions. Many of the problems identified will be known to a seasoned researcher: publication bias, p-hacking, and hyping correlation from observational studies that does not equal causation, while many researchers are also working collectively to solve these issues (e.g., Open Science Framework, n.d.). Nevertheless, having virtually all that is wrong with science summarized in one book is sure to move, inspire, and compel every scientist to take action. However, this book should not get into the hands of the public, for it will inject fear and despair, washing away the boundary between science and pseudoscience.

The book has had an incredible reception. In 2021, it was short-listed for the Royal Society Prize for Science Books (Bookseller, 2021), although it lost to another excellent book. The author, Stuart James Ritchie, is a lecturer at King's College London, currently with 8022 citations and an h-index of 43 (Ritchie, n.d.). As a researcher in psychology, he experienced early in his career that many journals (used to) refuse replication studies, the core of what makes science, science, embarking on a quest to change it (Ritchie, 2021).

The book supports its arguments exceptionally well. Every chapter consists of several flawed research papers, followed by other researcher papers rebutting those papers, and sometimes followed by papers refuting the rebuttal! Incredible. A quarter of the whole book consists of explanatory notes and references to literature, which is placed at the end, so as not to disturb the flow of reading. At one point, Ritchie criticizes a Nobel prize winner, Daniel Kahneman, for relying too much in his best-selling book (2012), on some work that was later discredited. Yet, the same could go for this book, too. In the author's own words: "... even if you read a seemingly devastating critique of a piece of research, the critique itself might be mistaken, and so might be the critiques of the critique. That also goes for everything I've written in this book." He offers a 5-pound reward for every minor mistake found in the book, and a 50-pound reward for a major mistake; this book shows that science is full of mistakes.

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[1] Asst. Prof. Dr. Martin Adamčík is currently working as a lecturer in the Department of Business Economics, Martin de Tours School of Management and Economics, Assumption University, Thailand. He obtained a Ph.D. in Mathematical Logic from the University of Manchester, the UK.
Email: madamcik@msme.au.edu

CRITICAL EVALUATION

The first part of the book presents shocking stories of fraud in science, with unfortunate consequences that even involved needless suffering from human patients. The author makes the impression that scientists do not possess any higher moral standards than others, but being objective, the author does not claim this. Everything he claims is well referenced, with the book being a summary of cases that the current literature agrees to be fraudulent, faulty, or simply just over-hyped. A quick search of the literature yields a typical stereotype of the well-meaning scientist, but a close inspection of one such reference (Sato, 2016), shows a paper with an abysmal sample size that presented some of its many hypotheses as significant.

The second part of the book demonstrates that this is not how science should be done. Out of the many small studies and their many hypotheses, something occurring by pure chance could be deemed significant (well, in statistical terms, not necessarily practically significant), and that is being presented. If we plot the results of many small studies like this with some bigger studies in a funnel plot, we realize that those small studies that did not get significant results were simply not published. This is known as publication bias. In my experience as a statistician, it is a huge problem in social science research, and business research is no exception. It is not a problem because scientists have ill intentions, but they simply do not understand that they are getting misleading results, and the system motivates them to publish whenever they get something positive. The book does a magnificent job of explaining this all, not by showing proofs and simulations, but showing historical examples that were eventually proven wrong. This book is unlike anything else that is out there.

The mathematics of publication bias, p-hacking, and underpowered studies has long been well understood (Ioannidis, 2005). People in the open science drive (Open Science Framework, n.d.) are already working tirelessly to fix this. Nevertheless, the book does not seem to fully appreciate that we are already collectively trying to make positive change, and that the key is to educate researchers about the above-mentioned problems. By painting a darker picture, the book is more shocking and hopefully in turn more effective in this education; it really reads like an exciting thriller. However, in doing so, it also commits the same sin that it criticizes: over-hyped science. Stuart Ritchie appeals to researchers to be modest in their claims, to be skeptical, and require large amounts of evidence, before they publish. His book also could have been more modest, acknowledging that we do our best, and that we are, eventually, getting correct results. For this reason, I do not find his criticism of Daniel Kahneman's reliance on published studies, fair. The system works, the proof is that this book could rely on many studies rejecting false claims of the past.

The system, however, could also work much better, and that is the focus of the last section of the book. This is, I argue, a less impressive part of the book by design. While the first two sections offer a reflection of what we objectively currently know, albeit a darker but more motivating reflection, the last section is an educated guess as to what could work better. Of course, the author openly and honestly admits this, but strongly argues that we must try to change things slowly and thoughtfully; as an example, he gives the already mentioned open science drive. Motivating researchers to publish looked like a good idea in the past, and maybe it really was, it just came with the unfortunate consequence of having many underpowered, p-hacked studies successfully published. Some of the author's original ideas, such as taking automatic AI software to conduct statistical computation instead of the researcher to avoid accidental p-hacking, might have their own unforeseen consequences. My educated guess is that researchers would understand even less what the statistical analysis does and thus commit even more blatant errors than those that occur in the collective publishing of many underpowered small studies whose significant results were obtained by chance.

Instead, education should be the key to move us forward. Copilot tools that help us to check the soundness of what we have done will surely be of a great help, as a spellchecker is. However, we must also understand how research design affects statistical results, and this book does the best job to date in explaining how to do it without actually showing any statistical computations. This book is thus unlike anything else out there, it is here for you, dear researcher, educator, and decision maker, to make science better.

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