2018

Calculus of the Impossible: Review of *The Improbability Principle* (2014) by David Hand and *The Logic of Miracles* (2018) by Lásló Mérő

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Abstract

David J. Hand. 2014. *The Improbability Principle: Why Coincidences, Miracles, and Rare Events Happen Every Day* (New York, NY: Scientific American/Farrar, Straus and Giroux) 288 pp. ISBN: 978-0374175344.

Lásló Mérő. 2018. *The Logic of Miracles: Making Sense of Rare, Really Rare, and Impossibly Rare Events* (New Haven, CT: Yale University Press) 288 pp. ISBN: 978-0300224153.

David Hand and Lásló Mérő both grapple with the occurrence of seemingly impossible events in these two popular science books. In this comparative review, I describe the two books, and explain why I prefer Hand's treatment of the impossible.

Keywords
numeracy, statistics, probability, popular science, David Hand, Lásló Mérő

In reading Lásló Mérő's (2018) *The Logic of Miracles: Making Sense of Rare, Really Rare, and Impossibly Rare Events*, I found myself having an episode of déjà vu. Having read David Hand's (2014) *The Improbability Principle: Why Coincidences, Miracles, and Rare Events Happen Every Day* a few years back, a book which also centers on the occurrence of seemingly impossible events, I was surprised to see no reference in Mérő's book to that from Hand. Perhaps this seemingly bizarre coincidence is part of the lesson, given that both authors discuss our tendency as humans to underestimate the probabilities of events. I still found the disconnect to be off-putting. In any case, here I describe both books, and discuss their potential relevance for the *Numeracy* community.

The core task that Hungarian research psychologist Mérő sets out for himself in *The Logic of Miracles* is to articulate a science of events which are rare, unrepeatable, and unpredictable—events that he calls miracles—using traditional models of nature. Mérő distinguishes early on between different types of miracles, some secular and others faith-driven, and delimits his work to the former. Mérő's normative thesis is that we, as readers, should take on sensibilities from two worlds that he invents for the book: the mild world of *Mildovia*, and the wild one of *Wildovia*. In the world of Mildovia, we can use models such the Gaussian distribution to anticipate and understand small deviations from normalcy. For example, in Mildovia we are likely to see people who are over six feet tall, but certainly not people over ten feet tall. This pattern emerges is because, though normal distributions have infinitely long tails, they are limited in that they are only models of the real world and yield extremely small probabilities for events several standard deviations from the distribution's mean. An implication of this characteristic for Mérő is that, in Mildovia, we have no means of understanding events which "seem to come out of nowhere" like 9/11 or the 2008 financial crisis (p. 30); for insight into those events, we need models from Wildovia, such as the Cauchy distribution. To Mérő, we inhabit both worlds simultaneously, and so it is imperative that we use Mildovia's models for understanding normalcy—potentially looping us[1] into a more Mildovian world—all the while preparing for the inevitable chaos associated with Wildovia. Mérő ends the book discussing how we might prepare for Wildovia, suggesting, for example, that we teach convertible knowledge (knowledge which is robust in a turbulent world), and foster antifragility (the disposition to become stronger through adversity), the latter term coming from Nassim Taleb's (2012) *Antifragile*. Insofar as his argument is normative, I found it lacking a sophistication that results from having engaged with scholarship in other fields such as philosophy or sociology. Admittedly, I was also put off by the tone of the book, as at times Mérő came across as presumptuous.

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[1] Here, "looping" is similar to the notion of self-fulfilling behavior. For example, if you tell yourself that you are confident before an interview, you are more likely to exhibit confidence in the interview.

Mérő's book sits at the border between popular science and research scholarship. While pitched as appropriate for a wide audience—and including engaging historical exposition throughout—*The Logic of Miracles* will likely appeal more to readers with a quantitative background, given that it includes substantial discussion of ideas from probability and statistics (e.g., probability distributions), as well as ideas from mathematics (e.g., scale invariance and fractals). Many *Numeracy* readers will have little trouble reading the book, but those without a background in undergraduate mathematics and statistics are likely to find it challenging. One implication of this difficulty is that the book's potential use in numeracy-focused courses is limited. This limitation is underscored by the fact that a driving context in Mérő's book is finance (investing, in particular), which many students will not yet relate to. To be fair, the book is not meant to be useful for such courses—I am situating it within my own frame of reference.

In contrast to *The Logic of Miracles*, Hand's *The Improbability Principle* is readily accessible, as it includes appendices and in-text asides aimed at explaining basic ideas in statistics and probability. This accessibility aligns with Hand's purpose, which is to engage the average reader with a nuanced look at why perceived miracles are so commonplace. Hand's book is more descriptive than it is normative; for this reason, I felt that Hand had less of an onus to substantiate any claims he made. The structure of the book is straight-forward. Hand names several "laws" that, taken together, serve to explain why seemingly impossible events occur quite regularly. In particular, Hand discusses laws of: *inevitability*, *truly large numbers*, *selection*, *the probability lever*, and *near enough*. Many of these laws are re-phrasings of familiar principles in statistics (e.g., the law of large numbers). Others, though, involve ideas less familiar to potential readers, such as the law of the probability lever (where he introduces concepts such as the butterfly effect). Hand delves into many of the same topics that Mérő does—human bias, the nature of science, and even various probability distributions—but does so in a manner that is easier for folks without a quantitative background to read. What I found engaging as a reader was Hand's rich narrative through subjects such as history, philosophy, psychology, science, and statistics. In particular, though both Mérő and Hand engaged with various disciplines in their respective books, I felt that Hand, in citing scholars such as Adolphe Quetelet and Ian Hacking, delivered a more robust engagement with other fields. Furthermore, one of the elements I appreciated about Hand's treatment of unlikely events is that—rather than splitting events into the binary categories of Mildovia or Wildovia, which felt constraining—he distinguished events by the order of magnitude of their likelihood. This focus was clearer to me as a reader, and would likely benefit students, should you decide to use the text in a course. Indeed, given that Hand focuses on various principles that might spark discussion among students, I plan on including the book as a suggested reading for courses where I assign a book-club project. Readers may also find

particular chapters in *The Improbability Principle* worthy of a week's reading in their course.

For *Numeracy* readers already familiar with Hand's work, I see little marginal benefit in reading Mérő's. For those who have read neither text, I encourage you to read the introductions in each book, and then follow your instinct. Personally, I will be keeping *The Improbability Principle* on my bookshelf, as I prefer its tone, diverse disciplinary insights, and potential utility in courses that focus on numeracy.

References

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