One can study probability as if it were just a part of theorem-proof mathematics[5]. The goals of theorem-proof probability are quite different from the goals of understanding the operation of chance in the real world, though there should be (and often is) substantial cross-fertilization of the math *techniques* in the two contexts. Or in Courant's words

> Living mathematics rests on the fluctuation between the antithetical powers of intuition and logic, the individuality of "grounded" problems and the generality of far-reaching abstractions. We ourselves must prevent the development being forced to only one pole of this life-giving antithesis.

Brief remarks on theorem-proof mathematics are in section xxx.

Finally, I should declare up front two prejudices that will become apparent. Because toy modeling is comparatively easy to do, there often emerge topics on which 20 or 200 papers are written in a few years on variants of some basic toy model, but where this work is anchored neither to real-world data nor to the accumulated body of theorem-proof mathematics. I call this *Legomania*, and I'm against it! My second prejudice is against much of the philosophy of probability[6] which is phrased using hypothetical examples. I call this *Fantasy World philosophizing*: if you can't think of a real example then maybe your point isn't worth making?

1.3 Textbooks, popular books and Wikipedia

To repeat an earlier comment, there's a wide gap between the contents of undergraduate textbooks and the contents of popular science books. Textbook "an introduction to mathematical probability" accounts exist at almost every level from elementary school to College junior level. At the latter end, typical contents in a post-calculus text such as [37, 44] are

- Jargon: events, sample space, random variables.
- Basic math: expectation, independence, addition and multiplication rules; illustrated via games of chance.
- Law of large numbers, central limit theorem.
- Named distributions and prototypical settings where they appear.
- Calculus-style manipulations with random variables and distributions.
- Conditional probability and Bayes rule.
- Correlation and regression.

[5] Traditionally called *pure mathematics*, but I prefer the phrase *theorem-proof mathematics*.

[6] Not academic technical philosophy papers, but rather the "popular philosophy" that I encounter while reading non-mathematical discussions of probability

More elementary courses just cut out some of these topics. My favorite *non*-textbook account of this basic mathematics is Haigh [26].

On the other hand, popular science accounts of probability tend to emphasize topics such as

History of probability	Quantum probability
Power laws	Fractals in probability
Chaos	Casino games
Game theory	Probability in finance
Genetics	Evolution
Self-organized criticality	Randomized (e.g. genetic) algorithms
Social networks	spread of epidemics or gossip
Lotteries	streaks in sports
Random number generators	Information and entropy

It is remarkable how little overlap there is between the textbook and popular science topics – for other academic subjects, say Evolutionary Biology or 19'th century American History, I'm confident there is much more overlap between textbook and popular writing.

Unlike many academics, I am a big fan of Wikipedia for uncontroversial factual information, and I write (e.g.) *Occam's razor* ($\mathcal{W}$) to mean there is a relevant Wikipedia article entitled "Occam's razor". Of course encyclopedia articles are focussed rather than discursive – one doesn't try to learn a whole subject like Probability from an encyclopedia – but I regard Wikipedia as a currently useful (and potentially much more useful) complement to textbooks and popular books. Within Probability, I was intrigued to notice (perhaps this is in retrospect predictable?) that the overlap between textbooks and popular books is in topics such as

Benford's law ($\mathcal{W}$)
Birthday problem ($\mathcal{W}$)
Boy or girl paradox ($\mathcal{W}$)
Coupon collector's problem ($\mathcal{W}$)
Gambler's ruin ($\mathcal{W}$)
Monty Hall problem ($\mathcal{W}$)
Nontransitive dice ($\mathcal{W}$)
Two envelopes problem ($\mathcal{W}$)
Zipf's law ($\mathcal{W}$)

which have Wikipedia articles. These typically make brief (less than one page) appearances in textbooks as illustrations of theory, but have longer verbal accounts in popular science.

Of course it's easiest to write a Wikipedia article on a very specific topic, such as those above. But I do encourage writers on broader topics (whether popular science or academic) to compose a Wikipedia article on their topic, for two reasons. First, the Wikipedia article will be more readily and widely accessible than your other writing. Second, writing the article imposes discipline

– a format that's not too vague, not too technical, and refers to sources – that is surely helpful in focusing your other writing.

> If it's possible to write an interesting and intelligible Wikipedia article on a topic, then one should be written.