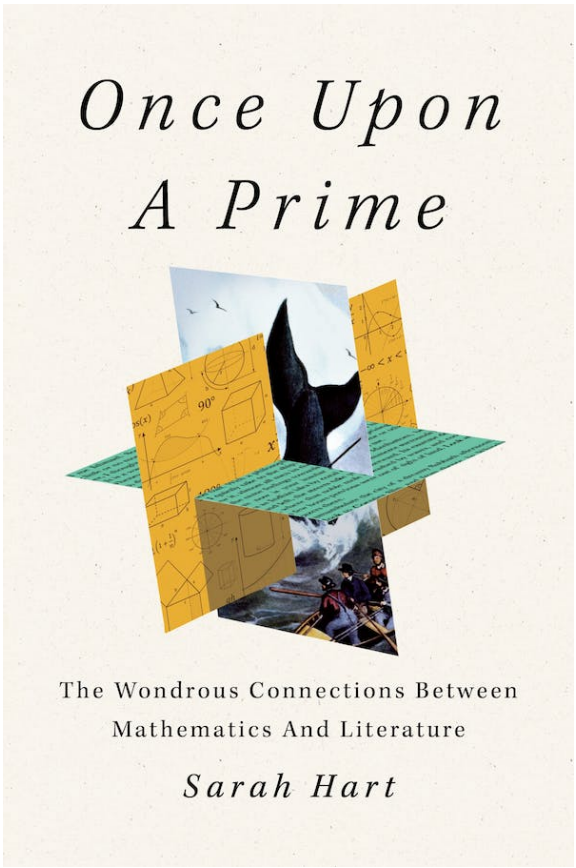
Once Upon a Prime. The Wondrous Connections Between Mathematics and Literature

Book Reviews June 2023 (Vol. 55, No. 3)

Karl Dilcher (Dalhousie University)
Book Reviews Editor, CMS Notes Editorial Board & Editor-in-Chief, CMS-CAIMS Books in Mathematics Editorial Board



By Sarah Hart
Flatiron Press, 2023
Hardcover, 290 pp., CA$ 39.99
Reviewed by Karl Dilcher

Mathematicians tend to like puns, and this reviewer is no exception. Is the title just a gimmick to get our attention? It certainly worked for me, as I browsed through the Science section of "The Bookmark", Halifax's only, and very good, independent bookstore. But being rather cheap, I buy a $40 hardcover only if it's really necessary. A quick look at the table of contents, and reading some short random samples, convinced me that it was.

I was not disappointed – far from it! In fact, the author nominates "The Best Value Book of All Time" in Chapter 4. While it is difficult to beat her example (I'll come back to this later), the book under review will be a strong contender for runner-up, at least in my opinion.

But back to the title. Searching my brain (an expression used a few times by the author) for other prime examples, I came up with "High Primes and Misdemeanours", the proceedings of a BIRS conference in honour of Hugh Williams's 60^{th} birthday, edited by Alf van der Poorten and Andreas Stein (AMS, 2004), and "Prime Suspects", a graphic novel by Andrew Granville and Jennifer Granville (Princeton, 2019). The first of these is exclusively mathematics and the second one is a detective story involving mathematicians and mathematics; both volumes have strong Canadian connections. The third one, "Once Upon a Prime", combines the two disciplines, as the subtitle indicates. Right from the beginning the book convinces the reader that there are indeed surprisingly many wondrous connections between mathematics and literature, and it does so in a wondrous way.

Of course, the title alludes to fairy tales, and indeed, the book contains numerous references to folklore and creation or foundation myths of different cultures around the world. I can't help but mention at this point that I grew up in the part of Germany, just south of Göttingen, where the Grimm brothers collected their stories and fairy tales. Perhaps this contributed to my fascination with the title.

The book begins with, "Call me Ishmael". Well, this opening sentence worked once, why not again? Further down on the first page the author writes, "The more Melville I read, the more mathematics I discovered. And it wasn't just Melville." She then mentions Leo Tolstoy, James Joyce, Arthur Conan Doyle, and Chimamanda Ngozi Adichie. As if this level of diversity wasn't enough, these names are followed by Michael Crichton's *Jurassic Park* and Aristophanes's *The Birds*. Talk about grabbing the reader's (or in my case the *potential* reader's) attention in the first two dozen lines of the book! And it only gets better; the level of diversity of literary genres and authors is astounding, and I would never have imagined the diversity of connections with mathematics which often goes far beyond the elementary.

Towards the end of the Introduction, the author states her purpose: "If you don't yet love mathematics, I want this book to show you the beauty and wonder of it, how it is a part of our creative lives, and why it deserves its place with literature in the pantheon of the arts. I want it to give you an extra perspective on the writing and writers you know, introduce you to writing you don't, and give you a new way of experiencing the written word.

"If you happen to be a mathematician, then you already have poetry in your soul [Thank you, Sarah Hart!], but we'll look at how this is manifested in places you may never have realized, as part of an enduring conversation between literature and mathematics. I warn you: you're going to need a bigger bookcase."

The author, Sarah Hart, is Professor of Mathematics at Birkbeck, University of London. Birkbeck's courses are almost exclusively delivered in the evening and students can study part-time or full-time. In connection with her discussion of the life and work of the brilliant but little-known English writer B. S. Johnson (1933-1973) who attended Birkbeck, Sarah Hart writes, "[I] am constantly banging on about the vital importance of giving people the chance to pursue higher education at any stage in their lives."

Hart is also the first female Gresham Professor of Geometry since its inception in 1597. Her area of research is group theory, but she has also made a name for herself as a successful expositor of mathematics. For instance, some of her excellent talks can be found on YouTube.

And how she can write! Although literature and mathematics are often portrayed as serious and heavy, this is a very light-hearted book. The author is funny, sometime self-deprecating, and she does use a few more puns; but all of this sparingly, with just the right dosage. The book "reads well"; in fact, it's a page-turner, difficult to put down, partly because you know the next page, or the next paragraph may contain yet another delightful sentence or surprising fact. You feel that the author had fun writing this book, and she delights in telling you all these amazing stories. And yes, if there is one word that might describe this book, it is "delight".

Another reason why the book works so well is the fact that the author brings a good deal of herself and her family into it. Some of the individual stories begin with describing visits with authors, or with media interviews. It's not the usual anonymous omniscient narrator giving you the facts, it is Sarah Hart, mother of two girls and working full-time, who is sharing with you the wondrous stories and facts which she herself discovered possibly not too long ago, and who makes you share in her delight.

Let me share a small sampling of delightful phrases with you. In Chapter 4 (The Arithmetic of Narrative Choice), the number 25! appears in connection with The Best Value Book of All Time, and the author gives the number explicitly, adding, "That's 15.5 septillions, if it helps (and I know it doesn't)". In the following chapter, she tells a story in which she is challenged to say something interesting about the number 22. At first, she is stumped, but later on she does come across a fascinating property related to a certain numerical sequence. This prompts her to conclude this segment by writing, "all number are interesting if you give them a chance." The second half of this sentence is the delightful part, especially since many of us mathematicians are familiar with the "proof" by contradiction that all numbers are interesting.

The author would likely consider this last statement to be "form without content"; in her opinion this should be avoided in good mathematics as well as in good writing. In fact, in Chapter 4 she writes in connection with experimental fiction and random plots that "structure for the sake of

structure, in literature just as in mathematics, risks being arid and pointless." Further on the topic of structure, she concludes Part 1 of the book by writing, "Above all, I hope I've shown that behind every work of literature there is structure, and behind every structure there is delightful mathematics to explore.

Before leaving this topic behind, let me summarize the structure of the book, which is divided into three parts and ten chapter. (And yes, the numbers 3 and 10 are indeed featured in Chapter 5: "Fairy-Tale Figures. The Symbolism of Number in Fiction". But this may just be a coincidence, or an instance of Richard Guy's "Strong Law of Small Numbers"). Part I has the title "Mathematical Structure, Creativity, and Constraint", Part II is about "Algebraic Allusions. The Narrative Uses of Mathematics", and Part III, "Mathematics Becomes the Story". Enumerating the individual chapters (which all have interesting and fascinating titles) might go too far here.

The book also contains nine pages of notes; it appears that, thankfully, the author and/or the editor resisted the temptation of overwhelming the reader with too much additional information. And finally, before a helpful and detailed index, there is a 6-page "Mathematicians Bookcase", which the author describes as "a collection of some of the books on my shelves that we have discussed, with a few bonus recommendations thrown in for good measure."

I already mentioned the opening sentence of the book, so at the end of this review I also wish to quote the last sentence of the body of the book: "In literature, as in life, there are as many different ways to be a mathematician as there are different ways to be a person."

Dear friends and colleagues, if you haven't yet bought a new book in your local independent bookstore this year (or this month), let this be your first one. You will not regret it.

Sarah Hart will be an invited speaker at this year's Bridges Conference, as part of the annual conference series subtitled "Mathematics—Art—Music—Architecture—Culture. Bridges 2023 will take place at the Sexton Campus of Dalhousie University in Downtown Halifax, 27-31 July 2023. Please see https://www.bridgesmathart.org/b2023/

Key words: History of mathematics; mathematics and literature.