

Imaginary Numbers: An Anthology of Marvelous Mathematical Stories, Diversions, Poems, and Musings

Reviewed by Alex Kasman

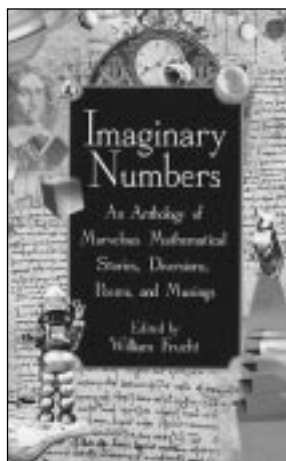
**Imaginary Numbers: An Anthology of
Marvelous Mathematical Stories, Diversions,
Poems, and Musings**

William Frucht, editor
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In 1958 a collection of short stories and book excerpts was published under the name *Fantasia Mathematica*. What tied these previously published works of fiction together was that they all had something to do with mathematics. The editor of that book, Clifton Fadiman, later remarked, “I had been storing away these wisps of mathematical thistledown in the untidy nest of my files, with hardly any expectation that others might take pleasure in them. But, to my surprise, and I believe also to the publisher’s, the little book assembled entirely as a labor of love attracted not a vast audience, of course, but at least an inappropriately large one, when one considers the esoteric nature of the subject.” Fadiman edited another collection that appeared in 1962 as *Mathematical Magpie*. Then in 1987 author and self-proclaimed “world-class mathematician” Rudy Rucker edited a collection of mathematically oriented science fiction stories called *Mathenauts*. For many years these three volumes remained the only published collections of mathematical fiction.

Who would have thought that there were so many mathematical stories published? In fact, there are many more. When I reviewed the novel *Cryptonomicon* for the *Notices* (December 1999, pages 1407–1410), I included a request for more

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examples of “mathematical fiction”. Since the review appeared I have received several new suggestions each week, and the list (<http://math.cofc.edu/faculty/kasman/MATHFICT/>) has grown larger in a few months than I ever thought it would become. Many of the works on this list, like the movie *Pi*, were so successful that it is hard to imagine that anyone with an interest

in mathematics would not have noticed them. Others are so rare, like the books *The Sinister Researches of C. P. Ransom* and *The Curve of the Snowflake*, that it is difficult now to find any trace of them. Since many of the mathematical stories, books, and movies on the list appeared for the first time only after the publication of *Mathenauts*, it might seem that it is about time for someone to attempt a new collection—and someone has.

Imaginary Numbers: An Anthology of Marvelous Mathematical Stories, Diversions, Poems, and Musings, edited by William Frucht, was published by John Wiley & Sons in the fall of 1999. As Frucht explains in the acknowledgments, he successfully arranged for a small reissue of Fadiman’s two volumes, which was to be followed by a new collection edited by Martin Gardner. When this plan did not seem to be working out, Frucht himself collected the thirty-one works that make up this book.

Among my favorite entries in the book is the short story “A New Golden Age” by Rudy Rucker (which also appeared in *Mathenauts*). Only this

story, of all the stories in these collections, leaves me with the impression that it was written with professional mathematicians as its intended audience. (In fact, Fadiman explicitly insists that his collections are *not* for mathematicians at all.) In this story, and in our world as well, mathematicians lament the fact that legislators cannot sufficiently appreciate mathematics and that this adversely affects the funding of their science. To address this problem, one of the mathematicians in the story creates a device called the Moddler. It can be used to experience the thoughts of great mathematicians while considering their greatest theorems, giving the user the momentary feeling of understanding and appreciating the results. An attempt to read the original papers after using the Moddler confirms that it does not actually give one any *real* understanding of the concepts. Still, the mathematicians find that they love using it to get some appreciation of results that were always beyond them. Finally, the legislators are convinced to try the Moddler, but the consequences are not exactly what the mathematicians had wished. I think the moral of the story is that perhaps we should be *glad* that legislators do not appreciate mathematics, because if they did, we might find we do not agree with their taste.

Another interesting story is “The Extraordinary Hotel, or the Thousand and First Journey of Ion the Quiet” by Stanislaw Lem. Here the famous Polish author toys with the counterintuitive nature of the countably infinite by postulating the existence of an intergalactic hotel with rooms indexed by the positive integers. For instance, the narrator of the story arrives at the hotel to find that there are no vacancies. However, as a favor the management makes room for him by simply asking each of the other guests to move to the next room. It goes on from there, discussing ideas that we have all encountered before, but probably not in such an entertaining context.¹

Connie Willis’s short story “Schwarzschild Radius” is based on events in the life of Karl Schwarzschild, who gave the first exact solutions to the equations of general relativity. The historical aspects of the story here are enhanced by cleverly self-referential fictional details. Told in flashback form, the events are recalled by a soldier who happened to intercept a letter from Einstein to Lieutenant Schwarzschild at the front line during World War I. As the story develops, haunting analogies are made between the situation of the soldiers in the trenches and the scientific theories being

discussed. For example, the discussion of the red shift of light from distant stars is echoed in the soldier’s treatment with an eye ointment that adds a red tint to everything he sees. The inability of information to leave from within the Schwarzschild radius of a black hole seems somehow to explain the fact that the soldiers’ families are not receiving the letters and requests they write from the front line. In the end we are left with the impression that even the disease that eventually claims Schwarzschild’s life was a consequence of the singular solutions he found to Einstein’s equations.

Let me briefly mention some other works appearing in *Imaginary Numbers*. “The Church of the Fourth Dimension” describes Martin Gardner’s (fictional) visit to an unusual church where he considers theology in dimension $n > 3$ and learns some topological magic tricks. The excerpt from Edwin Abbott’s classic *Flatland* is an unusual choice, as this passage seems to have more to do with the sociology of the famous two-dimensional world than with its mathematical elements. A chapter from A. K. Dewdney’s *Flatland*-inspired novel *Planiverse* describes a one-dimensional ocean surface in a two-dimensional virtual universe. Though interesting, this story left me wishing that the author had included *more* mathematics, since the two-dimensional air turbulence in the boat sails and the uniformly shallow one-dimensional sea he describes would have been ideal starting points for a discussion of Kelvin-Helmholz instabilities and KdV solitons! “A Serpent with Corners” is an elementary word problem disguised as a story by Lewis Carroll.

One of the few entries in the book to be accompanied by any comments from the editor is the short excerpt from Alan Lightman’s book *Einstein’s Dreams*. This passage, describing Einstein’s dreams of a universe in which entropy decreases as time passes, is preceded by historical notes that may be of use to some readers and that help to “set the mood” even for those who already know the background. Generally, the editor’s comments are helpful and appropriate. In fact, the book would have benefited from more. For instance, the book includes the dialogue “Prelude...” by Douglas Hofstadter from his Pulitzer Prize-winning *Gödel, Escher, Bach*. Rereading this excerpt merely served to remind me what an intricate and amazing work of art that book was, for it truly fulfills its promise of interweaving the spirit of the mathematics, art, and music of these three people. Yet I am afraid that in isolation the excerpt might just seem like nonsense. Some comments regarding the goals of Hofstadter’s book and its connection to this excerpt would be helpful. Otherwise, how is the reader unfamiliar with Gödel’s work to know that the discussion of Fermat’s Last Theorem is not merely a joke but a clever foreshadowing of the sort of

¹Or perhaps you have. George Gamow in “One, Two, Three...Infinity” attributes the hotel analogy to David Hilbert, and Allyn Jackson points out to me that the article “Hilbert’s Hotel”, by Ian Stewart (New Scientist, 19/26 December 1998 to 2 January 1999, pages 59-61) also presents this idea in the form of a story.

logical paradox that underlies Gödel's proof? (Let me explain. In this dialogue a character devises a formal logical calculus to attempt to prove Fermat's Last Theorem. In this notation the proof of the theorem happens to take exactly the form $x^n + y^n = z^n$, thus demonstrating that proving Fermat's Last Theorem is equivalent to finding a counterexample to it, which he does.) Comments from the editor might also enhance the poem "Ten Weary, Footsore Travelers" (a puzzle that asks the reader to find the mathematical error it contains), which is unattributed and appears without any indication of its source.

Two of the other poems included in this anthology are mathematics jokes in verse: "A Positive Reminder" by J. A. Lindon considers the formal consequences of building a wooden cube with edge length -1 , and "Parallelism" by Piet Hein questions the reality of the "mathematical fiction" that is projective geometry. The serious poem "The Definition of Love" by Andrew Marvell applies the same idea, that parallel lines can never meet, to the realm of human emotion. Though these poems seem appropriate for a collection of this nature, I am uncertain about the reason for including Roald Hoffman's poem "Why Does Disorder Increase in the Same Direction of Time As That in Which the Universe Expands?" Though the title is intriguing and bears a footnote attributing it to an article by Stephen Hawking, the title seems to have nothing to do with the rest of the poem. In fact, this brings us to the most serious criticism of the book.

Unfortunately, I do not feel that this book lives up to the subtitle *An Anthology of Marvelous Mathematical Stories, Diversions, Poems, and Musings*. I do not mean to say that the works in the collection are not marvelous. It is in its claim that these stories and poems are *mathematical* that I am afraid the title is misleading. A few of the works in this book, most of which I have mentioned above, have quite explicit connections to mathematics. Furthermore, several of the stories and poems do achieve for me the *feeling* of mathematics even if there is no specific reference to mathematical ideas (and so they are in this way like Rucker's Moddler). For example, Tommaso Landolfi's "Giovanni and His Wife" is really a story about music, not about mathematics at all, but it does for music something akin to what non-Euclidean geometries did for mathematics. However, there does not appear to be *any* mathematics at all in many of the remaining works. Perhaps I am guilty of not practicing what I preach, since I surely tell my students that there is interesting mathematics everywhere, but in comparison to the other three collections this one is by far the least mathematical.

The apparent absence of mathematics in these works may, to some extent, represent a "generation gap". Today computers are such a standard

part of everyday life and typical science fiction stories that I cannot see referring to a story as mathematical simply because of its connection to computers. Of course, I am aware that historically computer science grew out of mathematics, but it seems too much of a stretch to present the groundbreaking "cyberpunk" story "Burning Chrome" by William Gibson in this collection as a mathematical story. Similarly, the poems authored by the computer program Racter which appear here may be interesting from a philosophical point of view, but they do not seem to be especially mathematical.

Even if we consider computer science to be part of mathematics, there still remain many non-mathematical works in this collection. Some stories appear here apparently because they incorporate the "many world" interpretation of quantum mechanics (a standard science fiction plot device and not an especially mathematical one) or because they include the word "improbability" (for I can see no other justification for the inclusion of "The Private War of Private Jacob"). The surrealist fantasy "Gonna Roll the Bones" by Friz Lieber is a good example here, since Frucht explains its connection to mathematics in the preface. In this story we meet a gambler who has an unrealistically strong ability to control small objects that he throws (allowing him, for instance, to achieve any desired outcome from a roll of dice). Frucht explains that this story appears in this collection because gambling with dice "is one of the wellsprings of probability theory" and because the gambler's incredible skill at throwing is a "playful anticipation" of what chaos theorists would later call "sensitive dependence". I agree that because of these things one can discuss the story from a mathematical perspective, but the story itself does not seem mathematical.

Many works of mathematically oriented fiction have been published since 1987, and I was disappointed that so few of them are represented here. Frucht seems to have predicted this reaction, asking readers who "find this anthology frustratingly incomplete" to send him suggestions by e-mail. Perhaps it is already time for another such collection. Those who enjoy leisure-time reading with a mathematical slant may appreciate this book, but they should be aware that this editor seems to have put greater emphasis on finding things that he considers "marvelous" than things that are "mathematical".

Acknowledgments

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