5-2015

Book Review: How to Bake Pi: An Edible Exploration of the Mathematics of Mathematics

Darren B. Glass
Gettysburg College

Follow this and additional works at: https://cupola.gettysburg.edu/mathfac

Part of the Applied Mathematics Commons, Logic and Foundations of Mathematics Commons, Mathematics Commons, and the Other Physical Sciences and Mathematics Commons

Share feedback about the accessibility of this item.

Book Review: How to Bake Pi: An Edible Exploration of the Mathematics of Mathematics

Abstract

If you think about it, mathematics is really just one big analogy. For one example, the very concept of the number three is an drawing an analogy between a pile with three rocks, a collection of three books, and a plate with three carrots on it. For another, the idea of a group is drawing an analogy between adding real numbers, multiplying matrices, and many other mathematical structures. So much of what we do as mathematicians involves abstracting concrete things, and what is abstraction other than a big analogy? [*excerpt*]

Keywords

mathematics, philosophy of mathematics, theory of mathematics

Disciplines

Applied Mathematics | Logic and Foundations of Mathematics | Mathematics | Other Physical Sciences and Mathematics

Book Review: *How to Bake Pi: An Edible Exploration of the Mathematics of Mathematics*

DARREN GLASS

If you think about it, mathematics is really just one big analogy. For one example, the very concept of the number three is an drawing an analogy between a pile with three rocks, a collection of three books, and a plate with three carrots on it. For another, the idea of a group is drawing an analogy between adding real numbers, multiplying matrices, and many other mathematical structures. So much of what we do as mathematicians involves abstracting concrete things, and what is abstraction other than a big analogy?

It therefore isn't all that surprising that mathematicians seem fond of using analogies to describe mathematics itself. A quick Google search will show that many words have been written describing how doing mathematics is similar to playing a musical instrument, going to the gym, learning a foreign language, falling in love, climbing a ladder to the moon, and eating ice cream. My personal favorite writing on this topic is an article from a 2003 issue of *The Believer*, in which Jordan Ellenberg describes how mathematics is analogous to mountain climbing but is not analogous to competitive hot dog eating. Eugenia Cheng's analogy of choice is that mathematics is similar to baking, and she has written a book about this analogy entitled *How to Bake π: An edible exploration of the mathematics of mathematics*, recently published by Basic Books, which is almost certainly the first book ever written about baking and category theory.[1]

Yes, you read that right. Baking and category theory. Cheng is a category theorist by training, but is also deeply interested in the popularization of mathematics. In addition to a series of YouTube videos that she has made that give a semi-technical introduction to category theory for mathematicians, Cheng has gotten attention in the media for articles she has written about how to use math to make a perfect doughnut or to optimally combine jam, clotted cream, and scones.

How to Bake π is a book for general audiences and not for the type of person who is likely to be reading book reviews on the MAA's website. While Cheng tackles lots of interesting ideas from mathematics in her book, she mostly does so at a pretty low level and it is unlikely that many undergraduate math students, let alone professional mathematicians, will gain new mathematical insights from the book. And while the meta-level ideas about the analogies between ideas in cooking and ideas in mathematics as well as the more general thoughts about abstraction and mathematics were interesting, I think that most readers of MAA Reviews would find them more appropriate to a short article than a 250 page book. But we are not the target audience for Cheng's writing.

Each chapter begins with a recipe, which Cheng then uses to motivate the mathematics that follows. For example, a chapter that discusses mathematical generalizations begins with a recipe that she developed for a gluten-free, dairy-free, sugar-free, paleo-compatible "Olive Oil Plum Cake." She writes that "it's not really a cake — it's a *generalization* of a cake. It has things in common with a cake… but is still somehow not quite the same as a cake." The chapter goes on to discuss how non-Euclidean geometries are generalizations of the geometry that the reader is familiar with and how our normal notions of distance can be generalized to scenarios that mathematicians might think of as Hamming distances and taxicab metrics.

Another chapter discusses how some mathematics is created in order to solve a particular problem while other mathematics is developed on its own and applications are searched for after the fact. She refers to this as Internal-vs-External motivation and leans heavily on the analogy with how sometimes a chef goes shopping for ingredients for the recipe they want to cook and other times a dish is developed to use the ingredients one has in their pantry, such as the Chocolate and Prune Bread Pudding she developed, whose recipe is included in the book. Even from these descriptions you can probably tell that Cheng truly enjoys and is very thoughtful about her cooking, her mathematics, and her expository writing, and as a reader I enjoyed seeing where she would go next.

While the first two-thirds of the book introduce many different topics in mathematics and discuss Cheng's general philosophy of mathematics, the last third zeroes in on category theory, which Cheng describes as "the process of working out exactly which parts of math are easy, and the process of making as many parts of math easy as possible." She describes category theory as being more about the relationships between objects than about the objects themselves,

which (it probably won't surprise you to learn) she compares to the idea that a lasagna is a certain relationship between noodles, sauces, and cheese despite the fact that your specific sauce recipes may be different from mine.

She goes on to discuss various notions of sameness, structure, and universal properties, and manages to do so while keeping the book quite readable and light in tone even as the actual content gets increasingly technical. Again, I suspect that the lack of rigorous definitions or technical depth will probably leave most of you reading this review pretty unsatisfied with Cheng's book, but there are still some very interesting expository and philosophical ideas in the book.

Put another way: This is the best book imaginable to introduce someone who doesn't think they are interested in mathematics at all to some of the deep ideas of category theory, especially if they like to bake.[2]. However, I can't help but feel that the target audience for this book is very small (in particular, I cannot think of a specific person I would give it to as a gift), and that most people would rather keep their Julia Child separate from their Saunders MacLane.

Notes:
1. It is worth noting that in what must be a strange coincidence, there is actually another book about math and cooking coming out this spring, as Jim Henle's *The Proof and The Pudding* is being published by Princeton University Press this April.
2. Yes, Basic Books, you can use that quote as a blurb.

Darren Glass is an Associate Professor of Mathematics at Gettysburg College. While he likes to cook Mexican food and Indian food, he has never been a very good baker and his waistline probably thinks he should keep it that way. He can be reached at dglass@gettysburg.edu

http://www.maa.org/press/maa-reviews/how-to-bake-pi-an-edible-exploration-of-the-mathematics-of-mathematics