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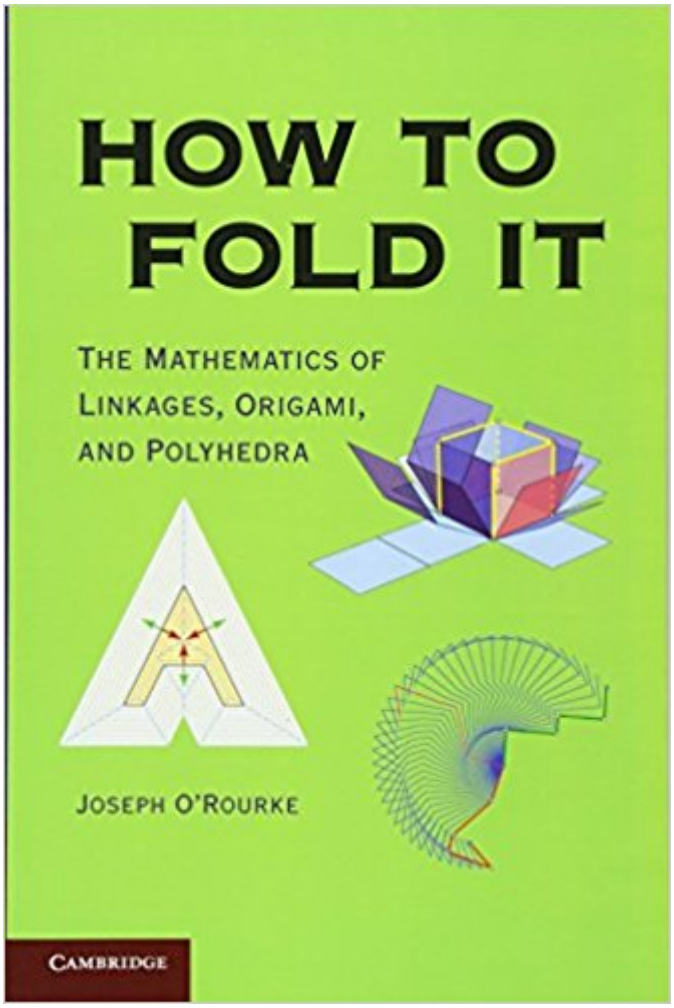
How To Fold It: The Mathematics Of Linkages, Origami, And Polyhedra



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Synopsis

What do proteins and pop-up cards have in common? How is opening a grocery bag different from opening a gift box? How can you cut out the letters for a whole word all at once with one straight scissors cut? How many ways are there to flatten a cube? You can answer these questions and more through the mathematics of folding and unfolding. From this book, you will discover new and old mathematical theorems by folding paper and find out how to reason toward proofs. With the help of 200 color figures, author Joseph O'Rourke explains these fascinating folding problems starting from high school algebra and geometry and introducing more advanced concepts in tangible contexts as they arise. He shows how variations on these basic problems lead directly to the frontiers of current mathematical research and offers ten accessible unsolved problems for the enterprising reader. Before tackling these, you can test your skills on fifty exercises with complete solutions. The book's Web site, http://www.howtofoldit.org, has dynamic animations of many of the foldings and downloadable templates for readers to fold or cut out.

Book Information

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Customer Reviews

"The major theorems presented are remarkable - results that may surprise the reader include the fact that, with the right folds, any shape or collection of shapes (even ones with holes in) that is composed of straight lines may be cut out from a sheet of paper with just a single cut." Martin Smith, London Mathematical Society Newsletter"Readers learn firsthand how the right way of looking at the right question potentially launches new fields of mathematics." D.V. Feldman, Choice Magazine"... a great book for someone who wants to learn about the mathematics behind origami without being

overwhelmed by the mathematics itself. This is a great book for a high school or undergraduate student to get introduced to the open problems in computational origami." Brittany Terese Fasy & and David L. Millman, SIGACT News

With the help of 200 color figures, Joseph O'Rourke helps readers discover mathematical theorems through folding paper. He explains these fascinating folding problems starting from high school algebra and geometry and introducing more advanced concepts in tangible contexts as they arise. The book's Web site, http://www.howtofoldit.org, has dynamic animations of many of the foldings and downloadable templates for readers to fold or cut out.

The random pages from "Click to Look Inside" were good enough for me to order this book, and I was not disappointed. Good illustrations, good math, and good writing on every page.For example, on page 138, he asks for the polyhedra other than a cube which can be folded from a Latin cross. He shows 7 tetrahedra, 3 pentahedra, 4 hexahedra, and 6 octahedra. He explains that this was unknown territory that he ventured into with 5 college students, and they made these discoveries.Most of the book concerns older problems, such as linkages and origami, but there was plenty of newer material, such as robot arms and protein folding.The supporting website is howtofoldit.org, which has some animations. Excellent book. Recommended.

O'Rourke is clearly one of those exceptionally gifted teachers who enjoys making complex ideas intelligible and exploring his subject matter with the reader. This is a fascinating and beautifully executed introduction to the mathematics of various folding structurs - O'Rourke provides a rigorous and stimulating explanation accessible to the mathematically interested lay reader.

I found this to be an interesting read. The illustrations are good, and I found the writing clear and easy to understand.A good book, I would recommend it.

This clever and enjoyable book meanders across a surprising range of topics. It starts by discussing the mathematics of robot arms, with sidebars that define and explain the vocabulary of mathematical proof. After the abstract elements, it adds notions like limits on the angles at which joints can bend, and the idea that a robot arm can't pass through itself. This of course (?!) introduces the biological problem of protein folding, again reduced to its core abstractions.From the jointed connections of robot arms, O'Rourke moves on to linkages, like the pantographs you see on

top of electric trains. It's easy to forget, in our digital age, that mechanical control once depended on the cleverness of engineers to turn the motion of a revolving shaft into the complex actions that would, for example, mechanically fold a box - or write someone's name. The author then translates this into paper pop-ups. That's where paper folding starts ...You get the idea. Each step in this narrative seems to follow naturally from the one before. Only in retrospect does the trip from protein structure to the Miura fold of a satellite's solar array seem improbable. The readable but fairly rigorous analysis in each discussion shows the mathematical richness of each structure. This neatly inverts the usual question about math: what's it for? Here, analysis and theory arise from physical structures, instead of residing in some realm of pure thought.Still, there's only so much any author can cram into about 175 profusely illustrated pages, Each section seemed like a bare introduction, leaving me hungry for more - or at least for references that could sate the thirst this stirs. It's a great way to show how theoretical questions arise from real-world observations, and an introduction to some startling but approachable conclusions.It just doesn't go far enough in any of its many directions to instil a real sense of satisfaction, though.-- wiredweird

I love origami and have always been curious as to the mathematical/scientific principles behind it. This book describes in depth the multitude of folds and angles involved in any folding project. It is a little beyond what I was looking for, giving super-detailed, extremely technical descriptions of the art of paper folding and then some. If you are looking for an explanation of folding, involving advanced mathematics, this is the book for you.I really enjoyed Chapter 5 which includes some cool cutting projects - I call them "one-cut wonders" - they are available in template form on the book's webpage. Fun!!!

Received this book as a christmas gift. I was pleasantly surprised to find good, quality binding and exquisite colored pictures to go along with the book. I thought it might be black and white but nope it isn't! The book is an easy but interesting and challenging read so far. A definite buy!

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