

# Nieuw Archief voor Wiskunde



## Boekbespreking

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G. N. Frederickson  
Hinged Dissections  
Swinging & Twisting  
Cambridge University Press, 2002  
287 p., prijs £35.00  
ISBN 0-521-81192-9

Review by Helena Verrill

Anyone interested in recreational mathematics, especially geometric puzzles, will enjoy this book.

In his previous book, *Dissections: plane and fancy*, Frederickson collects all sorts of plane dissections. His new book focuses on the special case of hinged dissections. These books complement each other, but are independent; the only background required is elementary high school geometry.

Given two equal area polygonal figures, or unions of polygonal figures,  $A$  and  $B$ , the dissection problem asks if there is a dissection of  $A$  into polygonal pieces which can be rearranged to form the figure  $B$ . That this is always possible was proved by Wallace, Bolyai and Gerwien in 1831–33. For the hinged dissection problem, each piece of the dissection must be joined to another piece by a hinge, that is, each piece of the dissection must have a point in common with some other piece, and this point must remain a common point of the pieces as they are moved to transform from  $A$  to  $B$ . When unfolded, the pieces form a chain of polygons. A relatively simple example is the four piece hinged dissection transforming a triangle into a square.

Whether there is always a hinged dissection relating two figures of the same area is still an open problem, which

this book does not attempt to tackle. Rather, it is organized into chapters on various classes of examples and methods of producing hinged dissections. For example, hinged dissections involving only squares and rectangles; hinged dissections constructed by superimposing tessellations; hinged dissections of regular polygons and stars.

There are chapters on various generalizations, e.g., allowing flipping two pieces about a point in common. Related problems, such as colorings of hinged dissections, and the analogous three dimensional problem, are also discussed.

The book is richly illustrated, with several pictures on almost every page. There are a good number of puzzles throughout the text, with solutions at the end. Also many open problems are given.

The author has researched in detail the history of hinged dissection problems, and includes an extensive bibliography, making this an invaluable source book for anyone interested in dissection problems.

Physical models of hinged dissections can easily be constructed with paper, thread and tape, and teachers will be able to use these captivating geometrical puzzles to help their students understand and appreciate basic geometry.

Pictures and photographs relating to the book can be found at: [www.cs.purdue.edu/homes/gnf/book2.html](http://www.cs.purdue.edu/homes/gnf/book2.html)