Rezensionen

Elem. Math. 68 (2013) 44 – 44
0013-6018/13/010044-1
DOI 10.4171/EM/218

Elemente der Mathematik

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M. Akveld, A. Jobbings: Knots Unravelled: From String to Mathematics. 129 Seiten, £ 12.00. Arbelos, Shipley, 2011; ISBN 978-0955547720.

Knots Unravelled is a beautiful introduction to the world of knots at a basic level. It is addressed to any enquiring reader from around the age of 12 or 13, so the concepts and ideas are explained in a very intuitive way. Actually, the authors hope that the book finds some place in schools; a keen student should be able to read and enjoy the book without help; while teachers could use it as motivational material for individual learning.

The book is organized in chapters and interludes between the chapters. In the seven main chapters, the authors introduce the reader to the fascinating world of knots. They start by showing that knots are everywhere and all around human history. Next, knots are considered as mathematical objects and the main question of the whole story arises: are two knots equal or different? The definitions given are intuitive (no words about Topology); knot diagrams and Reidemeister moves are the mathematical language and tools used along the whole book.

To answer the above question, some invariants are introduced in the middle chapters of the book, with the aim of distinguishing knots: the crossing number, the unkotting number, three-colourability and the linking number. At the same time, different ways of constructing new knots are explained, e.g. the mirror image, composite knots and links. While doing the tasks in these chapters, the reader will test these invariants with different knots, finding examples of knots that are really distinct, and at the same time appreciating that some of these invariants are not easy at all to compute. Moreover, examples of knots are easily found that can not be distinguished with these invariants. For example, the trefoil is only rigorously distinguished from the unknot in chapter 5 using the three-colourability invariant.

In this way we arrive at the last chapter of the book where a new invariant is introduced, this time much more powerful, the Jones polynomial. Even if it may be the most demanding chapter, it is explained in a very detailed and accessible way, using Kauffman's bracket polynomial. The reader is convinced that the Jones polynomial is really a knot invariant and can distinguish many knots. The chapter finishes with some last comments showing the strength of this polynomial, but also by noticing that this invariant is still not perfect. Further powerful invariants are mentioned, but the story is not finished, so the search continues!

Tasks are an integral part of the main text. Most of them consist of playing with rope or with knot diagrams to be convinced of some fact. The reader is suggested to work them carefully to get a good understanding. Solutions are provided at the end of the book.

The interludes constitute a few examples which show very different aspects of knots, for instance tie knots, or knots with only two contact points with the plane. The interested reader may consult the suggested references.

Most likely, the reader will want to know more about knots, and will be ready to embark into a deeper learning of this world.

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This is a reprint of a review published on-line by the *European Mathematical Society*.

Typesetting & Layout : *mathScreen online, CH-4123 Allschwil*