

# Puzzles for Xiamen

## A dedication

The puzzle collection of Barbara and Claus Michael Ringel was dedicated (after the sudden death of Barbara in 2016) to Xiamen University, so that the collection will find a permanent home and is available for the public.

Puzzles are always a source for pleasure and provide challenges. But puzzles can also help to advance mathematical thinking. Many puzzles have surprising solutions and foster in this way lateral thinking.

The aim of the collection was to look for puzzles with a mathematical background in order to have available as many examples as possible so that one may study the effect of variations and alterations. The puzzle collection features mainly puzzles (as well as related books) which illustrate mathematical ideas. Puzzles which serve to train dexterity or which are based on hazard have been neglected. The books (mostly unfortunately in German, few in English) provide information and solution for some of the puzzles and promote mathematical awareness.

When I met Barbara in 1972, a Soma cube was on her table and she challenged me to rebuild it. In the same year, being guest lecturer at Darmstadt, I appreciated the usual lunch gatherings of the algebra group, with small informal lectures, but, at the same time, with the possibility to play with giant Pentomino pieces.

Later, when Barbara and me lived together, there always were puzzles around; the new ones in the living room, the remaining ones on shelves and in an ever increasing number of boxes. We read with enthusiasm the columns by Martin Gardner and tried to make copies of all the puzzles which he discussed. In our house, puzzles served as a pleasant diversion at the typical wine-and-cheese parties after a colloquium lecture. It was interesting to see experienced mathematicians arguing about the impossibility to solve some rather easy puzzles. Insight into puzzles does not always follow class distinction.

Our children were not surprised when they found us on week-end mornings still in bed — playing with puzzles. For them, puzzles were part of their life and they asked to keep some of them (thus the Xiamen collection is not really complete).

The collection was used by Barbara and me for teaching students and for training teachers: Math teachers should be aware of the mathematical concepts behind the various puzzles. For several years, I gave once a year a public lecture about the mathematical background of some puzzles. And I always tried to include references to related puzzles in courses on linear algebra and analysis, on algebra, on combinatorics and on topology. Puzzles are not only part of recreational mathematics, but they can serve very well to illustrate mathematical problems, say concerning sphere packings, symmetries and breaks of symmetries, as well as sequential algorithms. Felix Klein has pointed out the role of the platonic solids in algebra and many puzzles exhibit very well their properties.

The puzzles were collected worldwide. It took some effort to convince the Bielefeld tax office that buying puzzles was not just a bee in our bonnet. On the other hand, it always was quite difficult, to buy specific puzzles, and, unfortunately, the number of shops selling puzzles has decreased tremendously, throughout the last 40 years. There are some small manufacturers which now can be contacted via the internet (but they are proud of their new creations, thus rarely they will sell well-established, but old-fashioned puzzles). Some places are famous for selling puzzles: Village Games in London's Camden Lock, Hakone in Japan, the Jeux Descartes shops throughout France. In Germany, the best time to buy new puzzles were always the last weeks of a year, since any Xmas market tries to include some puzzle seller.

When I decided to give a one-term seminar for teacher students devoted just to puzzles, it turned out that this was really hard work. A big problem was to balance the time between introducing a puzzle and discussing the solution. In principle, the participants should find the solutions on their own, and only few hints should be given — but this may need a lot of time which is not available in a course.

It is important to be aware of the mathematical structures which are seen in nature, in architecture, in arts and in music. Since some of the puzzles exhibit these structures as in a nutshell, they are an ideal tool for training mathematical thinking and fostering mathematical awareness.

I should add my appreciation to the long standing collaboration with Yanan Lin. It started during his time at Bielefeld, where he got his PhD, and continued throughout the years. I always was happy about his advice concerning puzzles (and puzzle shops). I am very grateful that Yanan Lin now takes care of the collection.

Bielefeld, Jan 1, 2019

Claus Michael Ringel

## Barbara and Claus Michael Ringel

Barbara Ringel was born in Dusseldorf in 1951, Claus Michael Ringel in Zwickau/Sachsen in 1945. They met in 1972 in Tübingen and married there in 1974. They first lived in Mondorf, near Bonn, and moved to the Bielefeld region in 1978.

Barbara had studied at the University of Tübingen and was high school teacher for mathematics and history, first at the Gesamtschule Schildesche, later at the Helmholtz-Gymnasium, at Bielefeld. She gave advanced training courses for teachers at various places, with focus on the use of computers and on hands-on activities. In her last years, she organized seminars for teacher students at the University of Paderborn.

Claus Michael studied philosophy, mathematics and physics at the University of Frankfurt/Main. After a two year stay at Carleton University in Ottawa/Canada, he became Associate Professor at the University of Bonn from 1974 to 1978, then Full Professor at Bielefeld University. He is an algebraist, his main interest lies in the representation theory of finite-dimensional algebras. From 2001 to 2007, he assisted Jürgen Frese in organizing a seminar on the philosophy of A. N. Whitehead at Bielefeld University. At various occasions, he gave lectures on brain-teasers and puzzles, stressing their importance in mathematical education.

Barbara and Claus Michael have published several papers on puzzling phenomena, in particular one on the mathematics of the panoramic photos. Both Ringels have visited China quite often. Around the turn of the centuries, a network between Chinese and German universities devoted to the Representation Theory of Algebras was established by Professor Liu Shao-Xue from BNU and Claus Michael Ringel. Later, he was Visiting Chair Professor at SJTU, for six years.

Barbara died in 2016, Claus Michael is still alive.