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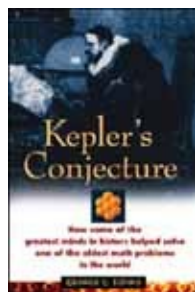
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May 2003

Reviews

## 'Kepler's Conjecture'

reviewed by Helen Joyce



## Kepler's Conjecture: How some of the greatest minds in history helped solve one of the oldest math problems in the world

By George Szpiro

George Szpiro has a most unusual day job for someone writing about the abstract world of pure mathematics. Although he first studied maths at university, he has been a political journalist now for a number of years, working as Israel correspondent for NZZ, a Swiss daily. He wrote this book at night, after the paper's deadline, and as it was being finished lost one of his closest friends in a suicide bombing. The contrast between sphere packings in three dimensions and his daytime subject material must often have struck him.

The story of Kepler's Conjecture from the 1590s to the present day is told here via the stories of those who worked on it. Kepler – the great astronomer who discovered that the planets travel on elliptical paths – conjectured that the most efficient way to pack spheres in three-dimensional space (ie the way that wasted least space) was the familiar way that greengrocers stack oranges. But the world had to wait until the late 1990s for a proof, and not for lack of mathematicians trying.

The eventual proof of Kepler's Conjecture in 1998 was computer-aided, as, notoriously, was the proof in 1976 of another famous longstanding problem; the Four Colour Theorem. (You can read the story of the Four Colour Theorem in "Four Colours Suffice", [reviewed in this issue of \*Plus\*](#).) The use of computers in the earlier

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proof invalidated it in the eyes of many contemporary mathematicians. But times have changed, and that of Kepler's Conjecture was solicited for publication in the *Annals of Mathematics*, probably the most prestigious mathematical journal of all. At the time of publication of this book the refereeing process had been going on for years and was still not complete.

Szpiro's writing style is, unsurprisingly, journalistic, and he pays particular attention to some distinctly unmathematical details, such as the fact that the father of one protagonist (John Conway) taught Paul McCartney and John Lennon chemistry in school! As well as making for an entertaining read, his concrete approach is particularly helpful in the analogies that often, by design, replace formal proofs. To give a rather gruesome example, circle covering – covering the plane as efficiently as possible with circles – is vividly described by analogy to carpet bombing – how many bombs will you need to scorch the earth, given that a bomb's blast radius is circular, with as little waste (of bombs, not human life, of course) as possible?

Mathematics seems passionless to outsiders, but Szpiro's descriptions of the various false leads and failed attempts to solve the Conjecture will quickly persuade the reader otherwise. The disagreements, the struggles for precedence, the personalities, the insane persistence and dedication that is doing mathematics research, come through very clearly.

Mostly, the proofs are presented in a conversational and evocative, rather than fully rigorous, style, and they are set in different type so that less mathematically trained readers can skip them completely if they wish. Most of the rigorous mathematics is banished to the plentiful appendixes. The final chapter, "This is not an epilogue", gives lots of open problems and applications of packing, and describes recent developments in related areas.

This book is built on solid historical and journalistic research; Szpiro has spoken in depth to practically everyone involved in the proof over the last few decades. He has created an unusual, enjoyable and accessible account of this longstanding problem that should appeal to anyone interested in the history of ideas.

You can read an [abridged chapter](#) from "Kepler's Conjecture" in Issue 23 of *Plus*.

### **Book details:**

*Kepler's Conjecture: How some of the greatest minds in history helped solve one of the oldest math problems in the world*

George Szpiro

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