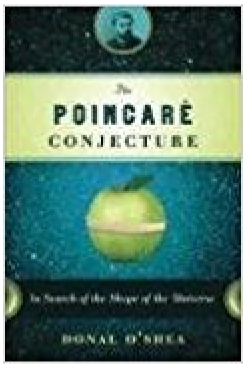
The Poincare Conjecture: In Search Of The Shape Of The Universe



Synopsis

Henri PoincarÃ© was one of the greatest mathematicians of the late nineteenth and early twentieth century. He revolutionized the field of topology, which studies properties of geometric configurations that are unchanged by stretching or twisting. The PoincarÃ© conjecture lies at the heart of modern geometry and topology, and even pertains to the possible shape of the universe. The conjecture states that there is only one shape possible for a finite universe in which every loop can be contracted to a single point. PoincarÃ©'s conjecture is one of the seven "millennium problems" that bring a one-million-dollar award for a solution. Grigory Perelman, a Russian mathematician, has offered a proof that is likely to win the Fields Medal, the mathematical equivalent of a Nobel prize, in August 2006. He also will almost certainly share a Clay Institute millennium award. In telling the vibrant story of The PoincarÃ© Conjecture, Donal O'Shea makes accessible to general readers for the first time the meaning of the conjecture, and brings alive the field of mathematics and the achievements of generations of mathematicians whose work have led to Perelman's proof of this famous conjecture.

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Customer Reviews

The reclusive Russian mathematician Grigory Perelman became a minor media celebrity last summer when he refused the prestigious Fields medal, awarded every four years to a mathematician under the age of 40. Perelman had succeeded in solving the PoincarÃ© conjecture, named for 19th-century French mathematician Henri PoincarÃ©, and which contemporary cosmologists believe has implications for our understanding of the shape of the universe. O'Shea, a professor of mathematics at Mount Holyoke College, begins his account of the long and contentious search for a solution to the puzzle by looking at how we came to understand the shape of the Earth, beginning with the Greeks, in particular Pythagoras and Plato. Writing for generalist science buffs, O’Shea gives a brief course in geometry and in topology and the topological structures called manifolds that are the basis of PoincarÃ©’s puzzle. Inexplicably, however, O’Shea doesn’t give readers a formal statement of the conjecture itself until well into the book. O’Shea describes mind-bending structures in topology as clearly as most of us can describe a cube, but readers will need to do a little Wikipedia-ing first to find out just what it is they’re reading about. Illus. (Mar.)

Euclid’s Elements is historically the most popular mathematics book ever written, but one thing about it nagged its readers: its postulate that every line has exactly one line parallel to it. Doubt about the postulate’s truth is O’Shea’s starting point for this accessible if challenging presentation of a famous problem ultimately rooted in the parallel postulate. The great mathematician Henri Poincare (1854-1912) spent years investigating the implications of non-Euclidian space. Aided by diagrams and analogies, O’Shea, a professional mathematician, explains non-Euclidian spaces, populated by objects technically called manifolds and n-spheres (n means the number of dimensions), which leads to Poincare’s conjecture, verbatim: "Is it possible that the fundamental group of a manifold could be the identity, but that the manifold might not be homeomorphic to the three-dimensional sphere?" Readers defeated by such language, despite O’Shea’s valiant nonnumerical clarity, can yet digest the author’s connection of the conjecture to the shape of the universe, the biographical portraits that animate his text, and the drama of the conjecture’s proof, announced in 2006. Gilbert Taylor

This book performed the impossible. With it, I was able to understand the purpose of the field of topology much better than with the efforts of the professors who tried to teach me it. I don’t understand why mathematicians explain the beauty of mathematics in such obscure ways. This book capure the beauty of mathematics and makes them accessible to the general reader

A complex subject explained beautifully. Recommended for scientific minds.

Writtemn well, with a special effort to introduce rather complicated complicated concepts in a simple, yet not vulgar, way.Some "srengthening" of philosophical and (meta) physical aspects could do good to this exposition.Recommended.

This was a fascinating and accessible exploration of topology in general carried by the history of the field.

The book is excellent and worth rereading. But should fix those illustrations which are too small that enlarge into pixelated nothings. Is geometry spelled with acute first e intentionally to denote the structure rather than the area of study? If so it isn’t clear and I never saw it elsewhere. Does the printed book have this? And fix the years which start with i instead of 1.

it triggered my initiative for understanding of geometry and topology. Also I appreciate the author’s view of historical scope.Those introduction of poincare and handsome klein is really intriguing for those who don’t search for math history

Really enjoyed this one, great explanations of tricky concepts

Lee Carlson’s review casts some doubt about the validity of Perelman’s proof, but this is not what the mathematical community of experts is saying. Even the people who have filled in the details of Perelman’s proof agree that all the merit is his. As this book shows, Morgan clearly states in his address in the ICM in Madrid that Perelman proved the PoincarÃ©’s conjecture and much more (Thurston’s conjecture) and introduced new methods that will be used by many mathematicians in the coming years.O’Shea’s book is a good complement to Szpiro’s. O’Shea is more encompassing and starts the history of the conjecture going back as far as Babylonic mathematics. It only gives the biography of PoincarÃ© in page 111 and misses some of the details of the controversy provoked by Yau and explained in detail in an article in New Yorker and also in the book by Szpiro. It also has some more technical details, but both books are good reading for a mathematically educated reader.

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