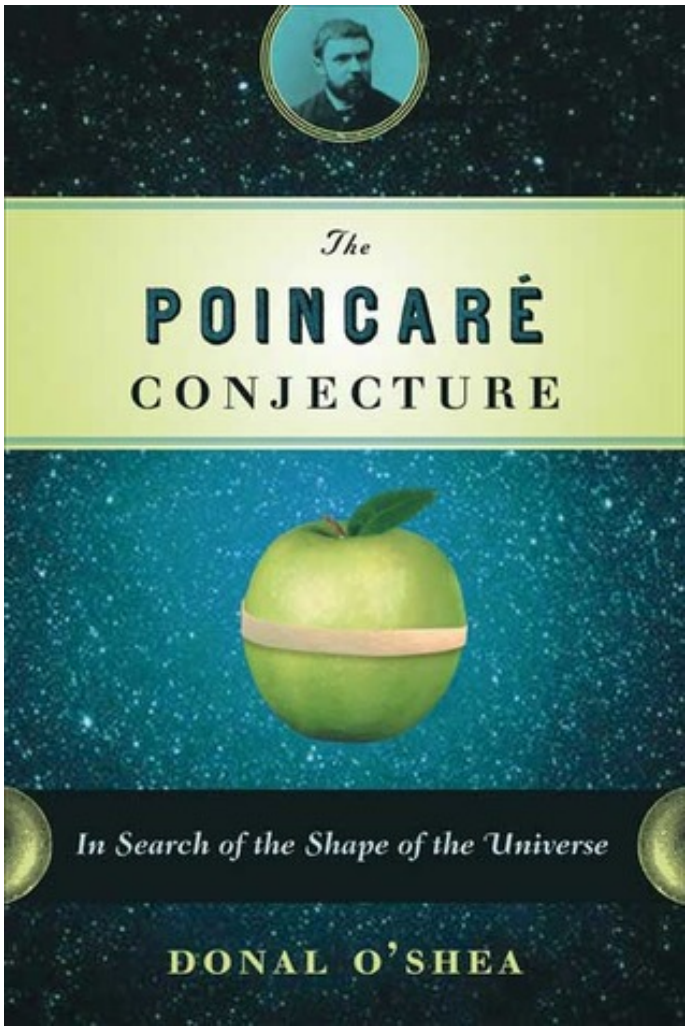
Donal O'Shea

The Poincaré Conjecture: In Search of the Shape of the Universe



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Author: Donal O'Shea

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Description

Henri Poincaré 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 Poincaré 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.

Poincaré'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 Poincaré 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.

Insightful reviews

Pasteurisiert: Wie falte ich Landkarten, die eine endliche Oberfläche darstellen jedoch noch Ränder haben, zu einer endlichen, randlosen sphärischen Oberfläche (=Globus) zusammen? Das kann man sich noch irgendwie vorstellen. Aber wie erzeuge ich aus zwei Kugeln (endliches Volumen mit Rand, nämlich der Kugeloberfläche) eine Dreisphäre, die ein endliches Volumen hat, aber keinen Rand???

Mit sowas und noch viiiel komplizierter befasst sich heute die Mathematik und unterstützt dabei die Physik und die Astronomie.

Nein, man (der Ottonormalverbraucher) muss das sicher nicht verstehen, um dieses hervorragende Buch zu lesen. Donal O’Shea nimmt uns mit auf einen spannenden Streifzug durch die Geschichte der Geometrie und Topologie. Es beginnt mit vorerst noch nachvollziehbaren mathematischen Entwicklungen und dem historischen Umfeld der genialer Mathematiker aller Epochen.

Fantastische Visionen tauchen auf: ist die Erde eine Scheibe, eine Kugel oder etwa ein Torus? Wie finde ich das heraus ohne fliegen zu können? Ist unser Universum endlich oder unendlich und komme ich, wenn ich in unserem System starte wieder dorthin zurück, auch wenn ich nur geradeaus fliege? Wenn ich vom Eiffelturm aus tief genug in den Weltraum sähe, würde ich unsere Erde dort irgendwo erblicken – und wenn ja, dann einmal oder sogar mehrmals?

Nein, dies ist kein Buch für abgehobene Mathematiker, sondern ein schönes Geschichtsbuch um den Kern einer Wissenschaft, die so alt ist wie das Zählen, und geeignet für ein breites Publikum.

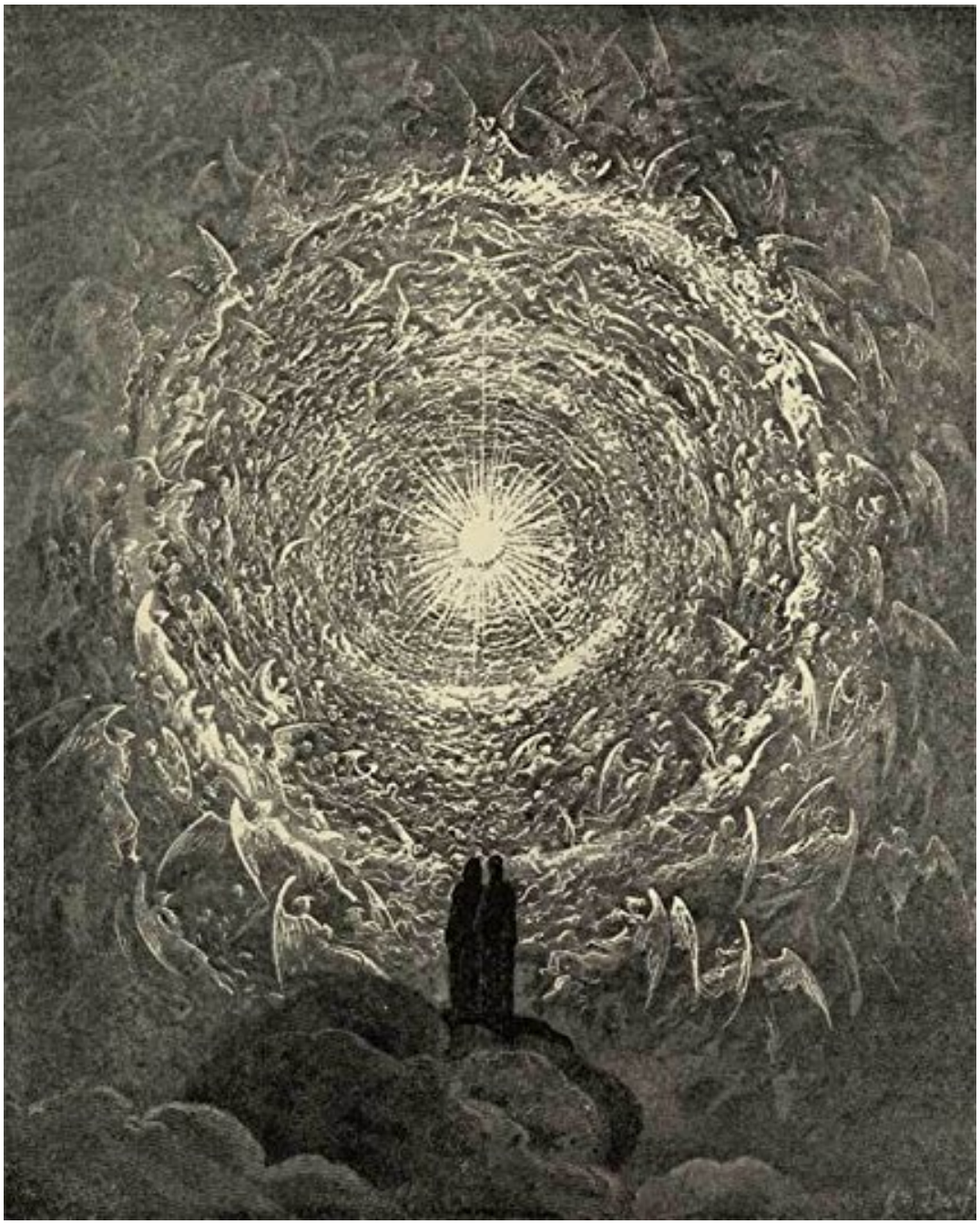
Nach vergnügtem Pasteurisieren gebe ich diesem Buch 5 von 5 Sternen. Ich habe viel gelernt und viele unterhaltsame Diskussionen mit Freunden und Kollegen dazu gehabt… alle, mich eingeschlossen, sind keine Mathematiker.

Vilém Zouhar: This book was in the 'mathematics' section in the library and I was expecting something more mathematics focused. Hence I was disappointed by the history lesson this book turned out to be. Except for the initial confusion, it was a nice read.

Manny: My meeting with this book fell considerably short of love at first sight. Not saw it on sale yesterday at a Melbourne bookstore and asked if I thought it might be interesting. I picked it up, glanced at the less-than-brilliant cover and leafed through it for a minute or two; the writing seemed lackluster and the first anecdote I found was one I'd seen before. I was about to put it back when I reconsidered. It cost $10 and was evidently an easy read. I'd always wondered what the deal was with the mysterious Poincaré conjecture. Why not find out?

Well, I couldn't have more wrong: this is a truly excellent book. The bare bones of the story are easy to summarize. The Poincaré conjecture, formulated in 1900 by Henri Poincaré, states cryptically that "every simply connected, closed 3-manifold is homeomorphic to the 3-sphere". It remained an important unsolved problem for about a century, until it was proved correct by the reclusive Russian mathematician Grigori Perelman. Perelman was awarded two of the most prestigious prizes in mathematics, but turned them down.

On that description it doesn't sound very interesting, but the author makes it come alive; he's done a huge amount of background reading on both the mathematics and the history, and when he puts it in its historical context you see how fascinating it is. Well over half the book is a history of geometry, starting from its foundations in antiquity with the Babylonians, Pythagoras and Euclid. O'Shea, a cultured mathematician with an intense interest in the history of his subject, gives you plenty of material on the Greeks (did you know there's a mistake in the proof of Euclid's Proposition 1?), then traces how their work was passed through the Arabs to Renaissance Europe. En route, he finds a delightful way to explain to the non-mathematicians what a "3-sphere" is: it turns out to be the shape of the universe as described in Dante's *Divine Comedy*, two sets of concentric spheres mystically joined at their common surface. He illustrates with a famous picture from Doré:



As he progresses towards the present day, he finds opportunities to introduce the other terms that will eventually be used in the Conjecture, and the narrative starts to focus in on the key concepts: manifolds, connectedness, topology and, above all, non-Euclidean geometry. This is the clearest overview of the subject I've ever seen, and he has a whole bunch of stories and observations I hadn't come across before. One thing I found particularly remarkable was the long guerilla war waged by the 19th century German mathematicians against Kant's conceptions of geometry. I have had several discussions with philosophically knowledgeable people on this site about Einstein's claim to have refuted Kant. What I didn't realize was that it was just the final battle in a campaign that had gone on for a century. Gauss laid the groundwork, but thought it was so controversial that he couldn't publish: at least in Germany, it wasn't possible to openly say that Kant was wrong, and non-Euclidean geometries made

perfectly good sense. But other great mathematicians - Riemann, Lobachevsky and Bolyai - found the same ideas, and they gradually came out in the open. Einstein finished it off: not only is it logically *possible* that the space we live in might be non-Euclidean, it actually happens to be *true*!

Another remarkable story from the end of this period is the intense rivalry between the German Klein (who, I learned, married Hegel's granddaughter) and the French Poincaré, a professional duel which so exhausted them that they both suffered nervous breakdowns as a result. O'Shea, who knows both French and German, includes lovely quotations from their correspondence. By the time we reach 1900 and the formulation of the Conjecture, it all makes perfect sense, and it's obvious why the problem captivated several generations of top mathematicians. I was worried that the last third would be anticlimactic, but my fears again turned out to be groundless. O'Shea hardly loses momentum at all as he goes into the finishing stretch, which involves explaining some horribly difficult mathematics; once again, he finds clever visual analogies to make the esoteric technique of Ricci flow seem reasonable and intuitive. It's obviously impossible to give us the details of Perelman's proof, but he successfully conveys both its general outline and the process which led to its acceptance by the world mathematical community.

At the end, there is the tantalizing mystery: why did Perelman turn down the huge prizes he'd won, and what was the even larger discovery he hinted at, which would make the Poincaré conjecture no more than a stepping stone? If this had been a novel, I would have groaned at the author's unsubtle attempt to set up a sequel, but oddly enough it happens to be real life. Stranger than fiction, you know.

Ron: it is a magnificent read. It needs to be learn as a historic creation to the subject, instead of a good reason for the nonmathematician. There are just too many phrases containing hugely really expert jargon which are tossed approximately for a nonspecialist to keep on with effectively.That said, there's a really nice tale spun here, in regards to the commotion attributable to the answer of a truly not easy challenge within the math community. The beginning of the problem, in addition to the folk involved, are dropped at existence good enough. Unfortunately, the hero of the story, Grigory "Grisha" Perelman, is given a bit of brief shrift, given the significance of his achievement. I admittedly discovered extra of Perelman via a brand new Yorker article in 2006 than I did during this book.That said, the ebook effectively acquired me brooding about topology and the form of our universe. It was once additionally neat to determine my diffrential geometry prof. spoken of very definitely within the book.

Mill: the 1st area of the booklet promises loads of cool information at the form of the universe, Grigori Perelman, and Poincare. yet that is it! simply because after that, it starts off throwing a few fairly pointless paragraphs (and chapters) at the biography of the people. that is what I hate approximately this book: pointless information. a few sections are thoroughly unneeded or even many of the times, it really is someplace you do not anticipate it to be, correct in the midst of a major work!Perhaps for the reason that i am a math significant myself and that i was once trying to find a number of formulation and equations to provide an explanation for it all. Anyways, i have picked up a topology category this time period and i'm going to determine it out extra

intellectually and extra exact.

Claudia: Saggio interessante sulla risoluzione di uno dei 7 millennium difficulties (si vince un milione di dollari consistent with l. a. soluzione di ognuno). Lo scienziato che ha risolto l. a. congettura, il russo Grigori Perelman, ha rifiutato sia il premio in denaro, sia l. a. medaglia Fields, according to l. a. quale ogni matematico sulla faccia della terra penso sia disposto a uccidere.Il libro è abbastanza divulgativo, ma ci vogliono nozioni di topologia according to comprendere appieno di che cosa si stia parlando.

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