

# The Hunt for Vulcan by Thomas Levenson review - Newton, Einstein and the invisible planet

It's a story that has been told many times, but this new take on the revolution in astronomy from Newton to Einstein is a fresh, smartly-paced read

**Tim Radford**

Saturday 10 September 2016 05.00 EDT

Isaac Newton set it up for Albert Einstein: he calculated a system of heavenly motion that governed the entire measurable cosmos. He then added a challenge: a theory, he wrote “that agrees exactly with exact astronomical observations cannot fail to be true.”

He didn't live to find out quite how much frustration that claim would give his fellow astronomers, who identified Uranus, and then from the behaviour of Uranus inferred the existence of another planet, and finally identified Neptune. They relied on Newton's predictions, which were spot on and self-evidently right, all the way to the edge of the solar system - except for one tiny little niggling detail about the planet closest to the sun.

Mercury's orbit precesses around the sun at a rate that cannot be fully accounted for by Newtonian mechanics. The discrepancy is very small, but it isn't an observational error. And since Newton's theory could hardly be wrong, the only answer that made sense was that there must be another small, invisible companion affecting the orbit of Mercury. So sure were astronomers that this companion planet must exist, they even gave it a name: Vulcan.

Vulcan remained a notional member of the solar system right up to November 1915, when Albert Einstein unfurled a theory of general relativity that provided a different and more successful explanation of the phenomenon of gravitational attraction. The Hunt for Vulcan is an object lesson in how science is done, why scientists sometimes get things wrong, and ultimately, why they get things right.

Thomas Levenson's book is one of six finalists in the Royal Society Insight Investment Science Book prize. It is already a winner, in the sense that each of the runners up gets a £2,500 award. But the overall £25,000 winner is to be announced on 19 September by a team of judges led by the author Bill Bryson, himself a Science Book prize winner in 2004.

The other candidates, all previously reviewed in the Guardian, are *The Most Perfect Thing*, by Tim Birkhead (Bloomsbury); *Cure*, by Jo Marchant (Canongate);

*The Planet Remade*, by Oliver Morton; *The Gene*, by Siddhartha Mukherjee (Bodley Head) and *The Invention of Nature*, by Andrea Wulf (John Murray).

Some science books explore new science, or neglected science, or enduring puzzles, or forgotten adventures in science. Levenson's is a fresh, smartly-paced account of a story much of which has already been told in different forms many times and especially last year, on the hundredth birthday of Einstein's theory of General Relativity.

Don't discount it for that. By making Vulcan the star turn, so to speak, Levenson shines a light on how science really happens. Other histories of planetary discovery speed past the mistakes and get to the great achievements. Levenson follows the twists and turns of the Vulcan pursuit - including the newspaper reports, the academic bickering and frustration - and with a light touch delivers serious lessons. One of them, which should be a comfort to us all, is that scientists keep on testing their own assumptions, and questioning their own observations. Yes, if they expect to find something, there is a likelihood that they will see what they are looking for, but they don't like to be the only people to see it. The lesson is that good science is replicable.

The other is that good scientists worry about tiny details: it's not enough to be broadly right. If you can't be dead right then something must be wrong.

So if Newton was consistently right then there must be another explanation for an anomaly in Mercury's orbit: if the missing planet or asteroid hadn't already been seen it must be masked by the sun, in which case it ought to be visible during solar eclipse.

The now-you-see-it, now-you-don't story of Vulcan provides a lot of the fun in Levenson's text, and at the same time introduces unexpected characters (among them Thomas Alva Edison) in a comedy of errors that lasted from 1859 to 1915, or possibly to 1919, when Sir Arthur Eddington observed an eclipse and claimed confirmation of Einstein's predictions (and I am especially grateful for the New York Times headline coverage: "LIGHTS ALL ASKEW IN THE HEAVENS. Men of Science More or Less Agog Over Results of Eclipse Observations.")

New readers who want to learn how the solar system works could profit from this book. Those who think they already know the story of the revolution in astronomy from Newton to Einstein will find episodes new to them. And those looking for a moral will find one nicely phrased: "Science is unique among human ways of knowing because it is self-correcting," writes Levenson. "Every claim is provisional."

● To order *The Hunt for Vulcan: how Albert Einstein Destroyed a Planet and Deciphered the Universe* for £6.55 (Head of Zeus, RRP£7.99) go to [bookshop.theguardian.com](http://bookshop.theguardian.com) or call 0330 333 6846. Free UK p&p over £10, online orders only. Phone orders min p&p of £1.99.

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