

The How and Why of Physics Discoveries



By Rachel Bubb

I really wanted to write about the history of physics discoveries and how they found everything out, starting from how they figured out how the universe works (which we're still figuring out!) To how things you see in everyday life work (like electricity). I hope this book is helpful, interesting, and spurs your curiosity to learn more about all of these things. It's not a complete book on physics, but a good starting point.



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I. Early Discoveries About Our Planet

You might have heard of some famous physicists before like Sir Isaac Newton. Perhaps you've even heard of famous astronomers like Johannes Kepler. Maybe you've heard about the debate from long ago of whether the earth was round or flat. If you think about it, it's a bit crazy that we live on a planet, but we definitely do. You don't feel it move, but it moves. You can't see that it's round (unless you go some place really high like Mt. Everest), but it is.

We're going to go back in time and talk about some early discoveries about our planet and solar system. One of the first people



who thought hard to figure out some of these mysteries was a man named Ptolemy. We don't know a lot about his life because there wasn't much written about him. We know that he was from Egypt and that the first time any mention of him was in 127 AD and the last mention of him was in 151 AD. So he was definitely alive from 127 to 151 AD. He lived in or close to Alexandria, one of the big cities of Egypt at the time, right along the coast of the Mediterranean Ocean.

One of the huge things Ptolemy did was to put together everything that people figured out about our solar system up to that point. Something he pointed out was that the earth was round. How did he come to that conclusion? One of the proofs he gave was that if you see a boat go out to sea, you get to a point where the boat seems to be almost cut off from view. If the earth was flat, you'd always see the boat in the water. Another proof he gave was the stars themselves. If someone went further south, the stars and constellations would get lower and lower

in the sky. If someone went further north, the stars and constellations would be higher and higher in the sky. If the earth was flat, this wouldn't happen- the stars would stay in the same place.

He also said that if the earth was flat, the sun would set at the same time no matter where someone was. However, since the sun set at different times, depending on where you were on the earth, it meant that the earth had to be round. However, they didn't have time zones like we do today and there were no telephones or planes that you could travel fast enough to see the difference of times. He came up with a great plan. He thought that if there was a lunar eclipse, he could ask people in different places to write down the exact time it happened. The times were all different, depending how east or west the person was. This meant that the earth had to be round in order for this to happen.

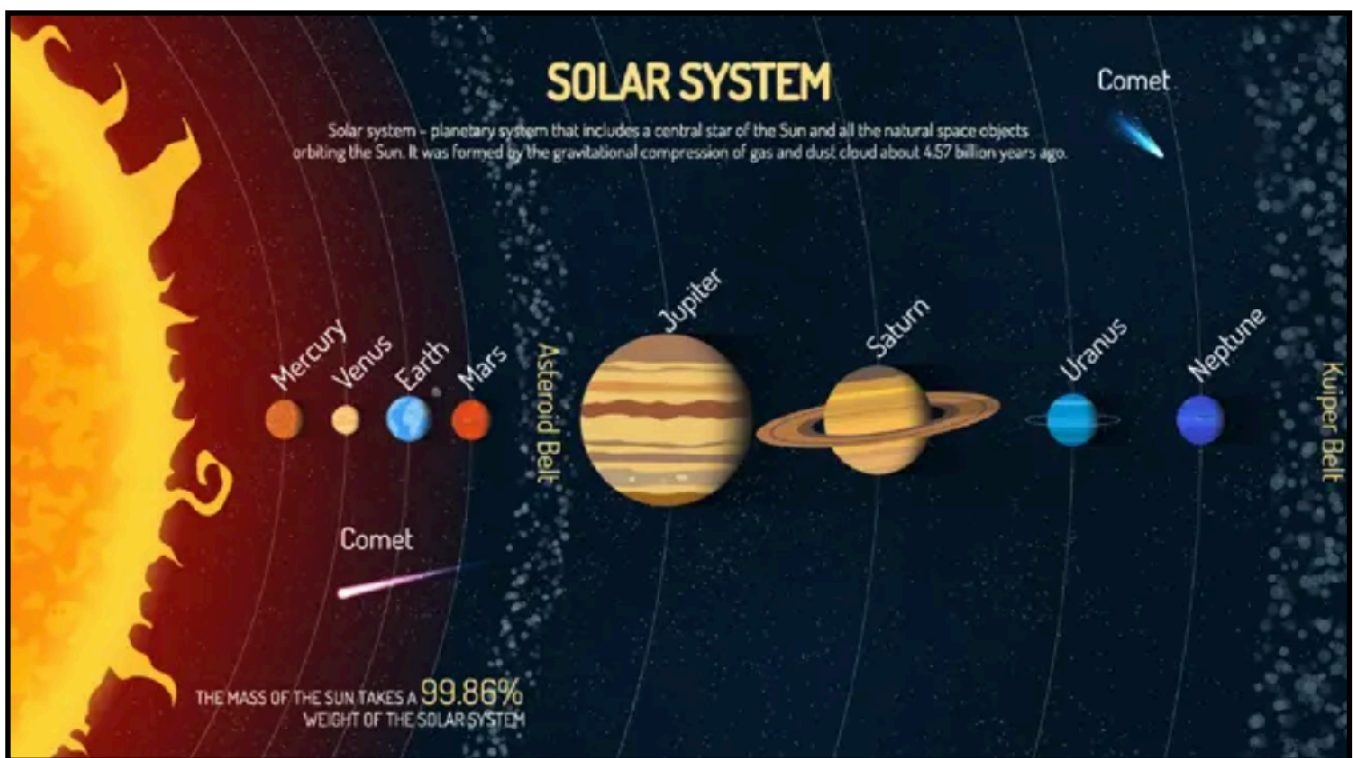
Another idea he struggled with trying to figure out and give proofs for was that the earth was always moving. However, if the earth is always moving, then how can anything stay on it if it moves? Don't we all just fall off of it? He hadn't come up with the idea of

gravity yet. That would come many, many years later. He also didn't realize that the air and atmosphere around the earth moves with it. Sadly, in the end, he couldn't find enough reasons to explain that the earth moved once every twenty-four hours. Since he believed that the earth couldn't possibly move (because it was so big) he came to believe that the earth was at the center of everything. He knew that something had to change in order for there to be seasons and day and night. However, for the earth to move, he reasoned, would be too hard. So he thought that everything else moved around the earth



instead. This belief would continue for many, many years, until the 1500s.

Something they realized at the time of Ptolemy was that the earth was not alone. There were other planets out there. At the time, they knew about Mars, Venus, Jupiter, Mercury, and Saturn. How were they able to figure out which ones were planets and which ones were just stars? One difference they noticed and (something you might notice if you look at night) is that stars twinkle and get brighter and less bright as you look at them. However, planets always shine with the same brightness.



Some of the planets (Jupiter, Saturn, Mars, Venus, and Mercury) people knew about for a long time and many of them are named after Greek and Roman gods and goddesses. Mars was named after the Roman god of war. They thought that since it looked a little red (as far as they could see), it reminded them of war and fighting, so they gave it the name "Mars." Mercury was named after the Roman god of traveling and Venus was named after the Roman goddess of love. Jupiter was the king of the Roman gods while Saturn was the Roman god of agriculture.

When more planets were discovered (especially after Galileo invented the telescope which we'll talk about in the next chapter), they decided to continue naming them with the names of Roman and Greek gods and goddesses. Uranus was named after the Greek king of the gods and Neptune was the Roman god of the sea. Pluto was named after the Roman god of the underworld. How about earth? How did it get its name? Its name was an old English or German word that used to mean "the ground." If you were to choose a name for a planet or a star, what kind of name would you choose?