CosmicFacts

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Scaling down the solar system

Readers of astronomy articles are often bombarded with numbers like trillions of stars, billions of light-years, and 1 x 10^{-32} of a second. Astronomy is certainly a science of extremes. To most of us, these numbers have little meaning. Creating a scale model can often help people understand difficult concepts. Road maps are good examples. Imagine using a provincial road map the size of Alberta! A road map is a scale drawing of the real thing, and can help travelers manage distances and directions. With this concept in mind, let us imagine a scale model of our solar system.

First we must select a scale. For the sake of simplicity, let us say the solar system is shaped like a flat circular object with the Sun at the centre and the planets orbit around the Sun. Let us fix our scale so the distance from the Sun to the outermost planet is one kilometre, which equals 1,000 metres. One kilometre is about the same distance as ten city blocks. Using city block as our scale, the Sun would be the size of a basketball at the edge of the first block. We would only have to walk about ten paces to find the first planet, Mercury. Mercury is the second smallest of the nine planets in the solar system. In our model, Mercury would be about the size of a pin head. The next planet, Venus, would be located about eight more paces along the first block, and it would be the size of a match head. Walk another seven paces and you will find the location of home sweet home; the water world of Earth. Earth is about the same size as Venus. To reach the next planet you will have to walk 13 more paces. This is Mars, and it is about half the diameter of Earth. So far we have walked less than half a block. The next planet will take us from the inner solar system of the small terrestrial planets to the outer solar system of the gas giant planets.

You have to walk through the rest of the first block and one-third of the way through the second block before arriving at the next planet. Here we find Jupiter, king of the planets. In the model, Jupiter would be the size of a dollar coin. If Jupiter is the king, then the next planet is surely the crown jewel. Saturn, with its majestic rings, is a sight to behold. Saturn would be located about half-way through the third block, and would be slightly smaller than a twenty-five cent coin. However, the great rings would have a diameter of two dollar coins. To locate Uranus, we must walk nearly to the end of the fourth block. Uranus is also a gas giant but would be only half the diameter of a dime. After this point you might as well enjoy the scenery, because it won't be until two-thirds through the seventh block that you locate the next planet, Neptune. This planet is very blue in colour and is only slightly larger than Uranus. After visiting eight planets you will have to walk to the end of the tenth block to find Pluto, the smallest planet. Pluto would be the size of the period at the end of this sentence.

This brings us roughly to the edge of the solar system with respect to the planets. Using the same scale model, and assuming these ten city blocks are located in Victoria, B.C., in order to travel to the next nearest star, Alpha Centauri located 3.4 light-years from the Sun, we would have to walk to St. John's, Newfoundland. To travel to the centre of our galaxy, the Milky Way, we would continue the journey for about 107 million kilometres, or equivalent to 2,670 round-world trips. In real distance, the closest large galaxy is located over 20 million billion kilometres (the number 2 followed by 19 zeros) away from us. And there are billions of galaxies in the visible universe. Even our model becomes impractical if we try to scale these distances. So, the next time you walk ten blocks, remember that we live in a very big place.

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