Newsletter 6: Eclipses and Columbus

Today, October 12, Spaniards celebrate Día de la Hispanidad – the day Columbus in 1492 reached the Americas. That discovery did not happen in isolation: it was the result of centuries of knowledge about the movements of the Sun, Moon, and Earth. Without that understanding – gained through the observation of eclipses – Columbus would never have believed that the Earth was round or that Asia could be reached by sailing west.

“The Earth is flat and small”

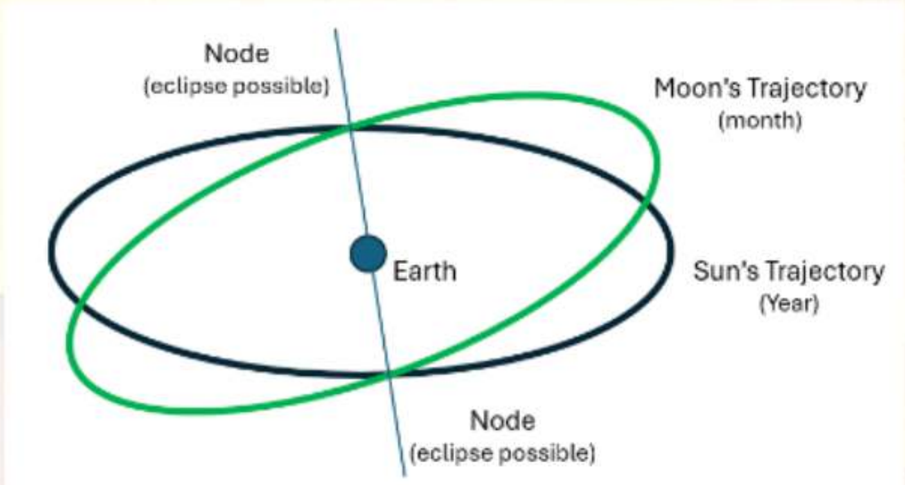
Much of what we think we know about late medieval ideas of the Earth, Sun, and Moon is wrong. We often hear that Columbus’s sailors feared falling off the edge of the Earth, or that people thought Asia could be reached by sailing west because they believed the Earth was small. Both ideas are false.

Columbus’s sailors knew perfectly well that the Earth was a sphere – that had been established since antiquity. Only Columbus himself made a major miscalculation: he underestimated the circumference of the Earth by thousands of kilometers. The advisers to the Spanish monarchs rightly estimated it at about 39,000 kilometers and considered his plan to reach Asia by sailing west impossible to achieve. For six years, he was turned away.

But the stubborn Columbus persisted – and was saved, more by luck than by calculation, by the accident of an unknown continent lying between Europe and Asia. But where did this insight into the size of the Earth originally come from?

Back to Antiquity

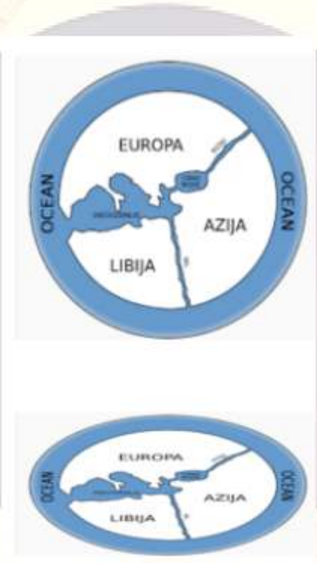
Look up at the night sky and you see the stars slowly moving: over the course of a day, they seem to make a great circle around us. The Moon moves among them too, but more slowly. It completes one circuit in about a month. The Sun follows almost the same path as the Moon, but at a slight tilt, completing its journey in a year. These two paths cross at two points, called the nodes.



On August 12, 2026, the Sun and Moon will both reach one of these nodes. At that moment, they line up perfectly with the Earth – producing a solar eclipse.

This pattern was known thousands of years ago. In 1492, people still believed that everything in the heavens revolved around the Earth. Only for the Moon was that actually true – the rest moves with the Earth itself around the Sun.

The Earth is not a circle but a sphere!



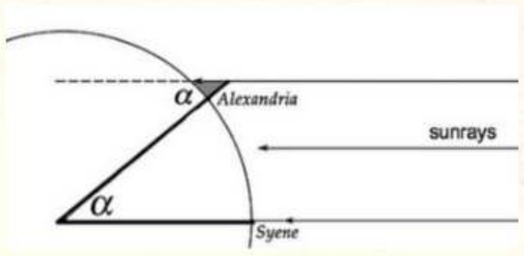
But what, exactly, was the shape of the Earth? That it must be round seemed obvious. The Sun and Moon are round, and everything in the heavens moves in circles. Those who believed the Earth was flat pictured it as a round disk, like a coin. But others went further: perhaps the Earth was not flat at all, but a sphere, just like the celestial bodies themselves. And because circles and spheres were seen as perfect forms – shapes belonging to the divine – that image fit beautifully with the order of the cosmos.

When the Sun and Moon pass through the same node, the Moon moves in front of the Sun and casts its shadow on the Earth: that is a solar eclipse. When the Sun and Moon stand opposite each other in the sky, at full Moon, the Earth's shadow falls on the Moon – a lunar eclipse.

During such a lunar eclipse, something remarkable can be seen. The Moon appears at different heights in the sky – sometimes high above, sometimes near the horizon – yet the shadow that moves across it is always round. If the Earth were flat, that shadow would look different from different angles, stretched or oval-shaped. But it never does. Each time, the Earth's silhouette is perfectly circular. That can only be true if the Earth is round in all directions – a sphere.

The beauty of this is that anyone can see it with the naked eye. Anyone who has ever watched a lunar eclipse has seen, with their own eyes, evidence that the Earth is a sphere. The ancient Greeks realized this more than two thousand years ago – and they took that discovery further than anyone before them.

So what is the Earth's circumference?



Around 240 BCE, the Greek scholar Eratosthenes learned that in a deep well in southern Egypt – at the site of modern Aswan – the Sun shone straight down into it only on the longest day of the year. That spot lies right on the Tropic of Cancer. In Alexandria, farther north where Eratosthenes lived, a short shadow could still be seen that same day.

From this, he deduced that the Sun stood at different heights in the sky at the same moment. He calculated that the difference in angle between the two cities represented one-fiftieth of a full circle. All he needed now was the distance between Alexandria and the well – something known from military and trade maps.

Combining the numbers, Eratosthenes calculated the Earth's circumference to be 250,000 stadia, which equals about 39,000 kilometers – astonishingly close to the real value of 40,000.

Back to Spain and Columbus

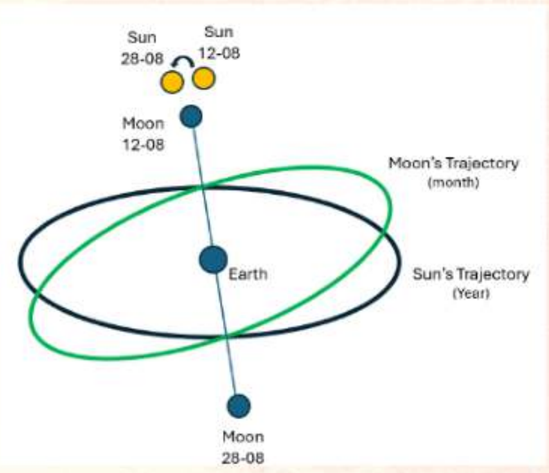
Eratosthenes' calculations were not lost. They survived through the Arab scholars and reached the West, especially the Spanish, who had the Arabs as neighbors until – once again – 1492. The problem lay in the unit of measurement: the length of a *stadion* was uncertain. Columbus chose the shortest version, ending up with an estimate of about 29,000 kilometers. He also used the largest estimates for the distance to Asia. Together, those errors made the journey seem manageable with the ships of his time.

So there is a direct line from observing the heavens and studying solar and lunar eclipses to the discovery of America. Of course, that is only part of Columbus's story. Trade with Asia had been blocked by the Turks. The Portuguese dominated the route around Africa. The Spanish monarchs had just defeated the Arabs and now had the means and the motive. And the investment in Columbus's three small ships was modest.

Still, without solar and lunar eclipses, and without the work of the ancient Greeks, history might have taken a very different course.

Looking ahead to "our" eclipse

Now that we know eclipses can only occur when the Sun and Moon are near a node, we can also predict when that will happen again. In 2026, this occurs in August and, half a year earlier, in February. On February 17, 2026, there will be a solar eclipse – not a total one, and only visible from the Southern Hemisphere. After that come two lunar eclipses, on March 3 and August 28 2026.



The latter is directly connected to "our" solar eclipse: by then, the full Moon will have completed half its orbit around the Earth, while the Sun remains close enough to the node for the Earth's shadow to sweep across the Moon.

It will not be a total lunar eclipse, but still a fine opportunity to see for yourself what the ancient Greeks already knew: the Earth is a sphere.

¡Feliz Día de la Hispanidad!

Timi, Marjan & Rene