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BOOK REVIEW

# How some ideas about the earth got around

## James Hannam: The globe: how the earth became round. London: Reaktion Books, 2023, 376 pp, $27.00 HB.

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*The Globe* is James Hannam's third book. His first, *God's Philosophers: How the Medieval World Laid the Foundations of Modern Science* (2010), was an attempt to show that science and religion were not in conflict in the Middle Ages, and that in fact medieval thinkers, most of whom were associated with the church, anticipated and led the way to modern science. The book was aimed at a non-scholarly audience and was a modest hit, well-reviewed—including a review by Boris Johnson when he was Mayor of London—and nominated for several prizes. Hannam's second book was an introduction to the UK tax system, and it also received a lot of praise from readers.

*The Globe* has many of the positive qualities of *God's Philosophers*: the writing is engaging and accessible to non-experts; complex ideas are explained clearly; the book weaves together diverse strands of complex histories across many cultures and a large swath of time, producing an interesting and cohesive story; and the book's claims, though for the most part not original, are backed by solid academic research. *The Globe* is an excellent example of how the discipline of History and Philosophy of Science (HPS) is both an approach that leads to new understandings and, at the same time, one of the best ways to explain science to a general audience. The sheer breadth of topics, schools of thought, time periods, and cultural contributions on display here is exhilarating. There should be more books like this one.

Divided into twenty-three chapters, *The Globe* covers ancient Babylon to today, with stops in ancient Greece, Egypt, Rome, Persia, India, the Middle East (including Greek, Judaic, and Islamic thinkers and cultures), Christian Europe, China, and more. It describes the story of how the Earth "became" a globe in the historian of science's sense of when the idea originated and how the idea was transmitted, adapted, and adopted. The book is well sourced, with 29 pages of endnotes organized by chapter and a 15-page bibliography. There is also a detailed index.

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Like many of my generation, I first learned geomorphology from a Bugs Bunny cartoon about the voyages of Christopher Columbus. The animators at Hannah-Barbera were deceived, however. As Hannam's chapter on Columbus shows, the committee the Spanish king appointed to evaluate Columbus's proposed voyage did not deny him funding because they believed the world was flat. In fact, they knew the world was round. They just did not believe that Columbus could successfully complete a voyage across such a vast expanse of ocean, and so they were unwilling to recommend funding it. Like the false popular belief that Galileo's trial was a battle of reason versus religion, the popular story of Columbus falsely imagines that his voyage was a triumph of empirical knowledge against backwards religious prejudice. The truth in this case, like in the Galileo case, is simpler, and probably more interesting. Columbus latched onto a value for the Earth's circumference that was considerably less than both the then-standard value and the truth; this, plus his acceptance of a far-too-great estimate of the east-west extent of Asia, convinced him that the distance he needed to travel to reach India was much shorter than it really is. If the Americas had not unexpectedly been in Columbus' way, he and all of his men would likely have died of lack of food or water in the open ocean.

So, well before 1492, Europeans knew the Earth was round. But when exactly did they know it and what precisely did they know? Hannam answers these questions in the early chapters. He explains that the Babylonians, Egyptians, and the earliest Greeks all held that the Earth was flat. They differed slightly, however, with respect to their views on how the flat Earth was laid out, positioned in the cosmos, arranged in relation to the divine, and so on. Other cultures, including those in Persia, India, and China, also believed that the Earth was flat. Then, in the generation immediately preceding Aristotle, the Greeks became convinced that the Earth was a sphere. Before that, the pre-Socratics and Socrates himself believed the world was flat; some later Platonic dialogues mention the spherical Earth (*Phaedo* is the earliest written example of the idea); and Aristotle anchored the spherical Earth at the center of a universe of nested concentric spheres. Aristotle's geocentric cosmology was hugely influential. The middle and later parts of *The Globe* explain how and when the Aristotelian concept was spread to other cultures, how it was resisted and revised, and eventually accepted. Hannam supplements this story of how scholars shared and debated Aristotle's geocentric cosmology with an explanation about how ordinary Europeans in the Middle Ages would have learned that the Earth is round from troubadours' songs, poetry, and art.

Probably because he is writing to a general audience, Hannam leaves out many of the details of the arguments to show that the Earth is round. I will offer three examples to illustrate my point. First, why were Aristotle's contemporaries persuaded by the observation that the shape of the edge of Earth's shadow on the Moon during the partial phase of lunar eclipses is always part of an arc of a circle? Hannam mentions but does not tell the reason, which is that any other Earth shape that is non-spheroidal will at least sometimes throw a shadow on the Moon whose edge has a non-circular shape. A circular disk, for example, will produce a circular shadow only in exactly one orientation, i.e., perfectly face on to the Sun, while in every other orientation it will cast an elliptical shadow. Second, Hannam says that Pliny the Elder's *Natural History* gives "more evidence for the curvature of the Earth than any other ancient author" (119), but this evidence is only gestured at, not detailed or explained. *Why* is the fact that we can see farther from the top of the mast than from the deck of a ship evidence that the Earth is curved? I would have liked

to have learned a lot more about how a series of fire beacons showed the ancients that "the time of day changes from east to west" (119) and what this has to do with the Earth being a sphere. As a third example, in the chapter on Islamic astronomy, we find one sentence and one citation (183; n. 14) telling us that the Muslim scholar al-Kindi (810–873 CE) gave a geometrical argument to the effect that if Aristotle is right that heavy things fall to the center of the universe and the Earth is at the center, then the Earth must necessarily be a sphere. In leaving out the details of these arguments, I think Hannam has dropped the ball. It means the book is more about the promulgation of the idea that the Earth is a sphere than the proof of that idea.

*The Globe* has forty-six illustrations, nine in color. Most are decorative rather than informative. Many are quarter-page representations of originals that are many feet across, meaning their details are impossible to discern. Some explanatory diagrams would have been helpful, for example illustrating Eratosthenes' calculation of the circumference of the Earth, which plays such a crucial role in the overall story.

My main criticism about *The Globe* is that there is not enough P in this HPS. No doubt I think this partly because of my own disciplinary interests. But sometimes the reports of philosophical ideas are shallow or so incomplete as to be misleading, and this is a missed opportunity. Hannam puts himself in the awkward position of saying that Aristotle is the first to *know* that the Earth is a sphere (rather than having an unjustified opinion to that effect), even though many of the reasons Aristotle invokes to justify his claim are *false*.

A richer philosophical framework would have allowed the story to be told even better. For example, it would have been illuminating to frame the question as a problem of theory choice: Given the available observations, which theory or theories of the shape of the Earth are best? Then we could have had deeper discussions of empirical and non-empirical factors influencing theory choice, of reasoning about observations and evidence, of analogies to the Copernican Revolution, and so on. Some philosophical ideas that I would have thought crucial are not even mentioned. For example, the view, common from the ancient Greek world to the Renaissance, that physical theories only need to be plausible accounts that could be true, because they *cannot* be true descriptions of fundamental reality.

Overall, *The Globe* is a good book. General readers will enjoy it and learn a lot from it. It corrects several of our misimpressions of the history of the idea that the Earth is round. Historians and philosophers of science will enjoy its breadth and the way the story is told, and they might find it useful as a supplementary text in some undergraduate classes.

## References

Hannam, James. 2010. *God's Philosophers: How the Medieval World Laid the Foundations of Modern Science*. UK: Icon Books. US Edition published 2011: *The Genesis of Science - How the Christian Middle Ages Launched the Scientific Revolution*. US: Regnery Publishing.