

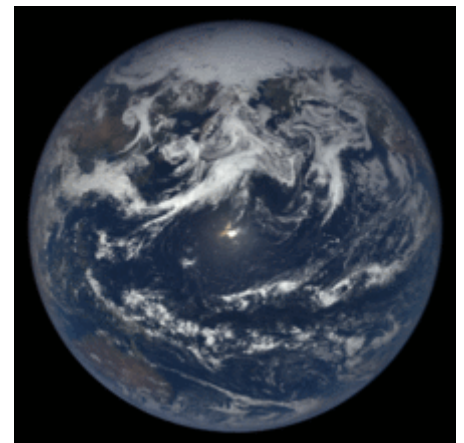
Modern flat Earth societies

Modern flat Earth societies consist of individuals who promote the erroneous idea that the Earth is flat rather than a sphere. Such groups date from the middle of the 20th century; some adherents are serious and some are not. Those who are serious are often motivated by pseudoscience.

Through the use of social media, flat Earth theories have been increasingly espoused by individuals unaffiliated with larger groups, many of which have members from several countries.^{[3][4]}



Projections of the sphere like this one have been co-opted as images of the flat Earth model depicting Antarctica as an ice wall^{[1][2]} surrounding a disk-shaped Earth.



An animation of 22 images taken by the Earth Polychromatic Imaging Camera on the Deep Space Climate Observatory from the L₁ Lagrangian point between the Earth and the Sun on 29 May 2016, showing a globe-shaped earth rotating once a day

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Historical context

Modern flat Earth hypotheses originated with the English writer Samuel Rowbotham (1816–1884). Based on conclusions derived from the Bedford Level experiment, Rowbotham published a pamphlet *Zetetic Astronomy*. He later expanded into a book *Earth Not a Globe*, proposing the Earth is a flat disc centred at the North Pole and bounded along its southern edge by a wall of ice, Antarctica. Rowbotham further held that the Sun and Moon were 3,000 miles (4,800 km) above Earth and that the "cosmos" was 3,100 miles (5,000 km) above the Earth.^[2] He also published a leaflet titled *The inconsistency of Modern Astronomy and its Opposition to the Scriptures*, which argued that the "Bible, alongside our senses, supported the idea that the earth was flat and immovable and this essential truth should not be set aside for a system based solely on human conjecture".^[5]

Rowbotham and followers like William Carpenter gained attention by successful use of pseudoscience in public debates with leading scientists such as Alfred Russel Wallace.^{[6][7][8]} Rowbotham created a Zetetic Society in England and New York, shipping over a thousand copies of *Zetetic Astronomy*.^[9]

After Rowbotham's death, Lady Elizabeth Blount established a Universal Zetetic Society, whose objective was "the propagation of knowledge related to Natural Cosmogony in confirmation of the Holy Scriptures, based on practical scientific investigation". The society published a magazine, *The Earth Not a Globe Review*, and remained active well into the early 20th century.^[10] A flat Earth journal, *Earth: a Monthly Magazine of Sense and Science* was published between 1901–1904, edited by Lady Blount.^[11]

International Flat Earth Research Society

In 1956, Samuel Shenton created the International Flat Earth Research Society as a successor to the Universal Zetetic Society, running it as "organising secretary" from his home in Dover, England.^{[10][12]} Given Shenton's interest in alternative science and technology, the emphasis on religious arguments was less than in the predecessor society.^[13] When satellite images showed Earth as a sphere, Shenton remarked: "It's easy to see how a photograph like that could fool the untrained eye".^[14] Later asked about similar photographs taken by astronauts, he attributed curvature to the use of wide-angle lens, adding, "It's a deception of the public and it isn't right".^[12]

In 1969, Shenton persuaded Ellis Hillman, a Polytechnic of East London lecturer, to become president of the Flat Earth Society; but there is little evidence of any activity on his part until after Shenton's death, when he added most of Shenton's library to the archives of the Science Fiction Foundation he helped to establish.^[15]

Shenton died in 1971. Charles K. Johnson inherited part of Shenton's library from Shenton's wife, and established and became president of the International Flat Earth Research Society of America and Covenant People's Church in California. Over the next three decades, under his leadership, the Flat Earth Society grew to a reported 3,500 members.^[17]

Johnson issued many publications and handled all membership applications. The most famous publication was *Flat Earth News*, a quarterly, four-page tabloid.^[1] Johnson paid for these publications through annual member dues costing US\$6 to US\$10 over the course of his leadership.^[1] Johnson cited the Bible for his beliefs, and he saw scientists as pulling a hoax which would replace religion with science.^[17]

The Flat Earth Society's most recent planet model is that humanity lives on a disc, with the North Pole at its centre and a 150-foot (45 m) high wall of ice, Antarctica, at the outer edge.^[18] The resulting map resembles the symbol of the United Nations, which Johnson used as evidence for his position.^[19] In this model, the Sun and Moon are each 32 miles (52 km) in diameter.^[20]

Flat Earth Society recruited members by speaking against the US government and all its agencies, particularly NASA. Much of the society's literature in its early days focused on interpreting the Bible to mean that the Earth is flat, although they did try to offer scientific explanations and evidence.^[1]

Criticism and decline

Eugenie Scott called the group an example of "extreme Biblical-literalist theology: The earth is flat because the Bible says it is flat, regardless of what science tells us".^[21]

According to Charles K. Johnson the membership of the group rose to 3,500 under his leadership, but began to decline after a fire at his house in 1997 which destroyed all of the records and contacts of the society's members. Johnson's wife, who helped manage the membership database, died shortly thereafter. Johnson himself died on 19 March 2001.^[22]

Relaunch

Historical accounts and spoken history tell us the Land part may have been square, all in one mass at one time, then as now, the magnetic north being the Center. Vast cataclysmic events and shaking no doubt broke the land apart, divided the Land to be our present continents or islands as they exist today. One thing we know for sure about this world...the known inhabited world is Flat, Level, a Plain World.

-Flyer written by Charles K. Johnson, 1984.^[16]



A photograph of the Earth taken from Apollo 17

In 2004, Daniel Shenton (not related to Samuel)^[23] resurrected the Flat Earth Society, basing it around a web-based discussion forum.^[24] This eventually led to the official relaunch of the society in October 2009,^[25] and the creation of a new website, featuring a public collection of flat Earth literature and a wiki.^[26] Moreover, the society began accepting new members for the first time since 2001, with musician Thomas Dolby becoming the first to join the newly reconvened society.^[27] As of July



Logo of the 2013 Flat Earth Society

2017, over 500 people have become members.^[28]

In 2013, part of this society broke away to form a new web-based group also featuring a forum and wiki.^[29]

Canadian society

Flat Earth Society of Canada was established on 8 November 1970 by philosopher Leo Ferrari, writer Raymond Fraser and poet Alden Nowlan.^[30] and was active until 1984.^[31] Its archives are held at the University of New Brunswick.^[32]

Calling themselves "planoterrestrialists",^[33] their aims were quite different from other flat earth societies. They claimed a prevailing problem of the new technological age was the willingness of people to accept theories "on blind faith and to reject the evidence of their own senses."^[31] The parodic intention of the Society appeared in the writings of Ferrari, as he attributed everything from gender to racial inequality on the globularist and the spherical Earth model.^[34] Ferrari even claimed to have nearly fallen off "the Edge" of the Earth at Brimstone Head on Fogo Island.^[35]

Ferrari was interviewed as an "expert" in the 1990 flat earth mockumentary *In Search of the Edge* by Pancake Productions (a reference to the expression "as flat as a pancake").^[36] In the accompanying study guide, Ferrari is outed as a "globularist," a nonce word for someone who believes the earth is spherical.^[37] The real intent of the film, which was part-funded by the Ontario Arts Council and National Film Board of Canada,^[36] was to promote schoolchildren's critical thinking and media literacy by "[attempting] to prove in convincing fashion, something everyone knew to be false."^[38]

Relaunch

Multi-media artist Kay Burns re-created the Flat Earth Society of Canada as an art project with her alter ego Iris Taylor.^[32] as its president.^[39] Burns created an installation entitled the Museum of the Flat Earth, which included some artefacts from the 1970 group. It was exhibited in 2016 at the Flat Earth Outpost Café in Shoal Bay, Newfoundland.^[32]

In popular culture

- Richard A. Lupof's novel *Circumpolar!* (1984) describes a flat Earth, with a hole at the centre instead of a North Pole, and the underside contains fictional lands such as Atlantis and Lemuria.^[40]
- California-based punk rock band Bad Religion include a song titled "Flat Earth Society", by Brett Gurewitz, on their album *Against the Grain* (1990). A prominent feature of the song is the refrain "lie, lie, lie," indicating a strong denunciation of the society and its theories.^[41]
- In 1984, English musician Thomas Dolby released an album called *The Flat Earth*. This became the name for his fan club and subsequent website forums. Daniel Shenton credited this album as his introduction to the theory and offered the first membership of the reopened Society. Dolby, while not a believer, accepted.^[27]

- In 2013, while discussing the importance of acting on climate change, President Barack Obama said there was no time for "a meeting of the Flat-Earth Society" in reference to climate change deniers.^[42]
- Rapper B.o.B composed a song titled "Flatline", in which he claims the Earth is flat, and promotes othe conspiracy theories.^[43] He was offered, and accepted, membership in the Flat Earth Society.^{[44][45]}
- Steve Jackson Games featured The Flat Earth Society in their Illuminati Card Game

Resurgence

In the modern era, the availability of communications technology and social media like YouTube, Facebook^[46] and Twitter have made it easy for individuals, famous^[47] and not, to spread disinformation and attract others to their erroneous ideas. One of the topics that has flourished in this environment is that of the flat Earth.^{[3][4][48]}

Modern flat earthers generally embrace some form of conspiracy theory out of the necessity of explaining why major institutions such as governments, media outlets, schools, scientists, and airlines all assert that the world is round. They tend to not trust observations they have not made themselves, and often distrust or disagree with each other.^[49]

Based on the speakers at the 2018 UK's Flat Earth UK Convention, believers in a flat Earth vary widely in their views. While most agree upon a disc-shaped Earth, some are convinced the Earth is diamond shaped. Furthermore, while most believers do not believe in outer space and none believe mankind has ever traveled there, they vary widely in their views of the universe.^[50]

The solar eclipse of 21 August 2017 gave rise to numerous YouTube videos purporting to show how the details of the eclipse prove the Earth is flat.^{[51][52]} Also in 2017, "the Tunisian and Arab scientific and educational world" had a scandal when a PhD student submitted a thesis "declaring Earth to be flat, unmoving, young (only 13,500 years of age), and the centre of the universe".^[53]

On May 3, 2018, Steven Novella analyzed the modern belief in a flat Earth, and concluded that, despite what most people think about the subject, the believers are being sincere in their belief that the Earth is flat, and are not "just saying that to wind us up". He stated that:

In the end that is the core malfunction of the flat-earthers, and the modern populist rejection of expertise in general. It is a horrifically simplistic view of the world that ignores (partly out of ignorance, and partly out of motivated reasoning) to real complexities of our civilization. It is ultimately lazy, childish, and self-indulgent, resulting in a profound level of ignorance drowning in motivated reasoning.^[54]


The British skeptical activist Michael Marshall attended the UK's annual Flat Earth UK Convention between 27-29, April 2018 and noted disagreement on several views of the believers' in a Flat Earth. To Marshall, one of the most telling moments at the convention was the "Flat Earth Addiction" test that was based on a checklist used to determine whether someone is in a cult, without the convention attendees realizing the possibility of themselves being in a cult.^[50]

See also

- Spherical Earth § Effects and empirical confirmation (documenting why the flat Earth belief is mistaken)
- Figure of the Earth
- Hollow Earth
- Myth of the flat Earth
- Wilbur Glenn Voliva
- Geodesy
- Mike Hughes (daredevil)
- Kyrie Irving

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External links

- [The Flat Earth Society \(2004/2009\)](#)
- [The Flat Earth Society \(2013\)](#)
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- [ModernDayFlatEarth.com](#)
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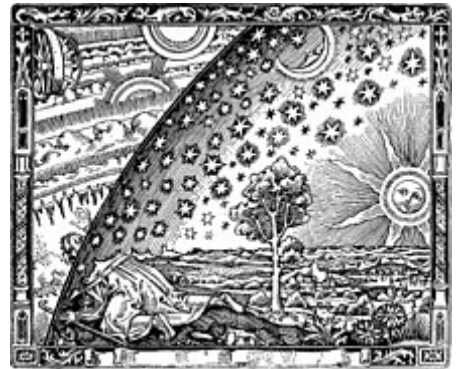
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Flat Earth

The **flat Earth** model is an archaic conception of Earth's shape as a plane or disk. Many ancient cultures subscribed to a flat Earth cosmography, including Greece until the classical period, the Bronze Age and Iron Age civilizations of the Near East until the Hellenistic period, India until the Gupta period (early centuries AD), and China until the 17th century

The idea of a spherical Earth appeared in Greek philosophy with Pythagoras (6th century BC), although most pre-Socratics (6th–5th century BC) retained the flat Earth model. Aristotle provided evidence for the spherical shape of the Earth on empirical grounds by around 330 BC. Knowledge of the spherical Earth gradually began to spread beyond the Hellenistic world from then on.^{[1][2][3][4]}

In the modern era, pseudoscientific^[5] flat Earth theories have been espoused by modern flat Earth societies and, increasingly, by unaffiliated individuals using social media.^{[6][7]}



The Flammarion engraving (1888) depicts a traveler who arrives at the edge of a flat Earth and sticks his head through the firmament

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History

Support for flat Earth

West Asia

In early Egyptian^[8] and Mesopotamian thought, the world was portrayed as a disk floating in the ocean. A similar model is found in the Homeric account from the 8th century BC in which "Okeanos, the personified body of water surrounding the circular surface of the Earth, is the begetter of all life and possibly of all gods."^[9]

The Israelites also imagined the Earth to be a disc floating on water; an arched firmament separated the Earth from the heavens.^[10] Like most ancient peoples, the Hebrews believed the sky was a solid dome with the Sun, Moon, planets, and stars embedded in it.^[11]

The Pyramid Texts and Coffin Texts of ancient Egypt show a similar cosmography; Nun (the Ocean) encircled nbt ("dry lands" or "Islands").^{[12][13][14]}

Greece

Poets

Both Homer^[15] and Hesiod^[16] described a disc cosmography on the Shield of Achilles.^{[17][18]} This poetic tradition of an Earth-encircling (*gaiaokhos*) sea (Oceanus) and a disc also appears in Stasinus of Cyprus,^[19] Mimnermus,^[20] Aeschylus,^[21] and Apollonius Rhodius.^[22]

Homer's description of the disc cosmography on the shield of Achilles with the encircling ocean is repeated far later in Quintus Smyrnaeus' Posthomerica (4th century AD), which continues the narration of the Trojan War.^[23]

Philosophers

Several pre-Socratic philosophers believed that the world was flat: Thales (c. 550 BC) according to several sources,^[25] and Leucippus (c. 440 BC) and Democritus (c. 460–370 BC) according to Aristotle.^{[26][27][28]}

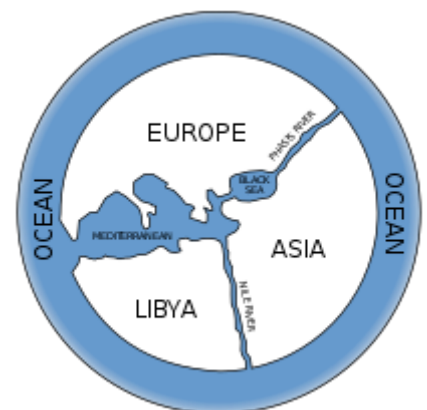
Thales thought the Earth floated in water like a log.^[29] It has been argued, however, that Thales actually believed in a round Earth.^{[30][31]} Anaximander (c. 550 BC) believed the Earth was a short cylinder with a flat, circular top that remained stable because it was the same distance from all things.^{[32][33]} Anaximenes of Miletus believed that "the Earth is flat and rides on air; in the same way the sun and the moon and the other heavenly bodies, which are all fiery, ride the air because of their flatness."^[34] Xenophanes of Colophon (c. 500 BC) thought that the Earth was flat, with its upper side touching the air and the lower side extending without limit.^[35]

Belief in a flat Earth continued into the 5th century BC. Anaxagoras (c. 450 BC) agreed that the Earth was flat,^[36] and his pupil Archelaus believed that the flat Earth was depressed in the middle like a saucer to allow for the fact that the Sun does not rise and set at the same time for everyone.^[37]

Historians



Imago Mundi Babylonian map, the oldest known world map, 6th century BC Babylonia



Possible rendering of Anaximander's world map^[24]

Hecataeus of Miletus believed the Earth was flat and surrounded by water.^[38] Herodotus in his *Histories* ridiculed the belief that water encircled the world,^[39] yet most classicists agree he still believed the Earth was flat because of his descriptions of literal "ends" or "edges" of the Earth!^[40]

Europe

The ancient Norse and Germanic peoples believed in a flat Earth cosmography with the Earth surrounded by an ocean, with the axis mundi, a world tree (Yggdrasil), or pillar (Irminsul) in the centre.^{[41][42]} In the world-encircling ocean sat a snake called Jormungandr.^[43] The Norse creation account preserved in Gylfaginning (VIII) states that during the creation of the Earth, an impassable sea was placed around it:

And Jafnhárr said: "Of the blood, which ran and welled forth freely out of his wounds, they made the sea, when they had formed and made firm the Earth together, and laid the sea in a ring round about her; and it may well seem a hard thing to most men to cross over it."^[44]

The late Norse Konungs skuggsjá on the other hand, infers a spherical Earth:

If you take a lighted candle and set it in a room, you may expect it to light up the entire interior, unless something should hinder, though the room be quite large. But if you take an apple and hang it close to the flame, so near that it is heated, the apple will darken nearly half the room or even more. However, if you hang the apple near the wall, it will not get hot; the candle will light up the whole house; and the shadow on the wall where the apple hangs will be scarcely half as large as the apple itself. From this you may infer that the Earth-circle is round like a ball and not equally near the sun at every point. But where the curved surface lies nearest the sun's path, there will the greatest heat be; and some of the lands that lie continuously under the unbroken rays cannot be inhabited.^[45]

East Asia

In ancient China, the prevailing belief was that the Earth was flat and square, while the heavens were round,^[46] an assumption virtually unquestioned until the introduction of European astronomy in the 17th century.^{[47][48][49]} The English sinologist Cullen emphasizes the point that there was no concept of a round Earth in ancient Chinese astronomy:

Chinese thought on the form of the Earth remained almost unchanged from early times until the first contacts with modern science through the medium of Jesuit missionaries in the seventeenth century. While the heavens were variously described as being like an umbrella covering the Earth (the Kai Tian theory), or like a sphere surrounding it (the Hun Tian theory), or as being without substance while the heavenly bodies float freely (the Hsüan yeh theory), the Earth was at all times flat, although perhaps bulging up slightly^[50]

The model of an egg was often used by Chinese astronomers such as Zhang Heng (78–139 AD) to describe the heavens as spherical:

The heavens are like a hen's egg and as round as a crossbow bullet; the Earth is like the yolk of the egg, and lies in the centre.^[51]

This analogy with a curved egg led some modern historians, notably Joseph Needham, to conjecture that Chinese astronomers were, after all, aware of the Earth's sphericity. The egg reference, however, was rather meant to clarify the relative position of the flat Earth to the heavens:

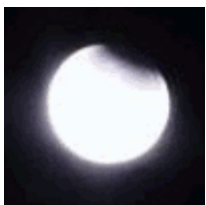
In a passage of Zhang Heng's cosmogony not translated by Needham, Zhang himself says: "Heaven takes its body from the Yang, so it is round and in motion. Earth takes its body from the Yin, so it is flat and quiescent". The point of the egg analogy is simply to stress that the Earth is completely enclosed by Heaven, rather than merely covered from above as the Kai Tian describes. Chinese astronomers, many of them brilliant men by any standards, continued to think in flat-Earth terms until the seventeenth century; this surprising fact might be the starting-point for a re-examination of the apparent facility with which the idea of a spherical Earth found acceptance in fifth-century BC Greece.^[52]

Further examples cited by Needham supposed to demonstrate dissenting voices from the ancient Chinese consensus actually refer without exception to the Earth being square, not to it being flat.^[53] Accordingly, the 13th-century scholar Li Ye, who argued that the movements of the round heaven would be hindered by a square Earth,^[46] did not advocate a spherical Earth, but rather that its edge should be rounded off so as to be circular.^[54] However, Needham disagrees, affirming that Li Ye believed the Earth to be spherical, similar in shape to the heavens but much smaller.^[55] This was preconceived by the 4th-century scholar Yu Xi, who argued for the infinity of outer space surrounding the Earth and that the latter could be either square or round, in accordance to the shape of the heavens.^[56] When Chinese geographers of the 17th century influenced by European cartography and astronomy showed the Earth as a sphere that could be circumnavigated by sailing around the globe, they did so with formulaic terminology previously used by Zhang Heng to describe the spherical shape of the sun and moon (i.e. that they were as round as a crossbow bullet).^[57]

As noted in the book Huainanzi,^[58] in the 2nd century BC, Chinese astronomers effectively inverted Eratosthenes' calculation of the curvature of the Earth to calculate the height of the sun above the Earth. By assuming the Earth was flat, they arrived at a distance of 100,000 li (approximately 200,000 km). The Zhoubi Suanjing also discusses how to determine the distance of the Sun by measuring the length of noontime shadows at different latitudes, a method similar to Eratosthenes' measurement of the circumference of the Earth, but the Zhoubi Suanjing assumes that the Earth is flat.^[59]

Alternate or mixed theories

Greece: spherical Earth



Semi-circular shadow of Earth on the Moon during the phases of a lunar eclipse

Pythagoras in the 6th century BC and Parmenides in the 5th century stated that the Earth is spherical,^[60] and this view spread rapidly in the Greek world. Around 330 BC, Aristotle maintained on the basis of physical theory and observational evidence that the Earth was spherical, and reported on an estimate on the circumference.^[61] The Earth's circumference was first determined around 240 BC by Eratosthenes.^[62] By the second century AD, Ptolemy had derived his maps from a globe and developed the system of latitude, longitude, and climes. His Almagest was written in Greek and only translated into Latin in the 11th century from Arabic translations.



When a ship is at the horizon, its lower part is obscured due to the curvature of the Earth.

In the 2nd century BC, Crates of Mallus devised a terrestrial sphere that divided the Earth into four continents, separated by great rivers or oceans, with people presumed living in each of the four regions.^[63] Opposite the oikumene, the inhabited world, were the antipodes, considered unreachable both because of an intervening torrid zone (equator) and the ocean. This took a strong hold on the medieval mind.

Lucretius (1st century BC) opposed the concept of a spherical Earth, because he considered that an infinite universe had no center towards which heavy bodies would tend. Thus, he thought the idea of animals walking around topsy-turvy under the Earth was absurd.^[64]^[65] By the 1st century AD, Pliny the Elder was in a position to claim that everyone agreed on the spherical shape of

Earth,^[66] though disputes continued regarding the nature of the antipodes, and how it is possible to keep the ocean in a curved shape. Pliny also considered the possibility of an imperfect sphere "shaped like pinecone".^[66]

In late antiquity, such widely read encyclopedists as Macrobius and Martianus Capella (both 5th century AD) discussed the circumference of the sphere of the Earth, its central position in the universe, the difference of the seasons in northern and southern hemispheres, and many other geographical details.^[67] In his commentary on Cicero's Dream of Scipio, Macrobius described the Earth as a globe of insignificant size in comparison to the remainder of the cosmos.^[67]



The Terrestrial Sphere of Crates of Mallus (c. 150 BC)

South Asia

The Vedic texts depict the cosmos in many ways.^{[68][69]} The earliest Indian cosmological texts picture the Earth as one of a stack of flat disks.^[70]

In the Vedic texts, Dyaus (heaven) and Prithvi (Earth) are compared to wheels on an axle, yielding a flat model. They are also described as bowls or leather bags, yielding a concave model.^[71] According to Macdonell: "the conception of the Earth being a disc surrounded by an ocean does not appear in the Samhitas. But it was naturally regarded as circular, being compared with a wheel (10.89) and expressly called circular (parimandala) in the Shatapatha Brahmana".^[72]

By about the 5th century CE, the siddhanta astronomy texts of South Asia, particularly of Aryabhata, assume a spherical Earth as they develop mathematical methods for quantitative astronomy for calendar and time keeping.^[73]

The medieval Indian texts called the Puranas describe the Earth as a flat-bottomed, circular disk with concentric oceans and continents.^{[71][74]} This general scheme is present not only in the Hindu cosmologies but also in Buddhist and Jain cosmologies of South Asia.^[71] However, some Puranas include other models. For example, the fifth canto of the Bhagavata Purana, includes sections that describe the Earth both as flat and spherical.^{[75][76]}

It has long been debated how and when the spherical conception arose in Indian astronomical models. Detailed records, particularly about the observational practices have not survived.^[73] The Greek text which possibly influenced the Indian astronomers in early medieval period is also unknown, and there is "no textual evidence for any significant transmissions of Western astronomy between the early first millennium and the early second".^[73] While the textual evidence has not survived, the precision of the constants used in pre-Greek Vedanga models, and the model's accuracy in predicting moon and sun's motion for Vedic rituals, probably came from direct astronomical observations. The cosmographic theories and assumptions in ancient India likely developed independently and in parallel, but these were influenced by some unknown quantitative Greek astronomy text in the medieval era.^{[77][78]}

Early Christian Church

During the early Church period, the spherical view continued to be widely held, with some notable exceptions.^[79]

Early Christian beliefs mention a number of ideas about the shape of the Earth. Athenagoras, an eastern Christian writing around the year 175 CE said, "The world, being made spherical, is confined within the circles of heaven."^[80] Methodius (c. 290 AD), an eastern Christian writing against "the theory of the Chaldeans and the Egyptians" who asserted that the Earth was spherical said, "Let us first lay bare ... the theory of the Chaldeans and the Egyptians. They say that the circumference of the universe is likened to the turnings of a well-rounded globe, the Earth being a central point. They say that since its outline is spherical, ... the Earth should be the center of the universe, around which the heaven is whirling."^[80] Lactantius, a western Christian writer and advisor to the first Christian Roman Emperor, Constantine, and writing sometime between 304–313 CE, ridiculed the notion of Antipodes and the philosophers who fancied that "the universe is round like a ball. They also thought that heaven revolves in accordance with the motion of the heavenly bodies. ... For that reason, they constructed brass globes, as though after the figure of the universe. ... I am at a loss as to what to say concerning those who, once they have erred, continue in their folly, defending one vain thing by another vain thing."^{[81][80]}

Arnobius, another eastern Christian writing sometime around 305 CE, said, "In the first place, indeed, the world itself is neither right nor left. It has neither upper nor lower regions, nor front nor back. For whatever is round and bounded on every side by the circumference of a solid sphere, has no beginning or end ..."^[80]

The influential theologian and philosopher Saint Augustine, one of the four Great Church Fathers of the Western Church, similarly objected to the "fable" of an inhabited Antipodes:

But as to the fable that there are Antipodes, that is to say, men on the opposite side of the Earth, where the sun rises when it sets to us, men who walk with their feet opposite ours that is on no ground credible. And, indeed, it is not affirmed that this has been learned by historical knowledge, but by scientific conjecture, on the ground that the Earth is suspended within the concavity of the sky, and that it has as much room on the one side of it as on the other: hence they say that the part that is beneath must also be inhabited. But they do not remark that, although it be supposed or scientifically demonstrated that the world is of a round and spherical form, yet it does not follow that the other side of the Earth is bare of water; nor even, though it be bare, does it immediately follow that it is peopled. For Scripture, which proves the truth of its historical statements by the accomplishment of its prophecies, gives no false information; and it is too absurd to say that some men might have taken ship and traversed the whole wide ocean, and crossed from this side of the world to the other, and that thus even the inhabitants of that distant region are descended from that one first man.^[82]

The view generally accepted by scholars of Augustine's work is that he shared the common view of his contemporaries that the Earth is spherical,^[83] in line with his endorsement of science in *De Genesi ad litteram*^[84] That view has been challenged:

[Augustine] was familiar with the Greek theory of a spherical Earth, nevertheless, (following in the footsteps of his fellow North African, Lactantius), he was firmly convinced that the Earth was flat, was one of the two biggest bodies in existence and that it lay at the bottom of the universe. Apparently Augustine saw this picture as more useful for scriptural exegesis than the global Earth at the centre of an immense universe.^[85]

Yet other historians, however, do not view Augustine's scriptural commentaries as endorsing any particular cosmological model.^[86]

Diodorus of Tarsus, a leading figure in the School of Antioch and mentor of John Chrysostom, may have argued for a flat Earth; however, Diodorus' opinion on the matter is known only from a later criticism.^[87] Chrysostom, one of the four Great Church Fathers of the Eastern Church and Archbishop of Constantinople, explicitly espoused the idea, based on scripture, that the Earth floats miraculously on the water beneath the firmament.^[88] Athanasius the Great, Church Father and Patriarch of Alexandria, expressed a similar view in *Against the Heathen*^[89]

Christian Topography (547) by the Alexandrian monk Cosmas Indicopleustes, who had travelled as far as Sri Lanka and the source of the Blue Nile, is now widely considered the most valuable geographical document of the early medieval age, although it received relatively little attention from contemporaries. In it, the author repeatedly expounds the doctrine that the universe consists of only two places, the Earth below the firmament and heaven above it. Carefully drawing on arguments from scripture, he describes the Earth as a rectangle, 400 days' journey long by 200 wide, surrounded by four oceans and enclosed by four massive walls which support the firmament. The spherical Earth theory is contemptuously dismissed as "pagan".^{[90][91][92]}

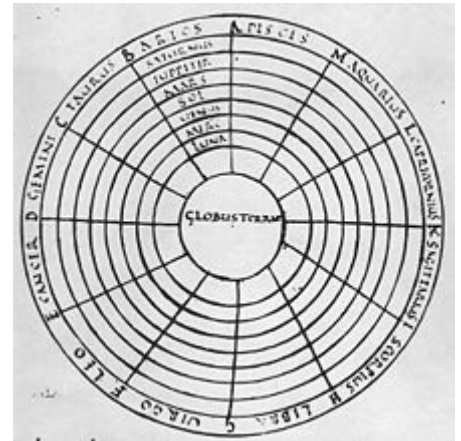
Severian, Bishop of Gabala (d. 408), wrote that the Earth is flat and the sun does not pass under it in the night, but "travels through the northern parts as if hidden by a wall".^[93] Basil of Caesarea (329–379) argued that the matter was theologically irrelevant.^[94]



Cosmas Indicopleustes' world view – flat Earth in a Tabernacle

Early medieval Christian writers in the early Middle Ages felt little urge to assume flatness of the Earth, though they had fuzzy impressions of the writings of Ptolemy and Aristotle, relying more on Pliny^[95]

With the end of the Western Roman Empire, Western Europe entered the Middle Ages with great difficulties that affected the continent's intellectual production. Most scientific treatises of classical antiquity (in Greek) were unavailable, leaving only simplified summaries and compilations. In contrast, the Eastern Roman Empire did not fall, and it preserved the learning.^[96] Still, many textbooks of the Early Middle Ages supported the sphericity of the Earth in the western part of Europe. For example: some early medieval manuscripts of Macrobius include maps of the Earth, including the antipodes, zonal maps showing the Ptolemaic climates derived from the concept of a spherical Earth and a diagram showing the Earth (labeled as *globus terrae*, the sphere of the Earth) at the center of the hierarchically ordered planetary spheres.^[97] Further examples of such medieval diagrams can be found in medieval manuscripts of the Dream of Scipio. In the Carolingian era, scholars discussed Macrobius's view of the antipodes. One of them, the Irish monk Dungal, asserted that the tropical gap between our habitable region and the other habitable region to the south was smaller than Macrobius had believed.^[98]



9th-century Macrobian cosmic diagram showing the sphere of the Earth at the center (*globus terrae*)

Europe's view of the shape of the Earth in Late Antiquity and the Early Middle Ages may be best expressed by the writings of early Christian scholars:

- Boethius (c. 480–524), who also wrote a theological treatise *On the Trinity*, repeated the Macrobian model of the Earth in the center of a spherical cosmos in his influential, and widely translated *Consolation of Philosophy*.^[99]
- Bishop Isidore of Seville (560–636) taught in his widely read encyclopedia, the *Etymologies*, diverse views such as that the Earth "resembles a wheel"^[100] resembling Anaximander in language and the map that he provided. This was widely interpreted as referring to a disc-shaped Earth.^{[101][102]} An illustration from Isidore's *De Natura Rerum* shows the five zones of the Earth as adjacent circles. Some have concluded that he thought the Arctic and Antarctic zones were adjacent to each other.^[103] He did not admit the possibility of antipodes, which he took to mean people dwelling on the opposite side of the Earth, considering them legendary^[104] and noting that there was no evidence for their existence!^[105] Isidore's T and O map, which was seen as representing a small part of a spherical Earth, continued to be used by authors through the Middle Ages, e.g. the 9th-century bishop Rabanus Maurus who compared the habitable part of the northern hemisphere (Aristotle's northern temperate clime) with a wheel. At the same time, Isidore's works also gave the views of sphericity for example, in chapter 28 of *De Natura Rerum*, Isidore claims that the sun orbits the Earth and illuminates the other side when it is night on this side. See French translation of *De Natura Rerum*.^[106] In his other work *Etymologies*, there are also affirmations that the sphere of the sky has Earth in its center and the sky being equally distant on all sides.^{[107][108]} Other researchers have argued these points as well.^{[95][109][110]} "The work remained unsurpassed until the thirteenth century and was regarded as the summit of all knowledge. It became an essential part of European medieval culture. Soon after the invention of typography it appeared many times in print."^[111] However, "The Scholastics – later medieval philosophers, theologians, and scientists – were helped by the Arabic translators and commentaries, but they hardly needed to struggle against a flat-Earth legacy from the early middle ages (500–1050). Early medieval writers often had fuzzy and imprecise impressions of both Ptolemy and Aristotle and relied more on Pliny, but they felt (with one exception), little urge to assume flatness."^[95]
- The English theologian Bede (c. 672–735) wrote in his influential treatise or *computus*, *The Reckoning of Time*, that the Earth was round ("not merely circular like a shield [or] spread out like a wheel, but resembl[ing] more a ball"), explaining the unequal length of daylight from "the roundness of the Earth, for not without reason is it called 'the orb of the world' on the pages of Holy Scripture and of ordinary literature. It is, in fact, set like a sphere in the middle of the whole universe." (*De temporum ratione*, 32). The large number of surviving manuscripts of *The Reckoning of Time*, copied to meet the Carolingian requirement that all priests should study the *computus*, indicates that many, if not most, priests were exposed to the idea of the sphericity of the Earth.^[112] Ælfric of Eynsham paraphrased Bede



12th-century T and O map representing the inhabited world as described by Isidore of Seville in his *Etymologiae* (chapter 14, *de terra et partibus*)

into Old English, saying "Now the Earth's roundness and the Sun's orbit constitute the obstacle to the day's being equally long in every land."^[113]

- St Vergilius of Salzburg (c. 700–784), in the middle of the 8th century discussed or taught some geographical or cosmographical ideas that St Boniface found sufficiently objectionable that he complained about them to Pope Zachary. The only surviving record of the incident is contained in Zachary's reply, dated 748, where he wrote:

As for the perverse and sinful doctrine which he (Virgil) against God and his own soul has uttered – if it shall be clearly established that he professes belief in another world and other men existing beneath the Earth, or in (another) sun and moon there, thou art to hold a council, deprive him of his sacerdotal rank, and expel him from the Church.^[114]



Isidore's portrayal of the five zones of the Earth

Some authorities have suggested that the sphericity of the Earth was among the aspects of Vergilius's teachings that Boniface and Zachary considered objectionable.^{[115][116]} Others have considered this unlikely and take the wording of Zachary's response to indicate at most an objection to belief in the existence of humans living in the antipodes.^{[117][118][119][120][121]} In any case, there is no record of any further action having been taken against Vergilius. He was later appointed bishop of Salzburg and was canonised in the 13th century.^[122]

A possible non-literary but graphic indication that people in the Middle Ages believed that the Earth (or perhaps the world) was a sphere is the use of the *orb* (globus cruciger) in the regalia of many kingdoms and of the Holy Roman Empire. It is attested from the time of the Christian late-Roman emperor Theodosius II (423) throughout the Middle Ages; the *Reichsapfel* was used in 1191 at the coronation of emperor Henry VI. However the word 'orbis' means 'circle' and there is no record of a globe as a representation of the Earth since ancient times in the west till that of Martin Behaim in 1492. Additionally it could well be a representation of the entire 'world' or cosmos.

A recent study of medieval concepts of the sphericity of the Earth noted that "since the eighth century, no cosmographer worthy of note has called into question the sphericity of the Earth".^[123] However, the work of these intellectuals may not have had significant influence on public opinion, and it is difficult to tell what the wider population may have thought of the shape of the Earth, if they considered the question at all.



12th-century depiction of a spherical Earth with the four seasons (book *Liber Divinorum Operum* by Hildegard of Bingen)

Europe: Late Middle Ages

Hermannus Contractus (1013–1054) was among the earliest Christian scholars to estimate the circumference of Earth with Eratosthenes' method. St. Thomas Aquinas (1225–1274), the most important and widely taught theologian of the Middle Ages, believed in a spherical Earth; and he even took for granted his readers also knew the Earth is round. In *Summa Theologiae* he wrote: "The physicist proves the Earth to be round by one means, the astronomer by another: for the latter proves this by means of mathematics, e. g. by the shapes of eclipses, or something of the sort; while the former proves it by means of physics, e. g. by the movement of heavy bodies towards the center and so forth."^[124] Lectures in the medieval universities commonly advanced evidence in favor of the idea that the Earth was a sphere.^[125] Also, *On the Sphere of the World*, an influential astronomy textbook of the 13th century, commonly studied by students at Western European universities, described the world as a sphere.^[126]

The shape of the Earth was not only discussed in scholarly works written in Latin; it was also treated in works written in vernacular languages or dialects and intended for wider audiences. The Norwegian book Konungs Skuggsjá, from around 1250, states clearly that the Earth is spherical – and that there is night on the opposite side of the Earth when there is daytime in Norway. The author also



Picture from a 1550 edition of *On the Sphere of the World*, the most influential astronomy textbook of 13th-century Europe

discusses the existence of antipodes – and he notes that (if they exist) they see the Sun in the north of the middle of the day, and that they experience seasons opposite those of people in the Northern Hemisphere.

However Tattersall shows that in many vernacular works in 12th- and 13th-century French texts the Earth was considered "round like a table" rather than "round like an apple". "In virtually all the examples quoted ... from epics and from non-'historical' romances (that is, works of a less learned character) the actual form of words used suggests strongly a circle rather than a sphere", though he notes that even in these

works the language is ambiguous.^[127]

Portuguese navigation down and around the coast of Africa in the latter half of the 1400s gave wide-scale observational evidence for Earth's sphericity. In these explorations, the sun's position moved more northward the further south the explorers travel. Its position directly overhead at noon gave evidence for crossing the equator. These apparent solar motions in detail were more consistent with north-south curvature and a distant sun, than with any flat-Earth explanation. The ultimate demonstration came when Ferdinand Magellan's expedition completed the first global circumnavigation in 1521. Antonio Pigafetta, one of the few survivors of the voyage, recorded the loss of a day in the course of the voyage, giving evidence for east-west curvature. No flat-Earth theory could reconcile the daily apparent motions of the sun with the ability to sail around the world, and the loss of a day could make no sense, either

Middle East: Islamic scholars

The Abbasid Caliphate saw a great flowering of astronomy and mathematics in the 9th century AD. Muslim scholars of the past believed in a spherical Earth.^[128]

The Quran mentions that the Earth (*al-arḍ*) was "spread out".^[129] To this 12th-century commentary, the Tafsir al-Kabir (al-Razi) by Fakhr al-din al-Razi, states "If it is said: Do the words 'And the Earth We spread out' indicate that it is flat? We would respond: Yes, because the Earth, even though it is round, is an enormous sphere, and each little part of this enormous sphere, when it is looked at, appears to be flat. As that is the case, this will dispel what they mentioned of confusion. The evidence for that is the verse in which Allah says (interpretation of the meaning): 'And the mountains as pegs' [an-Naba' 78:7]. He called them *awtaad* (pegs) even though these mountains may have large flat surfaces. And the same is true in this case."^[130]

The 11th-century scholar Ibn Hazm stated, "Evidence shows that the Earth is a sphere but public people say the opposite." He added, "None of those who deserve being Imams for Muslims has denied that Earth is round. And we have not received anything indicates a denial, not even a single word."^[131]

Scholar Ibn Taymiyyah stated that the Earth is spherical and not flat. He stated that the Arabic word *falak* (Arabic: فَلَكٌ) refers to that which is round. Ibn Abbas said it is like that of a spinning wheel.^[132] The word is used in Quran 21:33 and Quran 36:40. The scholar Al-Suyuti stated that the belief in a flat Earth is a deviation.^[132]

Ming Dynasty in China



Illustration of the spherical Earth in a 14th-century copy of *L'Image du monde* (c. 1246)

A spherical terrestrial globe was introduced to Yuan-era Khanbaliq (i.e. Beijing) in 1267 by the Persian astronomer Jamal ad-Din, but it is not known to have made an impact on the traditional Chinese conception of the shape of the Earth.^[134] As late as 1595, an early Jesuit missionary to China, Matteo Ricci, recorded that the Ming-dynasty Chinese say: "The Earth is flat and square, and the sky is a round canopy; they did not succeed in conceiving the possibility of the antipodes."^[54] The universal belief in a flat Earth is confirmed by a contemporary Chinese encyclopedia from 1609 illustrating a flat Earth extending over the horizontal diametral plane of a spherical heaven.^[54]



The Ming-Chinese *Shanhai Yudi Quantu* map in the *Sancai Tuhui* encyclopedia, published in 1609, with translations in English from Roderich Ptak's "The Sino-European Map".^[133]

In the 17th century, the idea of a spherical Earth spread in China due to the influence of the Jesuits, who held high positions as astronomers at the imperial court.^[135] Matteo Ricci, in collaboration with Chinese cartographers and translator Li Zhizao, published the *Kunyu Wanguo Quantu* in 1602, the first Chinese world map based on European discoveries.^[136] The astronomical and geographical treatise *Gezhicao* (格致草) written in 1648 by Xiong Mingyu (熊明遇) explained that the Earth was spherical, not flat or square, and could be circumnavigated.^[135]

Myth of the flat Earth

Beginning in the 19th century, a historical myth arose which held that the predominant cosmological doctrine during the Middle Ages was that the Earth was flat. An early proponent of this myth was the American writer Washington Irving, who maintained that Christopher Columbus had to overcome the opposition of churchmen to gain sponsorship for his voyage of exploration. Later significant advocates of this view were John William Draper and Andrew Dickson White, who used it as a major element in their advocacy of the thesis^[137] that there was a long lasting and essential conflict between science and religion.^[138] Subsequent studies of medieval science have shown that most scholars in the Middle Ages, including those read by Christopher Columbus, maintained that the Earth was spherical.^[139] Some studies of the historical connections between science and religion have demonstrated that theories of their mutual antagonism ignore examples of their mutual support.^{[140][141]}

Modern Flat-Earthers

In the modern era, the pseudoscientific belief in a flat Earth has been expressed by a variety of individuals and groups:

- English writer Samuel Rowbotham (1816–1885), writing under the pseudonym "Parallax", produced a pamphlet, "Zetetic Astronomy", in 1849 arguing for a flat Earth and published results of many experiments that tested the curvatures of water over a long drainage ditch, followed by another called *The inconsistency of Modern Astronomy and its Opposition to the Scripture*. One of his supporters, John Hampden, lost a bet to Alfred Russel Wallace in the famous Bedford Level Experiment which attempted to prove it. In 1877 Hampden produced a book, "A New Manual of Biblical Cosmography".^[142] Rowbotham also produced studies that purported to show that the effects of ships disappearing below the horizon could be explained by the laws of perspective in relation to the human eye.^[143] In 1883 he founded Zetetic Societies in England and New York, to which he shipped a thousand copies of *Zetetic Astronomy*.
- William Carpenter, a printer originally from Greenwich, England (home of the Royal Observatory and central to the study of astronomy), was a supporter of Rowbotham. Carpenter published *Theoretical Astronomy Examined and Exposed – Proving the Earth not a Globe* in eight parts from 1864 under the name *Common Sense*.^[144] He later emigrated to Baltimore, where he published *One Hundred Proofs the Earth is Not a Globe* in 1885.^[145] He wrote, "There are rivers that flow for hundreds of miles towards the level of the sea without falling more than a few feet – notably the Nile, which, in a thousand miles, falls but a foot. A level expanse of this extent is quite incompatible with the idea of the Earth's convexity; it is, therefore, a reasonable proof that Earth is not a globe", as well as "If the Earth were a globe, a small model globe would be the very best –



Flat Earth map drawn by Orlando Ferguson in 1893. The map contains several references to biblical passages as well as various jabs at the "Globe Theory".

because the truest – thing for the navigator to take to sea with him. But such a thing as that is not known: with such a toy as a guide, the mariner would wreck his ship, of a certainty!, This is a proof that Earth is not a globe."

- John Jasper, an American slave turned prolific preacher, echoed his friend Carpenter's sentiments in his most famous sermon "Der Sun do move", preached over 250 times, always by invitation. He claimed, "Low me ter ax ef d' earth is roun', whar do it keep its corners? Er flat, squar thing has corners, but tell me where is de cornur uv er appul ur a marbul, ur a cannun ball, ur a silver dollar"^{[146][147]}
- In Brockport, New York, in 1887, M.C. Flanders argued the case of a flat Earth for three nights against two scientific gentlemen defending sphericity. Five townsmen chosen as judges voted unanimously for a flat Earth at the end. The case was reported in the *Brockport Democrat*^[148]
- Professor Joseph W. Holden of Maine, a former justice of the peace, gave numerous lectures in New England and lectured on flat Earth theory at the Columbian Exposition in Chicago. His fame stretched to North Carolina where the Statesville Semi-weekly Landmark recorded at his death in 1900: "We hold to the doctrine that the Earth is flat ourselves and we regret exceedingly to learn that one of our members is dead."^[149]
- After Rowbotham's death, Lady Elizabeth Blount (Elizabeth de Sodington Blount, née Elizabeth Anne Mould Williams) created the Universal Zetetic Society in 1893 in England and created a journal called Earth not a Globe Review, which sold for two pence, as well as one called Earth, which only lasted from 1901 to 1904. She held that the Bible was the unquestionable authority on the natural world and argued that one could not be a Christian and believe the Earth is a globe. Well-known members included E. W. Bullinger of the Trinitarian Bible Society, Edward Haughton, senior moderator in natural science in Trinity College, Dublin and an archbishop. She repeated Rowbotham's experiments, generating some interesting counter-experiments, but interest declined after the First World War.^[149] The movement gave rise to several books that argued for a flat, stationary Earth, including Terra Firma by David Wardlaw Scott.^[150]
- In 1898, during his solo circumnavigation of the world, Joshua Slocum encountered a group of flat-Earthers in Durban, South Africa. Three Boers, one of them a clergyman, presented Slocum with a pamphlet in which they set out to prove that the world was flat. Paul Kruger, President of the Transvaal Republic, advanced the same view: "You don't mean *round* the world, it is impossible! You mean *in* the world. Impossible!"^[151]
- Wilbur Glenn Voliva, who in 1906 took over the Christian Catholic Church, a Pentecostal sect that established a utopian community in Zion, Illinois, preached flat Earth doctrine from 1915 onwards and used a photograph of a twelve-mile stretch of the shoreline at Lake Winnebago, Wisconsin taken three feet above the waterline to prove his point. When the airship Italia disappeared on an expedition to the North Pole in 1928 he warned the world's press that it had sailed over the edge of the world. He offered a \$5,000 award for proving the Earth is not flat, under his own conditions.^[152] Teaching a globular Earth was banned in the Zion schools and the message was transmitted on his WCBD radio station.^[149]
- In 2018, astronomer Yaël Nazé analyzed the controversy over a Ph.D. thesis proposed by a student at the University of Sfax, which defended a flat Earth as well as a geocentric model of the solar system and a young Earth. The dissertation, which had not been approved by the committee overseeing environmental studies theses, had been made public and denounced in 2017 by professor Hafedh Ateb, a founder of the Tunisian Astronomical Society on his Facebook page.^[153]

Flat Earth Society

In 1956, Samuel Shenton set up the *International Flat Earth Research Society* (IFERS), better known as the Flat Earth Society from Dover, UK, as a direct descendant of the Universal Zetetic Society. This was just before the Soviet Union launched the first artificial satellite, Sputnik; he responded, "Would sailing round the Isle of Wight prove that it were spherical? It is just the same for those satellites."

His primary aim was to reach children before they were convinced about a spherical Earth. Despite plenty of publicity, the space race eroded Shenton's support in Britain until 1967 when he started to become famous due to the Apollo program.^[149]

In 1972 Shenton's role was taken over by Charles K. Johnson, a correspondent from California, US. He incorporated the IFERS and steadily built up the membership to about 3,000. He spent years examining the studies of flat and round Earth theories and proposed evidence of a conspiracy against flat Earth: "The idea of a spinning globe is only a conspiracy of error that Moses, Columbus, and FDR all fought..." His article was published in the magazine *Science Digest*, 1980. It goes on to state, "If it is a sphere, the surface of a large body of water must be curved. The Johnsons have checked the surfaces of Lake Tahoe and the Salton Sea without detecting any curvature."^[156]

The Society declined in the 1990s following a fire at its headquarters in California and the death of Johnson in 2001.^[157] It was revived as a website in 2004 by Daniel Shenton (no relation to Samuel Shenton). He believes that no one has provided proof that the world is not flat.^[158]

Resurgence in the era of celebrity and social media

In the modern era, the proliferation of communications technology and social media platforms such as YouTube, Facebook^[159] and Twitter have given individuals, famous^[160] or otherwise, a platform to spread pseudo-scientific ideas and build stronger followings. The flat-Earth conjecture has flourished in this environment.^{[6][7][161]}

The solar eclipse of August 21, 2017, gave rise to numerous YouTube videos purporting to show how the details of the eclipse prove the Earth is flat.^{[162][163]} Also in 2017, a scandal developed in Arab scientific and educational circles when a Tunisian PhD student submitted a thesis declaring Earth to be flat, unmoving, the center of the universe, and only 13,500 years old.^[164]

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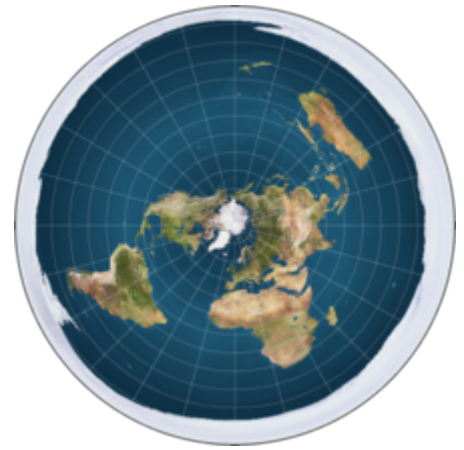
The term *flat-Earther* is often used in a derogatory sense to mean anyone who holds ridiculously antiquated views. The first use of the term *flat-Earther* recorded by the *Oxford English Dictionary* is in 1934 in *Punch*: "Without being a bigoted flat-earther, [Mercator] perceived the nuisance ... of fiddling about with globes ... in order to discover the South Seas."^[165] The term *flat-earth-man* was recorded in 1908: "Fewer votes than one would have thought possible for any human candidate, were he even a flat-earth-man."^[166]

See also

- List of topics characterized as pseudoscience
- Biblical cosmology
- Denialism
- Earth's rotation
- Geographical distance
- Hollow Earth
- Scientific mythology
- Skepticism
- World Turtle

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Azimuthal equidistant projections of the sphere like this one have also been co-opted as images of the flat Earth model depicting Antarctica as an ice wall^{[154][155]} surrounding a disk-shaped Earth.

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