

# Was the Star of Bethlehem a Star, Comet ... or Miracle?

Between 1935 and 1959, one of the highlights of the Christmas season was visiting New York's Hayden Planetarium where they would stage their traditional sky show in which astronomers pondered the age-old question of the possible origin of the Star of Bethlehem.

Hayden's very first Zeiss projector (three others have been installed since) was run back some 2,000 years in an attempt to reproduce the positions of the planets around the time of the birth of Christ. The entire procedure would take four hours with the planets engaged in an incredible fast-moving dance while the moon flipped around the sky a hundred times a minute!

Ultimately, the projector was brought to a halt on Feb. 25 in the year 6 BC with the planets Jupiter, Saturn and Mars forming a triangle low in the western sky.

In those days, a silhouette of the skyline of New York was a permanent fixture around the periphery of the planetarium dome, so the planet trio was depicted not above a Middle East desert, but Midtown Manhattan. The audience was then asked: "Was the star seen by the Wise Men an unusual, or was that fabled 'sign in the sky' a meteor, comet, nova, or something supernatural?"

In later years, the tedious running-back of the projector was discontinued, mainly to save needless wear and tear on the machinery. In 1960, special auxiliary projectors were designed to depict the planet triangle. And the panorama silhouette of New York skyscrapers was replaced by a series of projectors which could replicate not just the skyline of New York, but scenes from any location on Earth. As such, Hayden audiences could now watch as Jupiter, Saturn and Mars drew near to each other over the landscape of Bethlehem.

But there are many other contributing factors to this age-old story, including the uncertainty in the actual date of Christ's birth and the terminology used to describe celestial events during the Star's appearance some 20 centuries ago. For instance, any heavenly object bright enough to attract attention was apt to be called a "star." Meteors, for instance, were "shooting" or "falling" stars; comets were "hairy" stars; novae were "new" stars and planets were "wandering" stars.

The Bible says nothing about the calendar date of the Nativity, but does refer to historical personages and events, such as the reign of King Herod. Modern historical research suggests that Herod may have died sometime between 4 B.C. and 1 B.C. by our present calendar. The Magi are said to have visited Herod just before he died and presumably the birth of Christ and the first appearance of the fabled Star came sometime before that.

And it is very doubtful that Jesus was born in late December.

For one thing, the oft-quoted Biblical passage in St. Luke: "And there were in the same country shepherds abiding in the field, keeping watch over their flock by night" indicates that spring is the likely season; that was when the shepherds in Judea were tending the newborn lambs.

In ancient times, Dec. 25 was the date of the lavish Roman festival of Saturnalia. It was a time when gifts were exchanged; homes, streets and buildings were decorated; people came home for the holidays and everybody was in a happy, party mood.

It has been said that early Christians chose the date of the Saturnalia in order to avoid attention and thus escape persecution. When the Roman emperor Constantine officially adopted Christianity in the 4th century, the date of Christmas remained Dec. 25.

And Christ's birth almost certainly did not occur 2,011 years ago. Our present chronology by which the years are numbered as AD or BC was conceived by the Roman abbot Dionysius Exiguus around 523 A.D. Unfortunately, Dionysius made two significant errors in his calculations.

The first was his placement of 1 A.D. immediately following 1 B.C., completely disregarding the mathematically required 0 in between. Back then in Europe, zero was not considered a number. So, for instance, the year we now call 3 B.C., is actually -2 numerically speaking.

Second, Dionysius accepted the statement of Clement of Alexandria that Jesus was born in the 28th year of the reign of the Roman emperor Caesar Augustus. But Dionysius failed to realize that during the first four years of his reign this Roman ruler was known by his original name Octavianus, until the Roman senate proclaimed him as "Augustus."

So here alone we have an error of four years, but by the time it was realized our chronology was too well entrenched to be changed.

As for the time for the appearance of the Star, most astronomers and Biblical scholars believe that it most likely occurred sometime between the years 7 and 2 B.C. So this is the time frame that we need to explore to determine if there was anything unusual in the sky that might have caught the attention of the Magi.

At least four theories have been advanced to explain the Star of Bethlehem from a purely astronomical viewpoint.

Possibly the first idea put forward was that it was an unusually bright fireball meteor seen streaking toward the horizon. But as any sky watcher knows from experience, such an object can be seen to flash across the sky in a mere matter of seconds – hardly long enough to lead the Magi halfway across the Orient to the little town of Bethlehem. So we can confidently lay this concept to rest.

Not so easily dismissed, however, is the possibility that the Star was a bright comet. Such objects can remain visible to the unaided eye for weeks either in the predawn sky or at dusk. Surely it is not impossible to conceive that a comet with a bright star-like head and long gossamer tail pointing like some cosmic finger toward the horizon could have drawn the Magi to Bethlehem.

The famous Halley's Comet, last seen in early 1986, flared in the sky during August and September in the year 11 BC. However, most authorities dismiss it due to the poor time fit. Although it seems unlikely that another Great Comet could have appeared nearer to the accepted time frame of the Star's appearance and went unrecorded, we can never really be sure.

Besides, comets were viewed as omens of evil, such as floods and famine as well as the death – not the birth – of kings and monarchs. The Romans, in marking the death of the Roman General Agrippa, for example, used the 11 B.C. apparition of Halley's Comet as a benchmark. With this in mind, comets would seem to be wrong as the heavenly sign that would signal the coming of a newborn king.

Perhaps the simplest answer is a nova or supernova outburst: A new star blazes forth where none had ever been seen and leaves no trace for us to find in the future. Although their names imply a new creation, these spectacular objects are in reality dying stars, although they are new (albeit temporary) additions to the nighttime sky.

The appearance of a nova is unpredictable – a really bright one becomes visible perhaps once every 20 years or so. Going on this assumption, we're due for a bright naked-eye nova at almost any time now, since the most recent one appeared in August 1975 not far from the bright star Deneb in the constellation Cygnus.

Most bright novas suddenly and unexpectedly flare into prominence literally overnight, attracting the instant attention of sky-conscious people. But after several days or weeks of such prominence, it gradually fades back to obscurity.

Even more spectacular – but much rarer – are supernovae; stars that suddenly blow themselves completely apart, briefly producing an incredible energy output equivalent to the combined light of an entire galaxy of stars!

At the height of its outburst, a supernova can shine with a brilliance capable of casting shadows and can even be seen in broad daylight – truly a celestial announcement worthy of the birth of a king. In our Milky Way galaxy, over the past thousand years, there have been four brilliant supernovas, in 1006, 1054, 1572 and 1604.

Clearly, we are long overdue for another.

Although a nova or supernova is the most satisfying explanation for the Star, there is a serious problem with it, in that there doesn't seem to be any definitive record of a bright nova appearing in the sky during the time that biblical historians believe the Magi made their journey. One nova apparently did appear, bordering the constellations Capricornus and Aquarius during the spring of 5 B.C. But the Chinese records, which describe this object, imply that it was apparently not very conspicuous at all.

The final possibility is one or more of the bright naked-eye planets. The likelihood that the Magi could have confused one or more of the familiar planets with a star seems remote. However, sometimes two or more of these restless wanderers come together in a striking conjunction.

Perhaps a planetary grouping of particular beauty; an exceptionally close conjunction of two planets or groupings of three or more creating an eye-catching geometric figure in the sky may have taken place between the years 7 and 2 B.C. Such a gathering would be quite unusual to say the least.

One such event that we've already mentioned occurred in 6 B.C. involving Mars, Jupiter and Saturn, and happened in the constellation of Pisces, the Fishes.

Yet another possible explanation for the Star of Bethlehem is the three-times passing of Jupiter and Saturn between May and December in 7 BC; a rare triple or "great conjunction." Jupiter appeared to pass one degree north of Saturn on May 29; practically the same on Sept. 30; then finally a third time on Dec. 5.

There is no doubt about the visibility of these events, mostly opposite to the sun in nighttime skies. As for their astrological impact, the Magi would have certainly noticed that both planets did not appear to separate widely between their conjunctions. In fact, for eight consecutive months – the time it might have taken to travel the 500 miles or more from Babylonia to Judea – Jupiter and Saturn remained within three degrees of each other, from late April of 7 B.C. until early January of 6 B.C.

But perhaps no other planetary grouping can equal that of the two brightest planets – Venus and Jupiter – for the explanation that we seek. And if we take the only known account of the Star given in St. Matthew, then what we really need is the appearance of not just one, but two "stars." The first appearance would have been seen well in advance of the Magi's arrival in Bethlehem, and the other at the end of their long journey.

Maybe the signal for their star was to be a sign in the constellation of Leo, the Lion.

To the early Israelites, Leo was a constellation of great astrological significance and considered a sacred part of the sky. A very close conjunction of Venus and Jupiter would have been visible in the eastern dawn sky of the Middle East on August 12, 3 B.C.

When they first emerged above the eastern horizon, the two planets were separated by only about two-fifths of the moon's apparent diameter or 12 minutes of arc. As a comparison, the separation of the stars Mizar and Alcor in the handle of the Big Dipper is also 12 arc minutes.

Planets this close can be very striking, if they don't differ too much in brightness. Incidentally, this sign would have been both seen "in the east" by Persian men "in the East," explaining the ambiguous phrase in St. Matthew.

Venus ultimately vanished into the glare of the sun, but Jupiter and Leo remained in the night sky during the next ten months. During this time a number of additional planetary conjunctions took place, all of which would have been of great importance to the priest-astrologers of the time.

Sometime during the spring of 2 B.C. the Magi might have had their audience with King Herod, who questioned them diligently as to what they had seen and when. Obviously Herod and his advisers missed out on seeing the "star" for themselves (but then again, it appeared at around 4 or 5 a.m. when likely the only thing they were watching were the inside of their eyelids!). Herod sent the Magi on their way to search for the Christ child.

Then, during June of 2 B.C., as Jupiter and the stars of Leo began to sink into the western evening twilight, Venus again returned to this same region of the sky for an even more spectacular encore. The Magi certainly would have especially taken note that on the evening of June 17, Jupiter and Venus appeared even closer together than they did in the dawn skies of the previous August.

As the planets slowly descended toward the horizon they got closer and closer together. Finally, at 8:30 p.m. local time they drew to within a mere 0.6 of an arc minute of each other while appearing in the western twilight sky.

To the Magi the two brightest planets must have appeared to coalesce into one and glowed before them like a dazzling beacon over Judea. Eyeglasses were many centuries in the future, so only people with perfect eyes would have seen the planets separated.

Astronomy can tell us that all these planetary conjunctions indeed occurred. But whether anyone actually observed them, and if any of these sent the Magi on their historic journey, are all matters for conjecture.

And finally, was the Star of Bethlehem a miracle star?

Hubert J. Bernhard, who for many years was a lecturer at San Francisco's Morrison Planetarium made a series of four LP record albums in 1967, trying to educate and popularize astronomy. They were called "The Planetarium Lecture Series" and one of his topics dealt with the Star of Bethlehem. Near the end of his lecture Bernhard placed this discussion into perspective when he said:

"If you accept the story told in the Bible as the literal truth, then the Christmas Star could not have been a natural apparition. Its movement in the sky and its ability to stand above and mark a single building; these would indicate that it was not a normal

phenomenon, but a supernatural sign. One given from on high and one that science will never be able to explain."

Indeed, perhaps this is a mystery that modern science can never truly unravel. Astronomy has taken us as far as it can go. The final decision is yours, alone.