Star of Bethlehem

The biblical Star of Bethlehem, which heralded the birth of Jesus Christ, is only mentioned in the Gospel of St Matthew 2. The astrologically significant 7 BC triple conjunction of Jupiter and Saturn in the constellation of Pisces is the most likely candidate, although a comet in 5 BC and a comet in 4 BC cannot be ruled out. There is also the possibility that the star was simply fictitious.

Introduction

The Jesus biblical nativity story was added, somewhat belatedly, as a prelude to only two gospels. Luke has a peculiar census/taxation system, a journey from Nazareth, an over-booked inn, a manger, a visitation of shepherds in the fields on the birth night, circumcision, purification and a journey home. Matthew has a family living in Bethlehem, a star, Herod, magi, gifts, the massacre of the innocents, a flight into Egypt and a relocation to Nazareth in the first year of the reign of Archelaus.

There is no star in Luke, and in Matthew 2 the word ‘star’ is used only four times. The stellar facts are as follows.

(1) As Jesus was born in the last four or so years of the reign of Herod the Great (Matthew 2:1), the star occurred sometime between 8 BC and Herod’s death around Easter 4 BC. (A few, however, put Herod’s death as late as January 1 BC.) This time interval considers both the Lukean census (the Roman Monumentum Ancyranum of Caesar Augustus dates this as 746/747 ab urbe condita, i.e. 8/7 BC) and the massacre of the innocents (two years old and under, Matthew 2:16) and the two years in which the Holy Family were in Egypt, sheltering from the wrath of Herod the Great. In dating the star we must ignore the hijacking (around AD 336) by early Christians of the pagan winter solstitial feast of dies solis invicti natalis for the celebration of the birthday of Christ. Also Dionysius Exiguus was considerably in error, in AD 525, when he based his new calendrical year numbering on the calculation that Jesus was born on 25 December, 1 BC and was about one week old on 1 January, AD 1. Jesus was six months younger than John the Baptist (Luke 1:36). Early Christian and Muslim tradition suggests that Jesus was born in the autumn and on the day after the Jewish Sabbath. It is most unlikely that the shepherds would be ‘in the field, keeping watch over their flock by night’ (Luke 2:8) in an Israeli December. Modern Christmas celebrations owe much to ancient pagan midwinter Sun-worshippers traditions.

(2) The magi were most probably learned Babylonian Zoroastrian priests and astrologers, and certainly not ‘kings’, their later beatiification and royalty being mainly due to Psalms 68:29, 72:10, Isaiah 49:7 and 60:3, 60:10. They first saw the star heliacally ‘in the east’, ‘en te anatole’, in the pre-dawn sky (Matthew 2:2).

(3) Two thousand years ago the word ‘star’ was a generic term for any astronomical object. Planets were wandering stars, novae were new stars, comets were hairy stars and meteors were shooting stars. All could have been the ‘star’ of Bethlehem.

(4) The magi talked of ‘his’ star (Matthew 2:2). It clearly had an astrological association with the birth of a new ‘King of the Jews’ (not the expected Messiah). They then traveled to Jerusalem (not Bethlehem), as ambassadors, to pay homage to this king and to present gifts. Visits by Magi were commonplace in those days. The association of stars with kings and new rulers was not unusual at the time (see Numbers 24:17).

(5) Herod and all Jerusalem had not noticed the star (Matthew 2:3) and had not witnessed its first appearance (Matthew 2:7). This indicates that the star was insignificant. Gross exaggerations as to its brightness were introduced later on by St James (Protevangelium, 7, written about AD 150), Ignatius (Epistle to the Ephesians, XIX) and Origen (Contra Celsum, 1:58). Terms such as ‘indescribably great’, ‘its light was unspeakable’ and ‘new’ must be contrasted with the adjectivally unadorned Matthean star.

(6) The star appeared twice. It was first seen at dawn from the magi’s home town (Matthew 2:2). Its second appearance, probably in the evening southern sky, was after they had met Herod in Jerusalem, and were on the short 10 km southward journey to Bethlehem (Matthew 2:9). Their exceeding great joy on witnessing the second appearance indicates that this had been predicted, and they were pleased with the confirmation.

(7) The star ‘went before them, until it came and stood over where the young child was’ (Matthew 2:9). This is an astronomical stumbling block. Stars do not ‘go before’. Comets have, however, been noted by contemporary historians such as Dio Cassius (Roman History, 54:29) and Josephus (Jewish War, 6:5:3) to ‘stand over’ individual cities. Artists also have often used comets as Stars of Bethlehem in their nativity scenes, the AD 1303 fresco in the Arena Chapel in Padua by Giotto being a famous example.

(8) The star’s circumstances were uncommon. Regular astronomical events such as the stunning evening and morning appearances of Venus, and the zodiacal light, annual meteor showers, occasional fireballs and lunar occultations of Jupiter are surely so unremarkable that they would not regularly encourage magi to buy gifts and to travel long distances.

Astronomical possibilities

The facts and time frames must now be related to contemporary astronomical events. Fortunately Chinese observational astronomy was flourishing, and careful records were kept of unusual occurrences such as comets, novae, sunspots and shooting stars, for astrological purposes. Babylonian planetary astrology was also active but unfortunately only a few of the relevant clay tablets have been found. Ho (1962) recorded contemporary Far Eastern diary records. His object number 61 was Comet Halley. This was seen in 12 BC, as a po-hsing (a comet without a tail), but was too early.

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For 70 days between 9 March and 6 April 5 BC a sui-hsing (a comet with a tail) was recorded in Capricornus near the asterism Chhien-niu (RA 20.25 h, dec 15°). As no details are given as to the motion of this object, Clark et al (1977) take it to be a nova. The long duration is taken to indicate that it was bright.

A comet (po-hsing) was seen in April 4 BC near Ho-Ku in Aquila (RA 19.6 h, dec +8°). Duration details are not given so this comet was probably faint and short-lived.

Ho’s object number 65, a comet seen in December AD 13, is far too late.

The Star of Bethlehem might have been a planetary conjunction. Here the Earth-based observer sees two or more planets nearly along the same line of sight, this producing an impressive grouping on the celestial sphere. There was a significant triple conjunction of Jupiter and Saturn in 7 BC in Pisces. These planets have orbital periods of 11.9 and 29.5 yr respectively and thus pass each other in the sky every 19.9 yr. Every 120 yr or so, the Sun is also close to the Earth–Jupiter–Saturn line giving three conjunctions in about six months. Every 796.4 yr these triple conjunctions take place in Pisces, the last being in April 1573. In February 6 BC Mars joined Jupiter and Saturn forming a ‘massing’ only 8° across.

One advantage of a planetary conjunction ‘star’ is that the astronomical and astrologically uninterested would most likely not know it was happening, and, with the exception of point (7), it fits the facts. A planetary conjunction would have a clear message to astrological magi. It would tell them where to go, when to go and what to expect when they got there. Kennedy and Pingree (1971) noted how an 8th century AD astrological world history by Masha’allah, based on earlier Babylonian and Iranian ideas, stressed the role of Jupiter–Saturn ‘great’ conjunctions as heralds of important religious and political events. The Noachian deluge and the births of Jesus and Mohammed were mentioned particularly. In AD 1497 Don Isaac Abrabnel stressed that the constellation Pisces was specifically associated with Israel in Magian astrology. Saturn was regarded as the old ruler (and father), with Jupiter as the new king, and son. Both interpretations are unfortunately post facto. Predictions of the 7 BC triple conjunction have also been found on Babylonian clay tablets (see Sachs and Walker 1984).

A Jupiter–Saturn–Mars massing was observed in 1604 by Johannes Kepler. The contemporary appearance of the supernova of 1604 convinced Kepler that the latter was the Star of Bethlehem.

Other conjunctions have been suggested. Sinott (1968) and Mosley (1987) concentrated on the rather late June 2 BC close conjunction of Jupiter and Venus near Regulus in Leo. Much is made of the Judea–Lion association and of the possibility that Herod might have lived until just after the total lunar eclipse of 10 January 1 BC as opposed to the partial lunar eclipse of 13 March 4 BC.

Molnar (1999) reinterprets the astrological evidence. He is convinced that the constellation associated with Israel was not Pisces but the adjacent sign Aries. This is not only favoured by the Egyptian–Greek astronomer–astrologer Ptolemy, in his Tetrabiblos, but is also supported by Syrian coinage which shows a leaping Ram peering over its shoulders at a star. A diligent search is then made of the astronomical records for events that take place in Aries. Molnar also assumed that the Magi are Hellenistic astrologers, and comparisons are made with the natal horoscopes of other ‘kings’ such as the Emperor Hadrian and Antiochus 1 of Commagene. Jupiter and the Moon have important roles to play in these regal horoscopes, and there were two lunar occultations of Jupiter, in Aries, in 6 BC, one on 20 March, and the other on 17 April. As the first was ‘weakened’ by the nearness of the Sun in the sky Molnar chooses the second and suggests that Jesus was born on 17 April in 6 BC.

Unfortunately this thesis has certain problems. Both events were invisible. The 20 March occultation of Jupiter by the Moon occurred just before sunrise, and the 17 April occultation occurred at local noon. So the fact that Matthew stresses that the ‘star’ was ‘seen’ twice is ignored. Molnar surmises that astrologers only needed to calculate that something happened for it to be significant. However, even though Babylonian astronomers could easily predict planetary conjunctions and massings, the fact that the Moon is only 0.5° across, and lunar theory is extremely complicated, means that predicting occultations was way beyond them. We have to wait for the 17th century and a genius like Edmond Halley before lunar occultations could be predicted with any accuracy. Also, lunar occultations of Jupiter are most probably just too common to be the Star of Bethlehem. Jupiter is in Aries for 1 yr in every 12, and the Moon, in that year, moves through Aires 12 times.

Let us now consider the nova/comet in Capricorn, seen during March and April 5 BC, and the tail-less comet, or nova, seen in Aquila in April 4 BC. The former is favoured by Humphreys (1993) and by Clark et al (1997). Comets (which in those times were regarded as meteorological phenomena) have the advantage of ‘standing over’ specific places for short times. However, astrologically, comets are regarded as rather broad-brush indicators of doom, diseases, disaster and the death of kings. Needless to say, the death of one king could be good news for his successor. The snag with comets and novae is that they are completely unexpected. The astrology of comets is associated with the constellation that they appear in and the form and direction of their tails. Neither Capricornus nor Aquila has anything to do with Judea. Novae and comets brighten and then decay. They are not seen twice, as the Star of Bethlehem was. Comets are usually only seen after they have passed the Sun. It is an unusual comet that is seen both on its way in to the Sun and again on its way out. In this unusual case, we have had to wait for Isaac Newton, in the 1680s, to show that the same object was being seen on both occasions.

So the ‘exceedingly great joy’ of the magi, a joy that is often taken to indicate that one of their celestial
predictions had come true, and the same object had been seen twice, does not apply to comets or novae. Also, the 5 BC comet, that is seen for 70 days, will be bright at maximum, and it is then difficult to explain why Herod had not seen it and was taken by surprise by the Magi’s visit.

Let us return to the triple conjunction of 7 BC. Both Jupiter and Saturn were in opposition in Pisces and were moving around their retrograde loops. During late 8 BC and early 7 BC the planets approached each other at about 3.5° per month. On 27 May 7 BC they were only 1° apart (twice the lunar diameter). They then separated slightly, and by 27 July were 2.9° apart. Coming together again they were 1° apart on 6 October, 1.2° apart on 1 November and 1.05° apart on 1 December. During 6 BC they moved away from each other, as quickly as they had come together in early 7 BC. A 1° separation is not startling. This sight could easily be ignored by the astrologically uninterested. The close conjunctions in May and October–November provided an ideal ‘two stars’. The six months between these two events also gives ample time for the Magi’s preparation and travel. Proponents of this theory (for example Hughes 1976, 1979) regard Jupiter as the Star of Bethlehem. The date of the birth of Jesus is still uncertain but the astrologically minded Magi would have possibly associated it with the acronychal rising of the two planets, i.e. Tuesday 15 September 7 BC. The magi would have predicted this. There was no rush. They did not have to pay homage to the new King of the Jews on his actual day of birth; any time when he was a young child would do. Unfortunately, like most astronomical interpretations, the ‘going before’ and ‘standing over’ is still a problem.

Conclusion
The astrological interpretation of the Star of Bethlehem has one great snag. It gives a degree of credence and verisimilitude to a subject that is a quagmire of subjective, unscientific partiality. This interpretation has the star as a tangible physical phenomenon.

There are two other possibilities. One abrogates the scientific interpreter of all responsibility and regards the whole phenomena as miraculous. The passage of one age and the dawn of the next is thus heralded by a miraculous occurrence, and as such the star is inexplicable.

A more appealing proposal is that the star is an example of midrash. Thus it is nothing more than a fictitious invention giving fulfilment to the Old Testament prophecy of Balaam in Numbers 24:17 (‘there shall come a star out of Jacob’). The Star of Bethlehem would then join a host of other fascinating historic stars and comets that were thought to foretell the birth and death of heroes, kings and emperors. Matthew would have used it to add credence to the messianic nature of Jesus and to encourage more of his Jewish audience to convert by the Magi’s visit.

However, if it was an invention, why did Matthew omit one of his favourite phrases, ‘that it should be fulfilled’, and why did he invent such an ordinary star, or one that had such similarities to an actual celestial occurrence? To me the Gospel of St Matthew rings true. Its message is unembellished. I believe that the Star of Bethlehem actually existed, and that astronomical historians will enjoy searching for it for many years to come.

Bibliography
Clark, D H, Parkinson, J H and Stephenson, F R 1977 An astronomical re-appraisal of the star of Bethlehem — a nova in 5 BC, Q. J. R. Astron. Soc. 18 443–9
Ferrari D’Occhieppo, K 1977 Der Stern der Weisen Geschichteder Legende (Vienna: Herold)
Ho P-Y 1962 Ancient and mediaeval observations of comets and novae in Chinese sources Vistas Astron. 5 127–225
Hughes, D W 1976 The Star of Bethlehem Nature 264 513–7; 268, 565–7
Hughes, D W 1979 The Star of Bethlehem: an Astronomer’s Confirmation (New York: Walker)
Humphreys, C 1993 The Star of Bethlehem: an Astronomer’s Confirmation (New York: Walker)
Maunder, E W 1908 The Astronomy of the Bible (London: Sealey Clark)
Mosley, J 1987 The Christmas Star (Los Angeles, CA: Griffith Observatory)
Sinnott, R 1968 Thoughts on the Star of Bethlehem Sky Telescope 36 384–6
Teres, G 2000 The Bible and Astronomy: The Magi and the star in the Gospel (Budapest: Springer Orvosi Kiad Kft)
Scarrow, J V 1991 A Chronographic Analysis of the Nativity (New York: Vantage)

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