

# La història dels trànsits

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What kind of phenomenon did the Three Magi follow to Bethlehem? Astronomers from all over the world has tried to answer this question about a fact which happened more than two thousand years ago.

## 1 A debate more than 1000 years long

When Christmas arrive, people decorate their houses whith the typical ornaments they prefer, and one of the most famous ones is the Christmas star, nearly always present as a crown for the Christmas Tree.

The story about a star which drove the Three Magi to find the place where Jesus child were has been transmitted by popular tradition, but finds its origin at the Gospel itself. But nobody, in any place, has ever written anything about the nature of that astonishing object and so, astronomers from all over the world has tried to determine it through history: what was it? Can we know, by any means, the phenomenon which caused it? Will we be able to identify the event someday?

We know about attempts to find reasonable answers to these questions at least ten centuries ago. We have found manuscripts about the Christmas Star dating back to the 10th century, and paintings clearly inspired by this controversy, as the Giotto's work *The Adoration of the Magi*, from the 14th century. Even at the scientific age, we have found texts by the eminent astronomer Johannes Kepler (over 1600) trying to explain the phenomenon with an important amount of scientific rigor.

Lately, some astronomers has evaluated the different hypothesis published through history, trying to find which ones does not have any grounds. One of the most involved astronomers is Mark R. Kidger, from IAC, who has published the book *Star of Bethlehem*. The main part of what is said here is based on what he explains in this work.

## 2 What do we know about the Bethlehem Star?

The first problem we have to face is the fact that we have no texts written by direct witnesses of the star, but only documents on Jesus' life which were written some years after his death. That the only reference to the star is the Gospel of Matthew is often thought, but the truth is that other texts: the apocryphal Gospel of James and the Epistle Number XIX of Ignatius also mention the star. Nevertheless, this information is scarce and, very often, contradictory.

On the one hand, Matthew, James and Ignatius say that the Magi arrived to Bethlehem guided by an unbelievably great and bright star, while other evangelists, as Luke, do not even mention the star. If it was so astonishing, how can we understand that Luke did not say anything? This is still more surprising because the Gospels of Matthew and Luke are very similar. Probably the answer is that Matthew had some additional documents where the "Nativity" was described much more thoroughly.

On the other hand, the passages also state that Herod was very surprised by the explanation the Magi gave about the star. It seems quite impossible that a so extremely bright object was not seen neither by Herod nor by anybody at his court. Did his people hide the star to him? This is the most likely hypothesis, as the experts have informed.

With such a lack of reliable information, we can only suggest three kinds of hypothesis to solve the enigma, as Mark R. Kidger does:

- The Bethlehem Star is just a myth and surely it never existed. It is a quite reasonable option, because to invent exceptional celestial or earthly phenomena to give importance to the birth or death of a king or an emperor was a habit of that age.
- The Bethlehem Star is a miraculous event and so a manifestation of the Hand of God. Ergo, we cannot understand anything under the scientific approach and so this event has no interest. A scientifically valid explanation does not exist.
- The Bethlehem Star was a real astronomical event and it is only a question of time and patience to find the correct hypothesis among all: comets, meteors, supernovas, novas, planets... Only this path makes possible a scientific investigation and that is why we will center on it from now on.

### 3 The Christmas date

In order to explain scientifically a given event, we need to know exactly where and when it happened. In this case, we know very clearly the place, but we have no an exact idea of the date. It is well-known that December 25 is not exactly the day Jesus was born, but what it is not so well-known is that we can neither be sure about the year.

At the time of Jesus' life, under the Roman Empire rule, years were counted since the founding of Rome -ab urbe condita-. After the fall of the Roman Empire, in the 5th century AD, the roman calendar desapeared gradually and then, a man called Dionysius Exiguus tried to create a new calendar based on Christmas.

Dionysius started to count back the years of life of the roman emperors, stating this way the year 1 AD. This method has been used in many other traditions and it is very effective if you do not make any mistake or forget any king or emperor. Dionysius forgot that Caesar Augustus had first reigned as Octavianus, which means that his calculations have an error of 5 years. Therefore, Jesus was born, very likely, over the year 5 BC.

But let us go back to the biblical texts. We know from the Gospels that Jesus was born after a census was promulgated by Octavianus, which took place in 8 BC. We also know from the same source that Herod the Great was ruling over Judea by that time, and from the chroniclers of the time, that he died between a lunar eclipse and Pesaj. So, by modern calculations (see the analysis by Mark Kidger ) we have been able to determine that the birth of Jesus happened over 5 BC (as in Dionysius' calculations), or perhaps in 6 BC.

But, do we know the day? From 194 AD, several hypothesis have been following one another. Despite of this, perhaps just making use of the common sense we could solve the problem. If, as it is said in the Gospel, the shepherds were in the country, it could not be a winter date, but very likely one of the first days of the spring. Moreover, we know that gest houses were crowded, what was only usual at Pesaj. So we can conclude that the most probable option is that Jesus was born in a date near Pesaj in 5 BC, over the second half of April.

Why do we celebrate it on December? Christian communities chose this day because of its nearness to the pagan celebration of the winter solstice, in which houses were decorated with green branches - our Christmas trees - and several presents were made in commemoration, as we do nowadays. It is very usual that religious traditions adapt their celebrations to the pre-existent pagan calendars, to permit a major an deeper presence of their customs.

## 4 What was not the Christmas Star?

Once we have set the date, spring of the year 5 BC, we have to look for the astronomical phenomena which could attract attention of the Three Magi. The first step in one of these searches is to rule out the options that, in spite of having been taken into consideration sometimes, are not possible:

- Venus: It is the most spectacular and at the same time surprising planet, because it is observable before the sunrise in some seasons and just after the sunset in others, due to its orbit of lower planet. Anyway, it was a very well-known object since very ancient civilizations and could not astonish expert sky observers of that time.
- A supernova: Given the features of this kind of phenomena: they appear suddenly and are extremely bright, a supernova was a priori a very good hypothesis. In fact, some chinese astronomers detected an object of this type over the year 4-5 BC which could be compatible with the date previously calculated. But supernovas always leave a remnant in the region where they explode and every search to find this remnant has failed. Therefore, it is a ruled out hypothesis.
- The comet Halley: This hypothesis has been often considered correct, because some calculations of its orbit dating from the 18th century gave that it appeared over the year 1 BC and so it could be the Bethlehem Star if Dionysius was not wrong. Nevertheless, modern calculations show that the Halley appeared in the year 12 BC, an information in complete agreement with the observation of a comet by chinese astronomers. Finally, the comet Halley cannot be the longed for Christmas Star.
- The comet Hale-Boop: The appearance of this comet at Christmas 1996-97 gave rise to speculation, because calculations showed that this comet had started its trip through the Solar System over the date we are interested in. Nevertheless, this conjectures have no basis: the bright of the comet by that time was extremely faint, to a point that it could not be observed even with the best modern telescopes.
- A meteor: The option of a meteor shower with a particularly amazing shooting star showing the direction to Bethlehem has also been considered. But this kind of events are just a few seconds long and then they cannot be the Christmas Star. An alternative possibility is given by a very peculiar meteor shower during which every meteor follows the same path or, at least, the same direction. This odd type of meteor shower, called Cirilids, took place at the beginning of the 20th century and could have happened in any other date of the past. Anyway, the duration of the shower is not compatible with the time the Three Magi needed to complete their trip. The problem of this hypothesis is related then to the duration of the event.
- A conjunction of Venus and Jupiter: It seems that a very spectacular event of this type happened at Babylonia, where the Magi are thought to come from: the conjunction was so close that Venus partially eclipsed Jupiter. But we have been able to calculate that this event took place exactly in 2 BC and then it is not compatible with the date obtained for the birth of Jesus.
- An occultation by the Moon: This is a very common event - this year 2004 it has happened with Jupiter and it has been easily seen from the United States of America - and so it is difficult to believe that it could amaze the Magi so much to make them start such a hard journey. The american astronomer Michael Molnar has defended the hypothesis of an occultation of this type at the constellation of Aries, very important for Jews. To admit this possibility, we should change the date of the birth of Jesus from 5 to 6 BC.

## 5 What could it be? Conclusions:

There are two events able to explain the phenomenon : a triple conjunction of Mars, Jupiter and Saturn, or a comet or a nova observed by chinese astronomers in 5 BC. The third option is the one given by Michael Molnar, explained in the last point of the previous section.

A conjunction of Jupiter and Saturn usually happen every 20 years, and we know about one seen from Babylonia in 7 BC. The most important of its features is that took place at Piscis, a very important constellations for Jews. For babylonians, Jupiter was the good planet, and Saturn the evil one. So it is very probable that the meeting of good and evil at such an important area of the sky was a terrifying event for the confused minds of the time.

Another point in favour of the importance of the fact is that, some months later, over February in 6 BC, a new planetary meeting among Mars, Jupiter and Saturn at Piscis took place. If we take into account that Mars was the representation of the god of war and that the event was observable at the sunset, it necessarily attracted attention of the observers.

This phenomenon is quite common too, but what it is not so common and makes the investigator Mark Kidger think that this is the good direction is that these two events occurred in a very short period and afterwards, the following happened:

Chinese astronomers detected the appearance of a po-hsing, a comet with no tail or a star whose brightness increases suddenly, what we call a nova. If this object was a comet, it was surely neither the Halley nor the Halle-Boop. We can find also a mention to this object in the korean chronicles, where it is said that it was visible for 70 days at least.

Then, we have a bright nova which appears at the sky, according to calculations by historians from data taken by chinese and korean astronomers, over March in 5 BC. Here it is! The date of the Jesus' birth we have considered correct is April in 5 BC, so dear friends, we have just found the BETHLEHEM STAR!

As an alternative to the nova or to the chinese comet, some investigators, with Constantino Sigismondi as the brain behind, have suggested the hypothesis that these conjunctions coincided with one of the very spectacular maximums of brightness of the variable star Mira Ceti.

As a conclusion, it is very likely that the Three Magi were paying an special attention to the sky after the two events happened at Piscis that Mark Kidger has cared for, and the occultation at Aries proposed by Michael Molnar. This way, the appearance of a nova (or the case Mira Ceti suggested by Sigismondi) could make them think that the Messiah of Jews had arrived, so they started the trip to the place where the Scriptures said he was going to born, Bet lehem.