

*There will be signs in the sun, moon and stars,*

*- Luke 21:25.*

## **2. THE HUMAN KIND AND ECLIPSES.**

The eclipses were present in ancient times, and they are observable today. It must have been a spectacular show, for different cultures and civilizations throughout the ages. Can you imagine first organized ( not civilized ) people, that by accident happened to be in the area of the total eclipse. In my opinion it must have been something very special for them. Extremely rare, something that they were typically able to experience only once in a lifetime ( average life was shorter in those days, and traveling was limited ). Of course there are other natural phenomenon, that could have been in the area of unexplained things for our ancestors. Say for example a storm with lightning, or say a rainbow. The difference is however, that these other things were predictable to certain extent. If there are clouds seen around, and the rain is falling then there is a chance for the storm, as well as for a rainbow. The difference is in predictability. What makes eclipse a special phenomenon is its uniqueness, only one time on average for one lifetime and that is it. It must have been one of the most unexplained phenomenon for the stone age human beings, and also very spectacular. It is quite possible that eclipses speeded up the civilization progress. Stonehenge can probably be a good example here. It is proved that the ancient temple is dedicated to the Sun. It is not proved that it has anything in common with eclipses; however a single total eclipse could have triggered the idea of temple construction. Some archeo-astronomers speculate that the temple could have been used as an eclipse calendar. Many ancient civilizations erected huge temples dedicated to the Sun god and Moon god. I was very impressed by the pyramids of the Sun and the Moon near Mexico City. Teotihuacan is the name of the place. Construction of these buildings could have been also inspired by the single observation of the eclipse by local priests. They would have had a good justification for the higher tax collection “ Well, the gods wanted us to build the temples, this is what the eclipse was for, so we need money, period.”

There is a good book written by the Polish 19th century writer Boleslaw Prus, describing how the eclipse was used in ancient Egypt by local priests for political purposes. The book was written in the year 1897. There is also a full size movie created based on the book entitled “Pharaoh”. The movie was nominated for the Oscar in the year 1967. The Polish writer was inspired by the real eclipse that took place on July 31st 1063 B.C.. The center line of the eclipse passed almost precisely through the capital of ancient Egypt, Thebes. B. Prus knew about that, since for the first time in history, eclipses from ancient times, and future eclipses were calculated precisely, from 1207 B.C. to 2161AD. It was done by the Austrian astronomer Theodor von Oppolzer. In 1886 his book ( one year after his death ) “Canon of Eclipses” was published. The book contains details for 13 200 lunar and solar eclipses. Of course computers were not used to do the calculations, so one can imagine how difficult and time consuming the task must have been. As we know the religion of ancient Egyptians was related also to the Sun god “Ra”, so the eclipse of the Sun must have been something very special for them. B. Prus did not know about the eclipse that took place in the year 1338 B.C. on May 14th, since the first eclipse that T. von Oppolzer analyzed took place in the year 1207 B.C.. Chances are, that if Prus knew about the eclipse from 1338 B.C., it could have been his selection for the book. The eclipse of May 14th 1338 B.C. is my personal favorite from all eclipses that took place in ancient Egypt. In 1353 B.C. the new pharaoh Akhenaten ( Amenhotep IV ) was crowned, and his wife was famous and beautiful Nefretete. This was the heretic pharaoh, that is considered to be the first founder of the monotheistic religion. He changed the existing structure of beliefs, by creation of the new monotheistic god Aten ( the Sun god ). At that time the most important god of all was Amen, so it was a kind of revolution.

The priests of the god Amen were not very happy about the creation of the new “one and only god”. The tension between Akhenaten and priests of Amen was growing. It took only a few years and the situation developed to the point, where the peaceful coexistence of the new pharaoh and priests of Amen was not possible any longer. The pharaoh ordered a few of the temples of the god Amen to be closed. Probably in retaliation the priests did “something”, that forced Akhenaten to move out from the capital of Egypt. We do not know what this “something” was from the ancient documents that we have, but for the young pharaoh it was enough. He decided to create a new capital of Egypt dedicated to the god Aten. So he founded the new city ( today called Amarna ) in 1348 B.C. more or less half way between Cairo and Luxor. There are different theories why he selected that place. For sure he did not know that the big eclipse of the Sun was going to take place there. The big eclipse of the Sun took place in Amarna in the year 1338 B.C., less than two years before the Akhenaten’s death. Coincidence ? I do not think so. The economical situation in Egypt was not good at that time, and Egypt was in the middle of the war with Hittites. Is it possible that enemies of the pharaoh used the eclipse for political purposes. Amen’s priests could have argued, that even his beloved Sun turned its back on the pharaoh ( during the eclipse ), and finally convinced all undecided to join them. So, maybe the pharaoh was assassinated. The fact is that after his death in 1336 B.C., the old god Amen was restored, and the capital was moved back to Thebes. The name of the pharaoh was removed from his sarcophagus, probably because it was considered condemned. However, his son’s tomb survived untouched for centuries. Tutanhamen is the name of his son, in spite of the fact that originally it was Tutanhaten . The story of the tomb of Tutanhamen is the famous well known and documented story.

The earliest record of a solar eclipse comes from ancient China. The date of the eclipse, usually given as October 22, 2134 B. C. is not certain. The earliest reference to the eclipse in the Bible on the other hand, is known for certain. “ And on that day I will make the Sun go down at noon, and darken the Earth in broad daylight”( Amos 8:9 ). It was June 15th, 783 B.C. Also the same day of this eclipse is confirmed in Assyrian chronicles.

The most famous history related to the eclipse of ancient times, is the one that ended a five year war between the Lydians and the Medes. The two Middle Eastern armies were in the middle of the battle, when “the day was turned into night”. The sight of this solar eclipse was enough for both fighting nations to stop the war at once. They agreed to a peace treaty, and cemented the bond with the double marriage. The exact date of the eclipse is 28th of May 585 B.C. This eclipse was predicted by Thales, the Greek astronomer and also philosopher, but the prediction was probably not known to the warring nations. The first known civilization that realized that eclipses repeat themselves, and used this knowledge for future eclipse predictions, was the Babylonian one. Babylonians discovered based on their detail recordings, that eclipses tend to repeat themselves ( of course not very precisely, only to certain extent ). The eclipse cycle is called saros. Even today eclipses are numbered based on the given saros cycle number. In spite of the fact that Babylonians discovered the saros, it was not enough to predict where exactly on Earth the eclipse is going to happen. The knowledge in the area of Newtonian gravitation, Kepler’s laws, and precise time measurement was needed to accomplish this goal.

A very interesting eclipse took place on July 29th 1878. A group of observers climbed the summit of Pikes Peak in Colorado. They were rewarded with a spectacular view of extremely large solar corona. The coronal streamers extending in opposite directions as far as twelve diameters of the Sun were visible.

More or less at that time, people realized that the size of the solar corona visible during the total eclipse of the Sun is related to solar activity. The cycle of the solar activity, is also related to the number of sunspots. Typically a corona with a very detailed structure and more asymmetrical one, is visible during the high activity of the Sun.

From the total eclipses of the Sun closer to our times, of the so called advanced technological civilization of the end of the 20th century, the most important eclipse took place in the year 1919. Einstein's general theory of relativity predicted that the rays of light, should be bent a little close to the big mass. Our Sun is quite a big mass, so the light from stars visible very close to the edge of the Sun during the eclipse, were used for test. Einstein's theory was confirmed, and stars during the eclipse were visible in places shifted just a little bit.

Helium was discovered on the Sun. The name of the gas originates from the Greek word "Helios", the Sun. The chemical structure of the solar corona can be analyzed during the eclipse, however nowadays also the tool called coronagraph can be used to do that.

It is not uncommon to discover a new comet during the eclipse of the Sun. Very, very small comets are not visible from the Earth as long as they are not very close to the Sun, where the heat from the Sun melts them very fast, so that they become very bright. The evaporating gas is shining thanks to the light from the Sun, forming the famous long "coma". However once the comet is very close to the Sun, it cannot be observed from the Earth because the light from the Sun is many, many, many, times stronger. As a result the total eclipse time, when only the light from the corona is visible, is a perfect opportunity for the search of very weak comets. Many times astronomers witnessed that the comet fell on the Sun. Everybody remembers I hope, that in the year 1994 the comet that fell on Jupiter. Nothing very peculiar I would say, since comets are falling on the Sun quite often, they can also fall on the massive planet like Jupiter ( Jupiter is the most massive planet of all, 300 times heavier than Earth ).

It is probably worth to say a few words about the eclipse of 17th of April 1912. This eclipse was a very rare hybrid eclipse. It is a mixture of an annular and a total eclipse, and it was described in the previous chapter. The interesting thing is, that it happened just two days after the sinking of "Titanic", and it took place also on Atlantic Ocean. The famous movie showed us details of tragedy, where 1500 people died on April 15th 1912. Are these two things related? The answer is in a sense yes. Since there was suppose to be an eclipse two days later, for sure the night was very dark since there was no Moon in the sky. I can bet, that providing there was a Moon in the sky "Titanic" would not hit the iceberg. Please note that the tragedy took place almost at midnight, when the sky is the darkest. By the way producers of the movie probably did not know about the eclipse, since one can easily see shadows in the movie, that can be only explained by the light of the Moon!

A very interesting eclipse took place in New York City, in the year 1925 on January 24th. Millions of people in NYC witnessed the eclipse. The edge of the zone of totality was positioned in the middle of the city. As a result, people on the 97th street saw the total eclipse, while people on the 95th street were outside of the zone of totality, and the solar corona was not shown to them. The observation of the NYC eclipse, proved the very high accuracy of the very precise mathematical predictions of the eclipse. Most of the Central Park was not totally eclipsed, while the northern portion was in the shadow of the Moon.

The longer the eclipse, the more the Sun is hidden behind the Moon, and as a result the eclipse is more spectacular, the effect of the short night is deeper since the sky is darker, and also the short night happens faster. A seven minutes long eclipse took place in the year 1973 in Africa, very close to the equator. On June 30th, the supersonic aircraft Concord 001 flew in the Moon's shadow across Africa for 74 minutes, so the eclipse for people aboard was this long.

The supersonic speed is needed to follow the shadow of the Moon during the eclipse. Recently I have heard, that the practice of following the eclipse aboard of the supersonic plane is now a common thing. One hundred people followed the last eclipse of the century aboard the Concorde plane in the year 1999.

In my mind none of the described interesting eclipses, from the historical point of view, can be compared to the eclipse of eclipses. The “eclipse of eclipses” took place on July 11th 1991. It was the last long eclipse of the 20th century. The Japanese company MITSUBISHI named their new car “ECLIPSE” in 1991, and I would say they made a good selection.

What makes the total solar eclipse of 1991 “THE ECLIPSE OF ECLIPSES” is explained in the following chapters of this book. The name is selected on purpose. I think that the eclipse of 1991 eclipsed all other eclipses from the past and predicted for future, forever.