

The Ancient Stars above and Man's Historic Exploration of Mars

Chapter One

When the Stars and Planets were Gods

“These prototypical ice people (Neanderthal hunters) were hardly the stooped, shuffling brutes of popular imagination. Indeed, their brains were slightly larger than those of modern humans, and they showed remarkable resourcefulness in dealing with a forbidding environment.”

Planet Earth Ice Ages, Time-Life Books

The first exploration of the Moon, the planets and stars came slowly out of the ice of ages ...

Earth and Mars are dynamic planets of polar ice caps, ice sheets, planetary atmospheric winds, volcanic and river cut land forms and the elements for the development of life. One is locked in a perpetual ice age where primitive forms of life probably developed while the other moves from extended ice ages to warming trends that never seem to last on a world teeming with life.

Despite the fact that planet Earth's climate has gone through dramatic changes many times throughout its thousands of millions of years, today we humans live on an Earth that is typical of what has been a world with large areas of ice and cold while other areas are mostly temperate for most of the time human related species have moved from more primitive creatures to what we like to refer to as 'modern humans'.

As Mars continues its icy cold existence our home planet has been experiencing its latest 'ice epoch' which began around 40 million years ago during the mid Eocene, with the extended growth of the massive ice sheet in Antarctica, long before any ancient upright pre-human ancestor existed. Ice sheets still exist in the Arctic, Antarctic, Greenland and Ellesmereland as well as many mountain areas which host glaciers. There have been cooling periods and very cold periods which have devastated populations of animals and plants during this epoch with an intensification begun around three million years ago during the late Pliocene; the start of Earth's current ongoing ice age.

Beginning about 2.5 million years ago during the early Pleistocene, some 500,000 years before the time *Homo erectus* (upright man) began their early advance, planet Earth has experienced seventeen or more glacial episodes of major consequence interrupted by relatively short interglacial periods of some warming, the latest beginning around 20,000 years ago, but never enough to vanquish the ice at the poles as elsewhere – which would indicate the coming end of this ongoing ice age. This time period represents an age when glaciation has come and gone with some regularity. In fact the Antarctic as of this time in history (today) has been shown (by actual measurements) to hold the greatest amount of ice ever recorded in modern times; some 6,400,000 cubic miles of ice! Perhaps this age we live in today should be called an Intermediate Ice Period or IMIP within the larger ice epoch. It is a time when a good deal of the evolution of mankind can be said to have been greatly affected by the ever changing climate of our world and how mankind has been forced to adapt to these changes.

As the ice and cold winds came and went over thousands of years mankind developed the tools to gather food and eventually the stone implements to hunt in an Age of Stone. With these new skills early man could follow their food sources out of the African plains and into what would become Europe and Asia. Now using a new tool of fire and covering themselves with animal skins they could go further and hunt more game away from their ancient lands than ever before. Possibly, but not yet proven, these early humans could have used the sky above to direct their paths. And had they looked up into that mysterious night sky 60,000 years ago they would have witnessed the closest approach of planet Mars to Earth in tens

of thousands of years. At that time Mars, as today, was in a grip of an ancient planetary wide ice age. Mars is still in a deep ice age; Earth may very well follow its solar neighbor in the very near future.

Ten thousand years later a small 30 lb piece of that planet would enter the Earth's atmosphere and fall upon an ice field of Antarctica. It would be many centuries before man would stumble upon this gift from Mars; from one icy world to another.

43,000 years ago saw the rise of early *Homo sapiens sapiens* (Cro-Magnons) or European early modern humans (EEMH). They and their decedents, whose earliest ancestors took their first halting steps in forests, would go even further than their ancient ancestors populating much of the Earth's surface from the ice fields of the Arctic and Antarctic to the hot deserts and steaming jungles along the equator. This new world population of humans may have originally represented only a small group estimated at anywhere from 10,000 to 30,000 individuals, but their effect would become enormous. Eventually this species would send representatives to walk on the Moon beginning on July 20, 1969 C.E. and wonder what it would be like to walk on the cold ancient plains of Mars. That dream of Mars continues to this day.

AN IMPACT CRATER ON EARTH

It was around 40,000 years ago that a large iron meteorite impacted what would become the southwestern United States creating what is now the best known and best preserved meteor crater on Earth – Barringer Crater, west of Winslow, Arizona. Sitting at an elevation of 5,710 feet the resulting crater is 3,900 feet in diameter and 560 feet deep. Its rim rises some 148 feet above the surrounding plain.



Composite image of Barringer Crater by author looking to the west.
The crater was designated a National Natural Landmark in 1967.

The impacting meteorite is estimated to have been around 160 feet across of nickel-iron composition (est. 200,000 tons) with an approach speed estimated at eight miles per second or some 28,800 miles per hour releasing an estimated 10.4 megatons of energy upon impact. Estimated to have lost half of its mass as it ripped through the atmosphere, that portion which remained was mostly vaporized upon impact with the local area of grassland and open woodlands of the southern Colorado Plateau, with a small percentage turned into small fragments and dust. At a time when giant ground sloths and woolly mammoths roamed the plateau, known to have been colder and wetter than today, there would have been few if any ancient humans to see that catastrophic event which released its stored megatons of energy of matter at impact ($E = Mc^2$). Only a small percentage of the impactor remained to be buried under the south rim of the crater with even less scattered around the surface of the general area. Around 25 tons of iron from the meteorite has been found; some pieces as far away as 4 miles.

In 1903 mining engineer Daniel Barringer (1860-1929) suggested that the crater was the result of an impact of a large meteorite even though an 1891 U.S. Geological Survey investigation led by chief geologist Grove Karl Gilbert (1843-1918) had concluded that it was only a crater caused by a “violent volcanic steam explosion”. Incredibly, it would not be until the work of Dr. Eugene Merle Shoemaker (1928-1997) in 1960 and his discovery of shocked quartz-bearing rock along with the minerals coesite and stishovite that Barringer Crater was finally recognized as an impact crater – the first such recognized

on Earth. Shoemaker would write, “We had discovered a fingerprint for impact.” It was not long after, that American Apollo astronauts, lead by Shoemaker who had wanted to explore the Moon personally but was not able to qualify due to medical reasons, would come to the crater to train for their eventual flights to the surface of the Moon.



The floor of Barringer Crater by author looking towards the north-west wall. Note the two individuals at the bottom of the image well beyond the large bolder on the left./As seen from space, east of Diablo Canyon, NASA.

On the far side of the Moon there is another Barringer Crater making Daniel Barringer the only person to have craters named after the same individual on both celestial objects. And as of this writing Eugene Shoemaker is the only individual to have his ashes transported to the Moon’s surface by an American spacecraft, the *Lunar Prospector (1998 O1A)* launched on January 7, 1998. In the end this planetary and lunar scientist finally made it to the Moon.

Modern man has now witnessed impacts on Earth, the Moon, Mars and Jupiter. Barringer Crater stands today a dramatic reminder that our Earth is still subject to impacts from an ever developing solar system which still holds many mysteries yet to be discovered. Throughout our solar system we have discovered that impact craters are abundant and hundreds have been discovered on Earth. These impact events will continue to affect not only human activities, but all activities on planet Earth well into the far future of our planet. We may add those rather infrequent encounters to the 40,000 tons of space dust that is swept up and settles on planet Earth each and every year.

OF ICE AND METEORITES

5000 years after Mount Vesuvius began to form in Europe, mankind continued to move to ever expanding areas as the most recent ‘ice-age’ or “latest period of glaciation advance” found its greatest expanse or temperature peak between 21,000 to 24,000 years ago. Ice was 1 mile thick at the time covering the island of Manhattan with sea levels world-wide thought to be between 400 to 500 feet lower than today. At that time fully 30 percent of the Earth’s land masses were covered with ice, at times miles thick. Europe saw ice moving out of Scandinavia covering much of Denmark and northern Germany; ice sheets moved south out of Scotland covering a large percentage of Great Britain; ice spread out of Hudson Bay covering much of eastern Canada, mid-west United States and New England. A different ice sheet moved out of the Canadian Rockies covering western North America, much of Alaska, most of western Canada and areas of Idaho, Montana and Washington States. Relatively smaller ice sheets formed in the southern hemisphere over areas of Australia, New Zealand and Argentina.

As of this writing at least ten percent of the Earth’s land masses are still covered with ice with an additional 14 percent reported as areas of permafrost (soils imbedded with ice at or very near the surface at times down several feet deep similar to what is being discovered under much of the surface of Mars today). The fact is despite this interglacial respite we have been enjoying since the so-called “end of the

ice-age” dated around 11,000 years ago in this period known as the Holocene (9650 B.C.E. to present day), we are still very much in a continuing ice-period. This may be seen in the fact that Earth has a great ice sheet covering much of the Arctic Ocean year round; a continental ice sheet of great depth, the greatest portion of which covers most of Antarctica, as well as an ice sheet over much of Greenland marking it as unusually cold for an interglacial warming period, with at least 61 percent of all Earth’s fresh water during our times still held in ice!

As for the location of the ice; 90% is found on Antarctica (which is still increasing), with 3% found covering much of the Arctic Ocean, which is not too surprising considering the North Pole is centered over water and the South Pole is centered over a rather large landmass and in fact the Antarctic is generally much colder than the North Pole. Looking at the size, Antarctica encompasses 2.77% of the surface of the Earth as compared to Europe which encompasses 1.95%. It is also noted that summer temperatures in the Arctic today are 4 to 8 degrees C colder than during the Last Interglacial Period (LIP). That warming occurred around 125,000 years ago. Despite much rhetoric and unfounded speculation on the myth of manmade global warming, to the contrary, we continue to live on an ice planet in an age of ice.

It was during this ice period that another event occurred on an ice sheet of Antarctica in a region later known as Allan Hills some 13,000 years ago. A 6 x 3 inch meteorite of crystalline rock, at formation dated some 4.091 billion years old impacted the ice. The 4.3 lb meteorite had been blasted off the surface of Mars by the impact of an asteroid around 17 million years ago spending much of the time since in a decaying orbit of the Sun until the Earth swept into its path and captured it. When it was discovered in 1984 it became known as ALH 84001 as it was the first meteorite found during the 1984 season of meteorite hunting at Allan Hills in Antarctica. It was found to be the oldest Martian meteorite yet discovered at the time. This Martian sample was made of Orthopyroxene, Chromite, Maskeelynite and iron-rich carbonate, and it had clearly been effected when liquid water flowed on Mars, but that was not the most interesting part of the story.

In 1996 NASA (National Aeronautics & Space Administration) announced that electronic microscopic scans showed “chain structures” which resembled fossils of a bacteria-like life form! Needless to say, this was a controversial analysis, but if it can be confirmed it would represent the first primary evidence for the existence of extraterrestrial life, and it came from Mars. Further analysis reported in 2011 indicated that carbonates had indeed precipitated out of water and carbon dioxide from the atmosphere of Mars and formed on ALH 84001. These carbonates were thought to have originally evaporated from a shallow aquifer of liquid water now locked up close to the surface of the planet. Certainly the story of ALH 84001 and other Martian meteorites has just begun.

As for planet Mars; it is still deeply imbedded in an extreme ice-age which has lasted for hundreds of millions of years. But if recent data is confirmed the planet may very well be warming up – just a little, but it will never become the green oases that is much of Earth. Using the ever improving optics of orbital spacecraft, ice sheets and alpine glaciation have become a recent discovery on Mars; many now covered by seasonal planetary-wide dust storms.

BEFORE THE ANCIENTS

“Astronomy, as nothing else does, teaches men humanity.”

Arthur C. Clarke

Exploration by beings on this world began a very long time ago. Long before the ancients created the first civilizations on Earth the dreams of space and the ancient stars above were there with very early man. With minds at least as great as our own they must have been curious about what they saw. Certainly we can never know when or where the first primitive men stood away from their cooking fires, looking at the Moon and stars, reaching out a hand and wondering what it all meant. But when they did their awe and

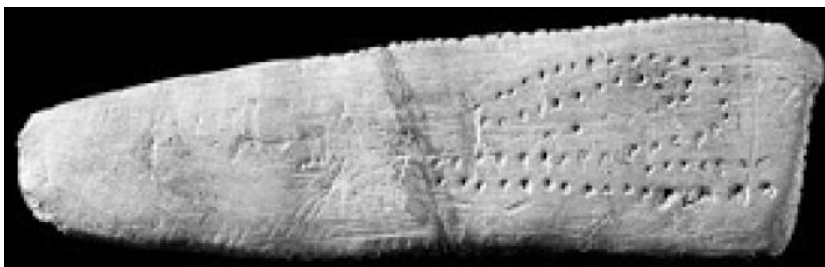
wonder at that endless sky above began mankind on a journey taking thousands of years of which we have barely begun – the conquest and exploration of space. There was also the constant fear of what lie beyond the shelter of the cave. Despite the great unknowns they would not allow their fears to stand in their way. As the ice once again began to retreat the mind of man must have exploded with wonder as they moved out of Africa and across the plains of Europe and Asia at what it all meant. That wonder is still with us today.

Away from the early fires came the hunt and the wild animals which hunted alongside these early humans. The saber-toothed cat, the woolly rhinos, cave bears and mammoths would have all shared this world with our most ancient ancestors who hunted with stone tipped spears, bow and arrow and the hunting axe. Julien d’Huy from the University of Paris refers to this time as the “Cosmic Hunt” said to have linked earthly efforts to the constellation Ursa Major by way of myth and magic. The ancient soothsayers watched the moving heavens for signs that would enable them to see into the future. Tales spun over these now cold ancient fires would have taken on great power and value. Even though they did not realize it the dream of flight to the planets and stars had begun. These were the earliest days of the first of the natural sciences – astronomy and mathematics. Jacob Bronowski (1908-1974) wrote, “Even very primitive peoples have a number system; they may not count much beyond four, but they know that two of any item plus two of the same thing makes four, not just sometimes but always.”

But, what were those pinpoints of light? Why do some appear to move? What was that glowing flash which cut through the darkness, gone in such a flash? And what of that bright disk ever moving and changing? What of that fearsome beast in the sky so bright with a glowing tail? Was that a god? Found in the Lascaux cave in France and dated to 15,000 B.C.E. one finds cave art which may depict the earliest rendition of a comet.

Certainly not everything they saw in the skies above was planets and stars. Perhaps the earliest men did not at first know how to even form the proper questions. But when they did from those first questioning looks at the stars above came the dream of outer space. Some of their depictions of stars may still be seen on the walls of ancient caves. These would become the ageless dreams of moons and planets made next to the magnificent graphic images of the world around them including the beasts of their world and impressions of their own hands to mark the caves and outcrops that an individual human had once been there. The hunter had made his statement ‘this is my mark’ which stands today to amaze mankind some 37,000 years after this one individual had passed this way.

We can state with some conviction that they were indeed looking at the heavens and marking the passing of the Moon and its changing lumination on primitive stone and bone calendars. Amazingly some of these early artifacts have survived till this day. One such artifact created during the last ice advance is a 27,000 year old fragment of a mammoth tusk discovered in Gontzi, Ukraine. This controversial find contains marks scribed on its edges which have been interpreted as a very early record of the lunar phases. With that we are reminded that English poet John Keats (1795-1821) once wrote, “What is there in thee, Moon, that thou shouldst move my heart so potently?”



The Blanchard Bone

Another small piece of bone (4 inches long) called the Blanchard Bone found in the Dordogne area of France was marked around 25,000 to 32,000 years ago by a primitive Cro-Magnon hunter who would not seem too out of place on our modern streets. The 69 complicated markings have also been interpreted as showing the phases of the Moon during two lunar months. This bone may have been used to mark the passage of time in order to understand how far an individual had travelled. It has also been suggested that the markings could have been useful in determining when to plant crops or when to harvest. But this was probably far too early in mankind's development. However, if these simple marks can be verified to be lunar in nature it would be proof of man's early interest in things astronomical. This could represent one of the earliest recordings.

Certainly the Moon, the major planets and the stars, quite easy to see on those dark clear nights, were fully part of man's early primitive world. It is just as clear that ancient pre-literate groups had spent time observing and keeping track of astronomical events in simple ways. The curiosity to discover was becoming a very basic science. Hunter-gatherers were watching the passage of the Moon even as they lived a nomadic life. They knew the fixed stars and could differentiate between those fixed points of light in the night sky and the points that wandered in predictable paths to be counted by the passage of time. Why was this one a different bright color? They had no understanding as to why they were different. Did the need to record such events lead to the first written words just as language was perhaps just as necessary for the organized hunt? Or was it all done merely for mythology and ancient religious beliefs of all powerful gods some known even today? All is not clear as there is much that modern science has yet to discover about the dreams empowered by the markings on stone and bone; what these early people saw in the skies above and the building of ancient circles of earth and stone.

Around 8000 B.C.E. as the ice continued to retreat, at least for a while, mankind was still on the move along with the recently domesticated dog. After the dog came domestication of the 'food animals' such as the goat and sheep. (Not that the dog failed to provide a meal or two.) It was a time for mankind to begin to dream and discover all that could be known of heaven and Earth. Yet we must keep in mind that almost all of mankind's important advances including the written word, towns and cities, math and science as well as farming and animal husbandry and much more eventually leading to mankind's efforts in space, have occurred during the very short period we are now in which marks the time from the last temporary ice retreat and the next coming ice advance, which is even now showing the first signs of its next inevitable advance. It will be an advance that mankind will have no control over.

A SERIES OF DYING STARS

A supernova when sighted has been defined as a "transient astronomical event". When seen from Earth it appears as a sudden new star (nova) usually very bright in the night sky (at times so bright it can be seen in daylight) where before the event no star was seen which slowly fades from view over a period of weeks or months. What we are seeing is the last stage of a massive star's life marked by a core collapse and one final titanic catastrophic explosion which destroys the progenitor star, leaving a small fast rotating neutron star surrounded by an expanding envelope of gas and dust from the explosive event. Over a period of a little more than 6000 years a series of these stellar explosions occurred close enough to Earth that the light from those catastrophic events would eventually be seen from Earth to be recorded by astronomers in several nations over a period of some 1500 years.

These ancient stars exploded beginning with an event around 11,500 B.C.E. The light from that event would not be seen on Earth until 1604 C.E. coming from the direction of the Ophiuchus constellation – SN 1604. The second star in this group exploded in a great destructive event around 8800 B.C.E. That light would pass by the Earth from the direction of the Cassiopeia constellation in 1181 C.E. becoming supernova SN 1181. The next explosive event occurred around 8000 B.C.E. Observers on Earth would see a bright new star in the night sky in 185 C.E. between the constellations Centaurus and Circinus

near the star Alpha Centauri – the light from SN 185 had arrived. Nearly 2,000 years later around 6100 B.C.E. another star would spectacularly end its life seen thousands of years later from the direction of the Lupus constellation in 1006 C.E. becoming SN 1006. Around 5900 B.C.E. another dying star met its end in a supernova explosion which completely destroyed the ancient sun. It would be thousands of years before that light would pass by the Earth from the direction of the Cassiopeia constellation – SN 1572. Finally around 5400 B.C.E. another dying star exploded; this time in the direction of the Taurus constellation and as with the earlier events the light from this stellar event would not reach the Earth for thousands of years arriving in 1054 C.E. – SN 1054.

As the energy from these stellar events was racing at light speed towards the Earth the ancients continued to build structures to observe the night sky. That building continues to this day even as we now send these powerful devices into space for ever improving views of the Universe we are a part of. If mankind is fortunate that work of discovery will never end. We are just now beginning to understand when that work first began.

FROM ANCIENT CIRCLES AND STONES

“For the peoples of antiquity the sky was always overhead. What happened there repeated itself, and these repetitions made it possible to structure time and the world, as they do for us today.”

Dr. Edwin C. Krupp: *In Search of Ancient Astronomies*

Astronomy may not have been the first profession, but it was the first science. For many years academics’ believed the first astronomical observatories were built by ancient Egyptians around 2600 B.C.E., but we are now discovering much older structures with primitive astronomical observations as a working possibility. In this new light one of the worlds’ first known calendar structures could very well be the Warren Field Structure discovered along the Dee River Valley in Aberdeenshire, Scotland. Dated to 8000 B.C.E. this Mesolithic (Middle Stone Age) construction site contains 12 pits in series which has recently been interpreted as a crude device for tracking lunar months by depicting the phases of the Moon. The structure is also aligned with sunrise at the winter solstice. This appears to show some type of known coordination or link in the minds of its builders between lunar cycles and the solar year. These could very well have been the first astronomers. They seemed to have moved beyond simple observation. The question is: Was this first device used to map the times needed to plant food or simply keep track of the ‘gods’?

Neolithic or New Stone Age people had developed a very good stone tool kit. A simple plough would soon become the tool of ancient man. We know that by this time grasses and other crops were being cultivated in several areas (agriculture was invented) as some animals were being domesticated. This domestication occurred during the period in the Middle East from 11,000-6,000 B.C.E. From around 7000-5000 B.C.E. Food production would help increase the world’s human population numbers. In order to consolidate work for the common good a political system would be needed. By c.6000 B.C.E. Neolithic villages were forming in the Middle East between the Mediterranean Sea and the Persian Gulf known as the Fertile Crescent well beyond the tribe or clan. The first centers of early civilization would be centered on the Mesopotamian Valley and the Nile in Egypt. These villages of mud and brick which held a few hundred people may be exemplified by the well known ancient city of Jericho. Civilization was taking off and so was man’s interest in the stars above.

Another ancient example of an astronomical observatory is the stone circle dated around 5000 B.C.E. of ancient Egyptian construction which may be found at Nabta Playa, Upper Egypt. Certainly Egyptian astronomical study began in prehistoric times, known to historians as the Pre-dynastic Period. Crudely resembling an early incarnation at Stonehenge only much smaller the Nabta Playa circles are thought to have been used to study astronomical alignments. Although some of these alignments are contested due to the age and condition of the sites, possible alignments include Sirius, Alpha Centauri and

Orion's Belt which may well be represented in the center of the site by three small standing stones. Human remains as well as cattle burials indicate the site was used by herdsmen and nomads for social gatherings and rituals. The ancient Egyptian Hathor or Cattle Cult is suggested. By this time ancient Egyptians had developed small permanent settlements. There would have been time set apart to observe the dark night skies.

The Goseck circle, contemporary to the Nabta Playa site, was discovered in Germany in 1991 and is one of several ancient circular enclosures built in Germany, Austria and the Czech Republic around 5000 B.C.E. for astronomical sightings. This circle could be one of the oldest sites yet discovered in the world built to observe and track the Sun. Two openings in the two 246 foot diameter concentric ditches are aligned with sunset and sunrise on the solstices. The Goseck circle, recently carbon dated to 4900 B.C.E., saw usage for at least 200 years. Interestingly, when the site was excavated animal and human bones were found including a skeleton, sans head, buried near the southeast 'gate' which would suggest the site was used for ritual human sacrifice. Traces of the original structure revealed that two wooden palisades with three gates on each had once surrounded the ditches much like a ceremonial protection fence with doors to let in the rays of the Sun. Much work needs to be done in these areas as more of these ancient sites are discovered, even as it must be said that much has been lost to the ravages of time.

In 1999 unauthorized archeological diggers in Saxony-Anhalt, Germany unearthed what could very well be the earliest surviving bronze and gold hand held astronomical device ever discovered. The 12 inch diameter, 4.6 pound object inlaid with gold symbols was recovered in 2002 having made its way from Germany to Switzerland. Created around 1800 B.C.E. and thought to have been used for some 400 years, the disc depicts both a full and crescent Moon, 4 or 5 days old, 32 gold stars as well as the well recognized star cluster the Pleiades. They are depicted on the disc in what is clearly a purposeful arrangement. Twelve lunar cycles or months are indented for a 354-day year. This work would have required an added 'leap month' to be indicated every 24 or 36 months to keep the calendar in sync with the actual solar year we are most familiar with (the seasons). Called the Nebra Sky Disc it would have shown its users when to insert the leap month into their lunar calendar. It was in fact – and is to this day – an astronomical pictorial device to regulate and record the passage of time – a clock – its mastery of pure thought not to be seen again for over 1000 years in the future.

The director of the State Museum for Prehistory in Halle, Harald Meller remarked, "The astronomical rules that are depicted wouldn't be imaginable without decades of intensive observations. Until the Sky Disc was discovered, no one thought prehistoric people capable of such precise astronomical knowledge."



Nebra Sky Disc c.1800 B.C.E.

Then there is the Kokino astronomical observatory built on the top of an extinct volcanic cone some 3323 feet high discovered in 2001 in the Republic of Macedonia. This early European Bronze Age structure was built around 1900 B.C.E. and was apparently used for well over 1000 years. Markings on the observatory were used to locate winter and summer solstices and the equinoxes as well as a central area used for observations of the Moon and possibly the Sun. Clearly understanding the movements of astronomical bodies was of great importance to these ancient peoples who were no longer simple hunter and gatherers. They were also observers of the heavens.

Exploration was also on the minds of man as witnessed by the great voyages of early Polynesian sailors who navigated the vast Pacific Ocean which covers some 35.26% of the Earth's surface guided by the Sun and stars as well as the flight of sea birds, the formation of clouds, ocean currents and even the waves they sailed across. Evidence indicates they travelled all the way across the vast Pacific to land on the western shores of America. There is much work yet to be completed in this area, but their long voyages cannot be dismissed as myth.

Of the many ancient stone structures related to archaeoastronomy perhaps the best known are the stone circles of Stonehenge, set on the rolling plain of Salisbury in southwest England. It is one of thousands of pre-historic stone circles in Ireland and England, and dates to hundreds of years before the pyramids of Egypt. This ancient Bronze Age artifact, visited by this author, was built during at least three separate stages carbon dated from between 1900 to 1600 B.C.E. The most recognizable feature, the large Sarsen stones were part of the final construction period.

Stonehenge I the first and therefore earliest ministrations consisted of a simple circular ditch over 300 feet in diameter with a raised bank of soil piled up just inside the ditch similar to other sites in Europe, with a ring of refilled holes (Aubrey holes) with four wooden posts. This first version also had a 'long avenue' leading away from the structure towards the northeast and the rising of the midsummer Sun. In this avenue one finds a standing stone known as the 'Heelstone' which has been part of Stonehenge since its inception.

Stonehenge II began construction around 1750 B.C.E., but by a different group of individuals known as the Beaker people who had spread to much of Europe using the same site. They extended the avenue some two miles farther east towards the Avon River along with the construction of at least 82 large 'blue stones' some weighing as much as 5 tons brought in from a quarry 150 miles away placed to form two stone circles.



Stonehenge post WW II British government image/Stonehenge during 1877

Stonehenge III was built in two phases ending at around 1600 B.C.E. (This was around the same time early Greek society was being organized.) This new group of people known today as the Wessex people (Middle Bronze Age c.1600-1200 B.C.E.) refined the site with 30 heavy linteled sarson sandstone uprights and five massive internal horseshoe shaped trilithons weighing as much as 50 tons each cut and shaped some 20 miles away and set in the familiar circle (only part of which still stand) we see today.

Scholars slowly began to understand that ancient peoples were much more aware of the skies above than they would have expected or allowed from earlier studies. These ancient structures began to assume a much greater importance to understanding these mostly pre-historic people. One of the first English scholars to suggest that Stonehenge had astronomical meaning was William Stukely (1687-1765) a clergyman and friend of Isaac Newton (1642-1727).

In 1740 Stukely visited the stones and reported that the avenue had been built to point towards the rising Sun at the summer solstice. The builders were learning that nature could be marked by the stones and expressed by numbers. However, very few accepted his idea at the time that a primitive people could have had such 'advanced' knowledge of the heavens. Even today some of these ideas are somewhat controversial. Nevertheless, modern astronomers have recently verified alignments most notably the summer solstice Sun rising directly behind the Heelstone. This would have been of great importance to early peoples for the planting and harvesting of crops. Other alignments show the most southern and northern rising of the Moon. It has also been suggested that these ancient stones could have been used to predict lunar eclipses. It may be also recalled that these alignments are not the providence of Stonehenge alone, thus adding confidence in their workings. Much of this new understanding of Stonehenge comes from the work of Professor Gerald Stanley Hawkins (1928-2003) who in 1965 published *Stonehenge Decoded* in which he described the stone facility as an "astronomical computer."

With this understanding of a changing sky those ancient peoples built many stone 'monuments' spreading across much of England as well as Western Europe, but they were not alone in this work. One finds examples of ancient stones placed to understand the movements of the heavens in the mid-east, Africa, South, Central and North America as well as dozens of other sites that work just as well in several other areas scattered around the world. Clearly no matter where these ancient people may be found there is evidence that knowing about the stars and the movements of celestial objects including the known planets were of great importance. Clearly the stars above were important to the builders of these ancient monuments. We may conclude that oral histories passed down to younger generations included references to the stars above and what these bodies meant in the lives of mankind. Interestingly later Roman and Greek writers paid little attention to these stones and wrote few descriptions of them. They did not

understand at the time what these structures represented even as they sought knowledge from the heavens above.

And what earthly events might ancient men have suspected as being caused by the appearance and movements of celestial objects? The seasons and with them rains and drought along with other atmospheric events were linked to these celestial 'gods' as were the tides (a rather good guess on that one). Mankind had invented the gods or at times a single god to explain events that were not understandable at the time. Therefore to know events on Earth the ancients needed to understand what these 'gods' were up to. They had seen golden winged gods, aerial chariots spitting fire, and later tales of magic carpets and flying shields glowing in the daylight. Personal events in the lives of individuals were also thought to be caused by such celestial interference. These gods would prove to be a deadly invention. Mankind's fate was now psychologically tied to the stars and the gods which lived in the heavens. Even today some people look to the heavens to find out what the gods or even a single god has in store for their future. They even pray to these gods and offer their monetary and other tributes to their high priests!

We have come to understand that searching and understanding the heavens has been important for thousands of years for many cultures and for some a failure in this work can at times prove quite unforgivable. Records of Chinese astronomers made before the 1045 B.C.E. founding of the Zhou Dynasty show records of Mars' appearances and motions against the stellar background. A Chinese story (or was it just a tall tale) tells of two astronomers Hsi and Ho who were said to have been too drunk to predict the solar eclipse of October 22, 2137 B.C.E., a major duty of Chinese astronomers. They had failed to scare off the sky dragon that would do its best to make a meal of the Sun. When the emperor recovered from the terror of the eclipse it is said he had the two now unemployed former astronomers beheaded! What price others may have paid in the past for such errors has been lost to history. Tall tale or not astronomical studies were conducted by the ancient Chinese who were the first to discover sunspots on the surface of our Sun with only the naked eye at 800 B.C.E. They were also the first to document a total lunar eclipse in 1361 B.C.E. Perhaps the Chinese astronomer of that day had learned the lesson of Hsi and Ho!

Years later, well before man had any idea of how to place an individual into orbit about our Earth or even a small unmanned satellite for that matter, humans were dreaming of placing men on the Moon and manned space stations into Earth orbit or perhaps a manned voyage to Mars. We were eventually dreaming of large cities in space and manned colonies on the Moon, Mars and even beyond. Space was on the mind of man. Yet, before those dreams could begin to take 'flight' the ancients would need to form the basic ideas of how the heavens came into being and what it all meant using only their eyes, their creative minds, newly developed mathematics, and a desire to put all that they saw into some form of order and with that, a new understanding of their mysterious world. There were no primitive telescopes which would allow a closer view of the heavens.

Mars would be no more than a bright red point of light in the sky along with the other planets for many centuries to come. Yet it would be the unusual blood red color of that light which would give pause. Needless to say, understanding did not come all at once from a single individual nor did it come in a particular order as many ideas of what it all meant were debated over the years. One of the first steps was to find a way to record what had been seen and be able to pass this knowledge on to future generations without change or error. Discoveries and oral traditions needed to be subjected to the written word.

"At Stonehenge in England and at Carnac in France, in Egypt and Yucatán, across the whole face of the Earth, are found mysterious ruins of ancient monuments; monuments with astronomical significance... They mark the same kind of commitment that transported us to the Moon and our spacecraft to the surface of Mars."

Edwin Krupp

THE ANCIENTS

"It is now generally agreed that Sumer was in some respects the cradle of civilization."

As far as historians understand at this time the concept of the city-state built around a central temple and ruled by a priestly class, had its beginnings with the Sumerians during the Middle Bronze Age and with consolidation of wandering tribes came the need to keep track of and organize the daily activities of these gathered peoples to include keeping records of property and taxes. These first real cities of Sumer held from 15,000 to 20,000 people, and trade would stimulate and expand the growth of these new cities. It should also be remembered that as these cities became city-states farmers who became part-time soldiers during unproductive periods developed into the first small armies. In a very true sense with cities came the first local wars which mankind has been perfecting for a very long time ever since. Yet the *Emuna Elish* from Sumer, written around 2,500 B.C.E. would remind us that, "In the orchards of the gods, he watches the canals..." Mars, the god of war, had been said to have had canals criss-crossing its ancient surface in the not too distant past. Agriculture was of prime concern no matter what planet one lives on. The ancients were learning to take some control over the natural world and their place in it rather than be completely controlled by nature even though man will never have much control over this planet or any other.

Around 3500 to 3000 B.C.E. during the Uruk Period of Sumer, a primitive yet expressive written language was developed by the Sumerians who lived in an area known as Mesopotamia (a Greek work which means "the land between the rivers") between the famed Tigris and Euphrates Rivers. This writing is known today as cuneiform and it was a first for mankind. Writing was in fact the key to developing ancient civilizations from their earliest times. The Sumerians had recorded on clay tablets the first written ideas about a massive flood, a large boat to save some of humanity, a confusion of tongues, a personal god and a nether world that would be later recalled and claimed as their own by others in later works. Nevertheless, Sumer was their place of birth. Theirs was a world of myth, magic and astrology. Tales of these celestial figures in the heavens would be created and retold over ancient fires including many lunar myths. These were the ancient gods who lived in the skies above. This is evidence of early state supported activity including state support of astronomical research. The night sky was to be carefully watched and feared, and Earth was the center of all things. For the Sumerians the motionless Earth was the center of the Universe as all things passed above.

It is the Sumerians many believe who may also claim the origins of recorded Western astronomy. They made star charts and were probably the first to group the stars into constellations. The first science came from these early people. Mankind's first maps were not of his world but of the heavens and the realm of the gods. There is a group of some 15,000 tablets discovered during the 1970s in Northern Syria, northwest of Mesopotamia which speak of the creation of "heaven, Earth, Sun and Moon," dating to around 2300 B.C.E. Clearly they were concerned about things well beyond their own world in the realm of the gods. Amount these historic finds is the 'genesis' tablet *Enuma Elish* or "when above", the first known record (a poem) to describe the formation of our world out of the disorder and chaos of the primordial waters which came before all. Much of what is first discussed by early man is written upon these ancient works. For the Sumerians we find the planets Mercury or Ubu-idim-gud-ud; Mars was Nergal; Jupiter was Sag-nae-gar and Saturn was Ubu-idim. The Sun god was Sippar or Uta; the Moon god was Sin. Venus was Inanna known to be a single object and not as others may have thought as two; a morning and evening star.

It was at this time that the early city of Uruk, situated along the banks of the Euphrates River, was home to some 50,000 people, supplied by a good agricultural surplus. It was an enclosed living space of around 2 square miles housing not only nobles and slaves, but artisans, merchants and people of all levels of learning and skills. Adapting to the yearly foods on the plains, controlled irrigation became the key to a stable life in the cities and towns which had developed in the Sumerian controlled area.

It is to this area of the ancient world at Ur that a three-step ziggurat was built between 2123 B.C.E. and 2100 B.C.E. by king Ur-Nammu to be used to observe the heavens. Roman historian Titus Flavius Josephus (c.37-c.100 C.E.) wrote that Abraham had visited the ziggurat around 2000 B.C.E. which had been built in his home town of Ur about 100 years before his birth. If Abraham had been more than a “literary construct” composed around the late 16th century B.C.E., he would of course have been a Sumerian. At the height of Sumerian development anywhere from 800,000 to 1.5 million people lived in the general area at a time when an estimated 27 million people populated the Earth.

Among other discoveries the Sumerians are reported to have known that the Earth spins on its axis and that the axis of spin has a wobble! (This of course means that a flat Earth was not part of their understanding.) There is an ongoing debate as to whether or not these ancient people understood the fact that the angle of axis changes 1 degree every 72 years causing a precession taking 25,920 years to complete ‘A Great Year Circle.’ They may well have understood precession (defined as a slow wobbling of the Earth’s axis much like that of an off balance spinning toy top), but the jury is still out on that one.

Nevertheless, by 2000 B.C.E., as Babylon was becoming the primary city of southern Mesopotamia, they had developed many mathematical formulas, and they understood that the known planets which included Mars moved along the zodiac on predictable paths. It was the bright reddish color of Mars that caused the Sumerians to see it as “carnage and destruction/war.” “Star of judgment of the fate of the dead.” However, as of this writing nothing of a purely astronomical nature is yet known to have survived from these ancient people. All primary work has been lost even as workers continue to sift the sands of time for new discoveries.



Sumerian tablet, c.2600 B.C.E. / Babylonian tablet from 164 B.C.E. reporting on Halley’s Comet.
A later Babylonian tablet would record the next passing of Halley in 87 B.C.E.

The astronomical information they have passed on has been sent down through the ages indirectly by the Babylonians, builders of the famous Hanging Gardens (one of the Seven Wonders of the Ancient World c.700 B.C.E. which included the Colossus of Rhodes, the Lighthouse of Alexandria, the Mausoleum at Halicarnassus, the Temple of Artemis and the Statue of Zeus) located in the capital city of Nineveh, whose earliest known star catalogs date from around 1200 B.C.E. We know this because many of the star names appearing on these charts are of Sumerian origin. The known planets celebrated as gods in the Mesopotamian area from a stand point of religion and mythology began with the Sumerians. For the Sumerians religion and astronomy were as one, but there has been much more. One example is the practice of dividing a circle into 360 degrees with each degree further divided into 60 minutes of arch which came directly from the Sumerians. They are also responsible for giving the hour 60 minutes – which means during each hour of the day we are all still on “Sumerian time!” All recorded things astronomical seem to begin with the ancient Sumerians.

It has also been learned from Babylonian tablets that calculations used by the Babylonians for complex movements of the planets and Sun were inherited from the Sumerians and that the Babylonians

did not perhaps fully understand the basis for these mathematical formulas only how to use them. They used a method of timing the rise of the planets above the horizon which was more accurate than plotting their positions on the “celestial sphere.”

From the time of Hammurabi who reigned from c.1792-1750 B.C.E. we mark the end of Sumerian history and the beginnings of Babylonian history. It is to Hammurabi that we link his code of laws to his people literally carved in stone. From Babylonia comes the first ‘as yet discovered’ application of mathematics to the problems of astronomical phenomena as recorded on cuneiform tablets. On a series of these baked tablets known as the *Enuma Anu Enlil* one finds literally hundreds of years of observations of the heavens. Tablet 63 of this epic work is the oldest known astronomical record in the world, dating to around 1600 B.C.E., and it depicts 21 years of the first and last visible risings of planet Venus or Nindaranna to the Babylonians as well as the setting in the evening sky. Known as the “Venus tablet of *Ammi-saduqa*” it shows the Babylonians knew the planets had periodic paths apart from the fixed stars and these paths could be predicted over time. The tablets also discuss what omens could be expected during those ancient times.

The Babylonians had developed a detailed daily record keeping system to track the movements of the Sun, the Moon and the planets. This is the earliest historic evidence so far discovered of this planetary phenomena recorded by man, dating to as far back as at least 800 B.C.E. Other ancient Babylonian tablets recently deciphered show that they were also tracking the movements of Jupiter and had an “arithmetical technique to predict the planets motion...” There are other Babylonian tablets the MUL.APIN which contain star catalogues and groupings of stars into constellations some of which have clearly changed over time. They were mapping and organizing the world of the gods. Yet despite what has been learned it must be said to be only a fragment of their astronomical work as only fragments of their contemporary clay tablets on astronomy have been discovered much like the Sumerians that pre-dated their early work.

Taurus the Bull, known as *The Bull in Front* by the Babylonians, was perhaps their primary constellation. For the Babylonians Sirius, the brightest star in the heavens was also of great importance. It was called KAK.SI.DI and was placed in a constellation of a bow and arrow. The MUL.APIN also details plans on how to measure the changing lengths of the day as measured by water clocks, and cast shadows (possibly pre-dating the Greeks) is given as well as calculations to predict the heliacal risings and settings of the known planets. It is to the Babylonians that we may thank for our seven day week that we all simply take for granted and don’t question. This of course predates the Christians who later decided that their god rested on the seventh (Babylonian) day. And it is to these ancients that the days of the week are named for the seven ‘planets’ which in ancient times included the Sun: Sunday – (Sun), Monday – (*lundi*, Moon), Tuesday – (*marda*, Mars), Wednesday – (*mercredi*, Mercury), Thursday – (*jeudi*, Jupiter), Friday – (*vendredi*, Venus), and Saturday – (*samedi*, Saturn). Earth of course was not one of the wonderers, but would be if one were standing on the surface of Mars! For the Babylonians Mars was *Salbatani*. For the Egyptians it was *Har Decher* (Red One) and for the Persians it was *Pahlavani Siphir*.

One recovered Babylonian tablet set around 1200 B.C.E. even records the first known prediction of someone’s fate based upon what month the individual had been born – astrology was alive and well in ancient Babylonia. As earlier soothsayers and ancient mystics were continuing to keep a close eye on the night skies for guidance about future events that may yet occur, the mystical path of man guided by the planets and the stars had been set. Most people at this early age believed these planets controlled their destinies. It was around this time that the Chaldeans, the astronomers of the area around Mesopotamia, named Mars or *Nergal* (Star of Death) as the master god of battle. Perhaps in some distant future Mars will become part of humanities controlling destinies as we reach for the outer planets and on to the stars. The late Babylonian astronomers also understood that Planet Mars orbited the Sun in a cycle of 37 times every 79 years. They also had the mathematical means handed down from the Sumerians to calculate and correct the predicted positions of the known planets.

Beginning with the rule of Babylonian king Nabonassar (747-733 B.C.E.), during the mid-early Iron Age c.1000-c.500 B.C.E., an increase in not only the quantity but also the quality of astronomical observations appears. Such was the quality that they attempted to calculate eclipses. They had been able to recognize the approximately 18-year saros cycle which is the period of time (approximately 18 years, 11-1/3rd days) in which eclipses repeat which was detailed in cuneiform tablets. Using these ancient observations Ptolemaeus set Nabonassar's reign as a starting point for usable astronomical research as he felt these were the earliest accurate records found (beginning on February 26, 747 B.C.E.). They were the first to completely record and document a solar eclipse noting its start and ending times on March 19, 721 B.C.E. With today's computer programs the accuracy of that observation can be easily verified. Useful astronomy seems to have had its start in the ancient centers of Mesopotamia, China, India and Egypt. The earliest Chinese records of Mars are found prior to 1045 B.C.E. It may also be said that transient events such as comets have been seen and recorded throughout much of man's history since the earliest of times.

It would be to the Assyrians that we may ascribe the first verifiable recording of a solar eclipse on June 15, 763 B.C.E.

THE STARS OF EGYPT

It has long been demonstrated that a great deal of technical skill and great effort was required to design, align and build the Egyptian pyramids. This is quite clear, yet no recorded plans have yet been discovered in order to guide historians as to just how this work was completed. Perhaps these records were lost when the Great Library of Alexandria was destroyed. This technical skill set around the 3rd millennium B.C.E. included a close watch on the heavens. The pyramids were aligned with the north polar star which at the time of their building was the star Thulan in the constellation Draco. As stated above the precessional cycle of the equinoxes moves the polar star out of and eventually back into position every 25,920 years. This means that in around 15,000 years the north polar star will be Vega. There are many examples of temples and important buildings constructed along astronomical alignments. An excellent example is the temple of Amun-Re at Karnak. This temple was built to align to the rising of the midsummer Sun. The entire main corridor is fully illuminated only on this day of the year. The Egyptians of course had Sun clocks to keep track of the day a clear indication of astronomical knowledge. As late as the 1950s the earliest confirmed date in history was 1872 B.C.E. during the 7th year of King Sesostris' rule in Egypt due to the astronomical notation of a total solar eclipse that had occurred during that year.

Egypt also played host to the oldest known use of meteorite iron. Found in northern Egypt, nine small round beads of iron were proven to have been made from meteorite iron now dated to around 3200 B.C.E.

Early Egyptian astronomers knew about the planets (taken from the Greek word for wonderer or *planetes*) in the night skies which included the reddish light of Mars or Doshiri and by 1534 B.C.E. had recorded that Mars occasionally traversed a retrograde motion as it moved across the sky. By this date an Egyptian astronomer named Senenmut had drawn a map of the heavens showing the positions of the planets. It would be these planetary positions which would help astronomers to date his "Senenmut star map" to 1534 B.C.E. Mars was also painted on the ceiling of the tomb of Seti I (the Ramesseum ceiling) who reigned from c.1303-1290 B.C.E. They were mapping the regular motions of these points of light. They wanted to understand. For the Egyptians the Universe was a rectangular box which of course held Egypt at its center. This is a much different view of the cosmos than the Hindus who saw the Earth sitting on top of four elephant backs – then standing on a tortoise back! But on what does the tortoise stand?

Fixing the dates of important festivals and other rituals were the key reasons for keeping track of the Sun and Moon as well as the parade of fixed stars. Astrology was a part of everyday life in ancient Egypt and on into the after world of death. (History has shown that offering a better life 'after death' has long been a method used by those in power to control the uneducated masses or slaves. Kings, queens and

dictators still use this and other methods to keep and hold power to this day.) Stars on the ceilings of tombs of Ramses VI who reigned from 1156-1148 B.C.E. and Ramses IX who reigned from 1140-1121 B.C.E. show this degree of importance as do many other depictions of star fields found throughout ancient Egypt including as one may have expected, the lids of coffins.

Clement of Alexandria otherwise known as Titus Flavius Clemens (150-215 C.E.), a Roman historian wrote of the knowledge required by the priests of ancient Egypt when it came to astronomy/astrology. “And after the singer advances the astrologer, with a horologium in his hand, and a palm, the symbols of astrology. He must know by heart the Hermetic (Egyptian theological texts) astrological books, which are four in number. Of these, one is about the arrangement of the fixed stars that are visible, one on the positions of the Sun and Moon and five planets, one on the conjunctions and phases of the Sun and Moon, and one concerns their risings.”

The Egyptians worshipped many ‘gods’ in the heavens above including the star Sirius (Sopdet for the Egyptians or Sothis for the Greeks). They had recognized that its first heliacal rising each year, that is its first annual rising on the eastern horizon just before sunrise indicated the annual flooding of the Nile Delta was upon them. It was the start of the agricultural cycle and thus a critical event. It would also be to the Egyptians that we have a day divided into 12 parts. AM was *anti meridiem* (before the middle of the day). PM was *post meridiem* (after the middle of the day). However, despite thousands of years of observation the actual formation of the solar system and the deeper Universe were completely unknown to the Egyptians and Babylonians as well as other ancient peoples. For the Egyptians their Universe began from a mass of water in the center of all things they called Nu. It was the well-spring of life itself. From Nu came their Earth, flat and finite, the Sun and above all floating in water were the stars. Most of these were gods. As above by Egyptian myth the entire Universe was held in a large rectangular box.

Much of what the Babylonians thought of the creation would have been familiar to the Egyptians. Both groups believed in “spontaneous life creation” as did many societies since, including the Greeks. Soviet biologist Alexander I. Oparin (1894-1980) would write, “Among the ancient peoples the belief in spontaneous generation did not arise as the consequence of any particular philosophy. For them, spontaneous generation was simply an obvious, empirically established fact, the theoretical basis of which was of secondary importance.” Even later philosophers such as Francis Bacon (1561-1626) and Rene Descartes (1596-1650) believed that living things could spontaneously generate from inanimate matter. With this deep philosophical background it was no great leap of faith to imagine life starting on other planets including nearby Mars.

And from the ancient Hebrews, reflecting on what probably came indirectly from the Sumerians we may read “Let there be a firmament in the midst of the water, and let it divide the waters from the water... Let the waters under the heaven be gathered together unto one place... called the dry land Earth.”

It is possibly due to the efforts of the Egyptians to understand and record the heavens and skies above that we find the first written account of a phenomena well known to many modern people, and yet just as mysterious today as it was in ancient times. On an Egyptian papyrus written more than 3,400 years ago is an account of several sightings of “brilliant bright round objects in the sky” by none other than Pharaoh Thutmose III, who reigned from c.1504 to 1450 B.C.E., along with his scribes and much of his army – UFOs! Swamp gas? Aircraft perhaps? No. Not in ancient Egypt. There was no ancient Gustave Whitehead (1874-1927) to build and fly their first aircraft. So what did they see?

“In the year 22, of the 3rd month of winter, sixth hour of the day... the scribes of the House of Life found it was a circle of fire that was coming in the sky... It had no head the breath of its mouth had a foul odor; its body one rod long and one rod wide. It had no voice. Their hearts became confused through it; then they laid themselves on their bellies... They went to the Pharaoh... to report it. His majesty ordered... all which is written in the papyrus rolls of the *House of Life*. Now after days had passed, these things became more numerous in the skies than ever. They shone more in the sky than the brightness of the Sun, and extended to the limits of the four supports of the heavens... Powerful was the position of the

fire circle... The army of the Pharaoh looked on him in their midst. It was after supper. Thereupon, these fire circles ascended higher in the sky towards the south..." It was then ordered by Thutmose III to be written down "so that it be remembered for ever." That is what seems to have happened with this account.

It would seem from this and other events that the dream of the stars possibly had visitors from off world in ancient Egypt with dreams of exploration of their own. A close look at other ancient Egyptian documents may well be understood as such. There is much yet to learn of the stars above even in our time.

Due to their many years of observation and written works Babylonia and Egypt had heavy influences upon the early astronomical thinking of the ancient Greeks as well as the Indian and Islamic astronomers and their work would continue to contribute through much of the classical Greek period. The foundations had been laid, but the Greeks had their own ideas as well. For many ancient peoples the study of the heavens was mostly for worship and astrology, but for the Greeks the study of the stars and wanderers (planets) was to bring some real understanding of what they were actually seeing to the mind of man. This was something new and it would begin our long journey of organized astronomical discovery.

"The first science in the modern sense that grew in the Mediterranean civilization was astronomy. It is natural to come to astronomy straight from mathematics; after all, astronomy was developed first, and became a model for all the other sciences, just because it could be turned into exact numbers."

Jacob Bronowski