

# Cosmology & Culture

## Lecture 2

Wednesday April 8, 2009

EGYPTIANS, MESOPOTAMIANS,  
HEBREWS, & GREEKS

UCSC Physics 80C

**Week**

# **Cosmology & Culture Syllabus**

**CORRECTED**

**1 INTRODUCTION**

## **Part I COSMOLOGICAL REVOLUTIONS**

- 1 Chapter 1 Wrapping Your Mind Around the Universe**
- 2 { Chapter 2 From the Flat Earth to the Heavenly Spheres**
- Chapter 3 From the Center of the Universe to No Place Special**

## **Part II THE NEW SCIENTIFIC PICTURE OF THE UNIVERSE**

- 3 Chapter 4 What Is the Universe Made of? *The Cosmic Density Pyramid***
- 4 Chapter 5 What Is the Center of the Universe? *The Cosmic Spheres of Time***
- 5 Chapter 6 What Size is the Universe? *The Cosmic Uroboros***
- 6 Chapter 7 Where Do We Come From? *The Cosmic Las Vegas***
- 7 Chapter 8 Are We Alone? *The Possibility of Alien Wisdom***

## **Part III THE MEANINGFUL UNIVERSE**

- 8 Chapter 9 Think Cosmically, Act Globally**
- 9 Chapter 10 Taking our Extraordinary Place in the Cosmos**
- 10 Reports on student projects & summary of course**

“The universes are our models of the Universe. They are great schemes of intricate thought – grand cosmic pictures – that rationalize human experience; these universes harmonize and invest with meaning the rising and setting Sun, the waxing and waning Moon, the jeweled lights of the night sky, the landscape of rocks and trees and clouds. Each universe is a self-consistent system of ideas, marveiously organized, interlacing most of what is perceived and known. *A universe is a mask fitted on the face of the unknown Universe.*”

Edward Harrison, **Masks of the Universe**

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# Timeline of Ancient Middle East

BCE

- 3100 Unification of Kingdom of Egypt
- 2800 Gilgamesh, king of Uruk (early Sumer)
- 2650 Great Pyramid of Giza built
- 1800 Hammurabi of Bablyon -- first great legal code  
*Enuma elish*; early astronomical observations
- 1700 Appearance of proto-Canaanite alphabet
- 1500 Ugarit (Canaanite city worshipping Baal)
- 1400? Israelites in Egypt
- 1300? Exodus
- 1000 David establishes Jerusalem as capital,  
Solomon builds First Temple
- 922 Judah (S) divided from Israel (N)
- 900-700 J and E versions of Torah written, then D, then P
- 722 Kingdom of Israel destroyed by Assyrian Empire
- 587 Destruction of Jerusalem by Babylonian Empire
- 586-538 Babylonian Exile of Jews from Judah
- 500 Ezra the Scribe -- The Redactor?

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	Proto-Canaanite	Early Phoenician	Greek		Proto-Canaanite	Early Phoenician	Greek
.			Α	i			Ι
b			Β	m			Μ
g			Γ	n			Ν
d			Δ	s			Ξ
h			Ε	.			Ο
w			Υ	p			Π
z			Ζ	r			Ρ
h			Η	q			Ϟ
t			Θ	r			Ρ
y			Ι	s			Σ
k			Κ	t			Τ



# Middle East

BCE  
3100  
2800  
2650  
1800  
1700  
1500  
1400?  
1300?  
1000

922  
900-700  
722  
587  
586-538  
500

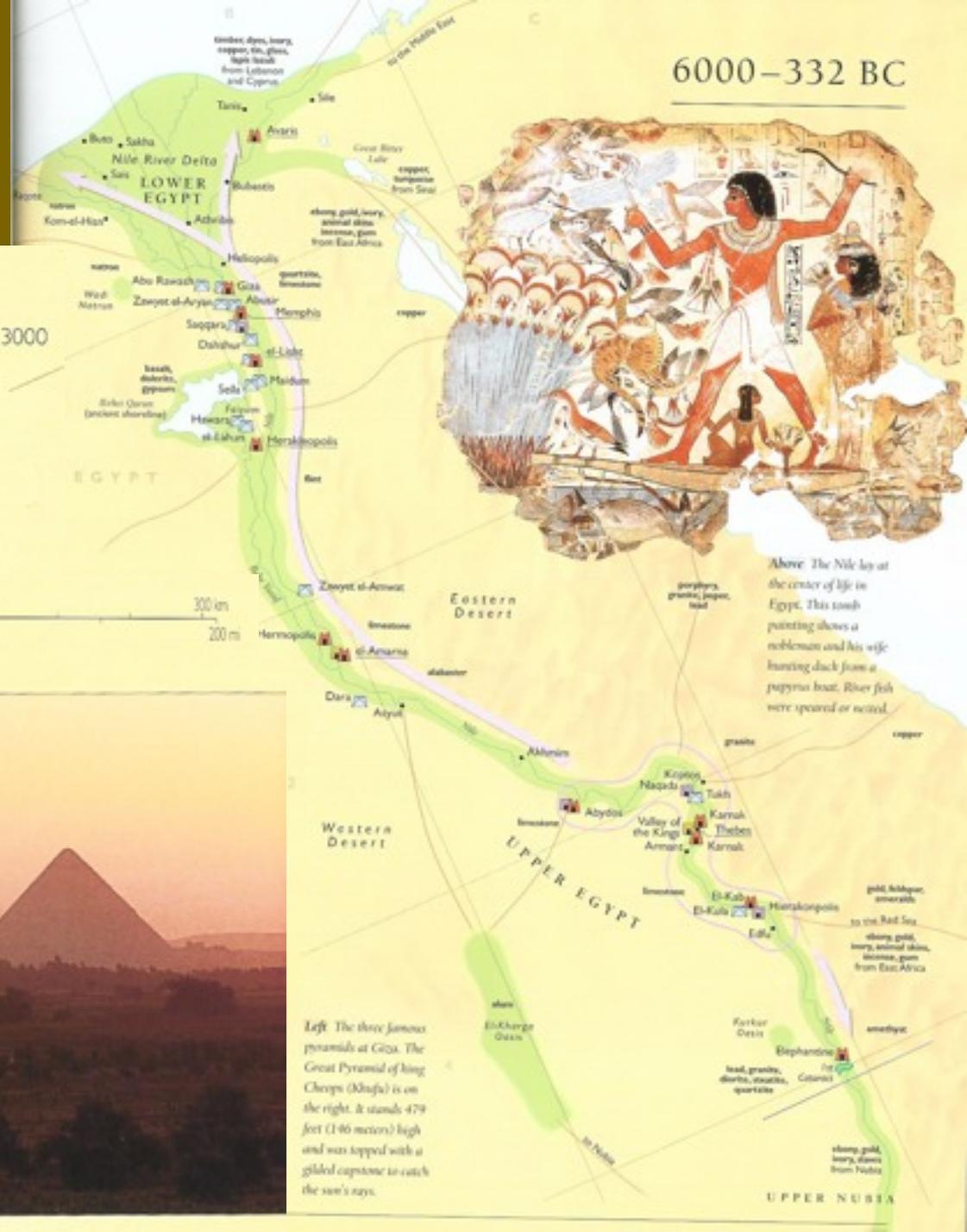
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Ezra the Scribe -- The Redactor?

)  
legal code  
variations  
et  
aal)

# Ancient Egypt

6000–332 BC

-  conjectural border of kingdom of Upper Egypt, c.3000
-  military expansion of Upper Egypt, c.3000
-  Royal tomb, c.3250–2649
-  southern border of Old Kingdom
-  Old and Middle Kingdom pyramids
-  New Kingdom Royal tombs
-  New Kingdom temples
- Avaris**  Royal capital at some point
-  fertile area
- gold**  source of commodity
-  trade route into Egypt



Above: The Nile lay at the center of life in Egypt. This tomb painting shows a nobleman and his wife hunting ducks from a papyrus boat. River fish were speared or netted.



Left: The three famous pyramids at Giza. The Great Pyramid of King Cheops (Khufu) is on the right. It stands 479 feet (146 meters) high and was topped with a gilded capstone to catch the sun's rays.



SOUTH  
(face)

# Ancient Egyptian Cosmos



From *Book of the Dead* papyrus belonging to Nesitanebeteshru, a 21<sup>st</sup> Dynasty priestess.

# Ancient Egyptian Cosmos



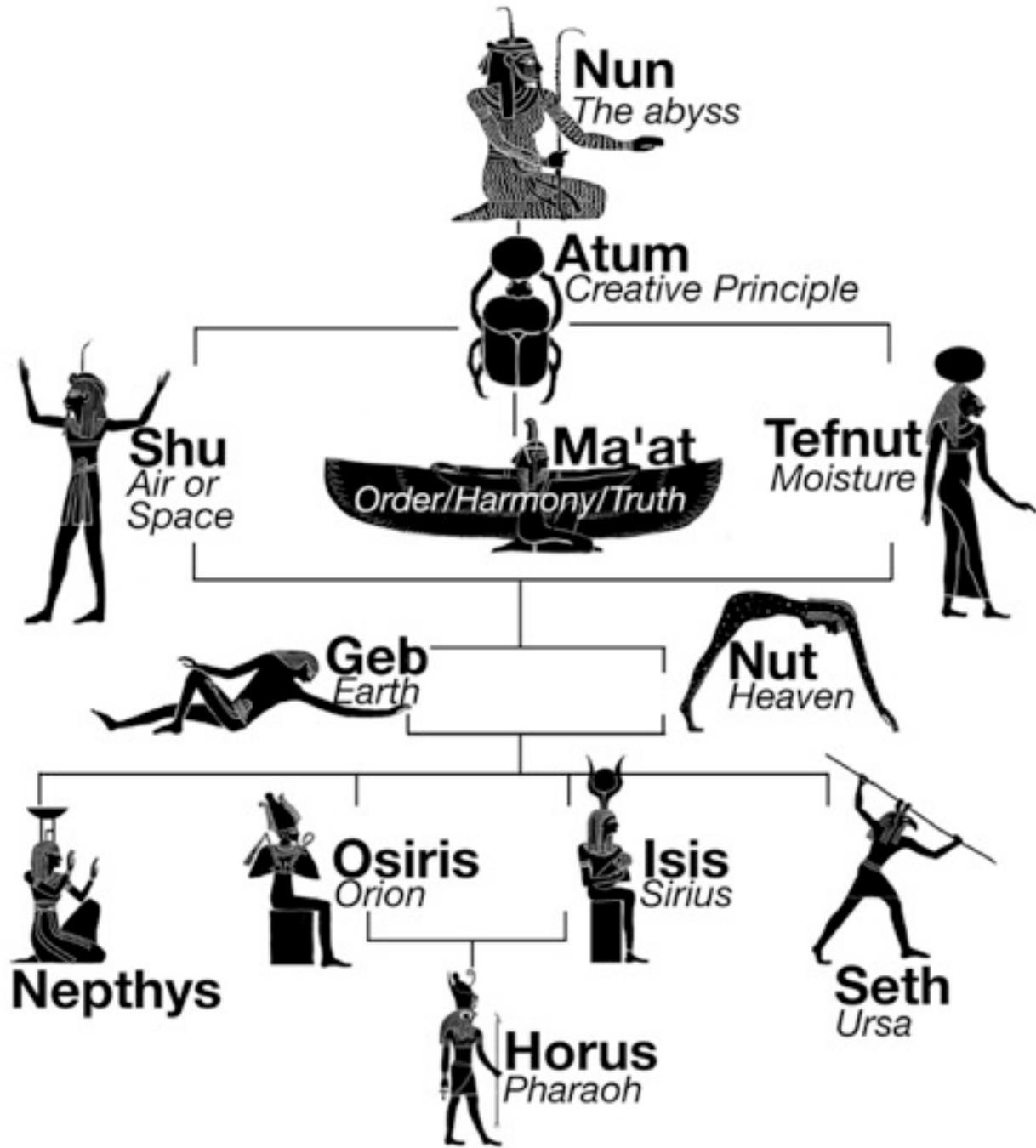
NUT

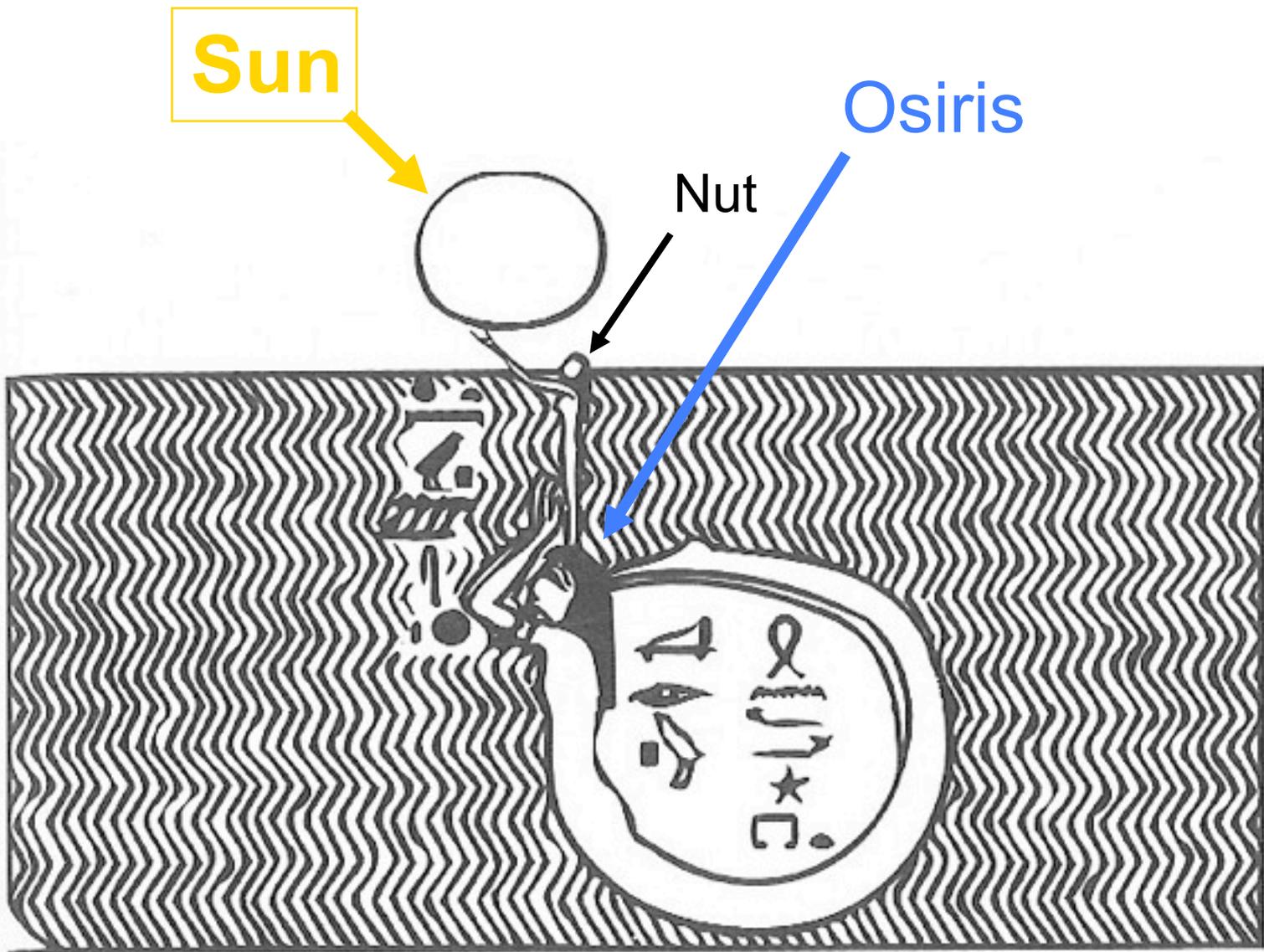
SHU

GEB

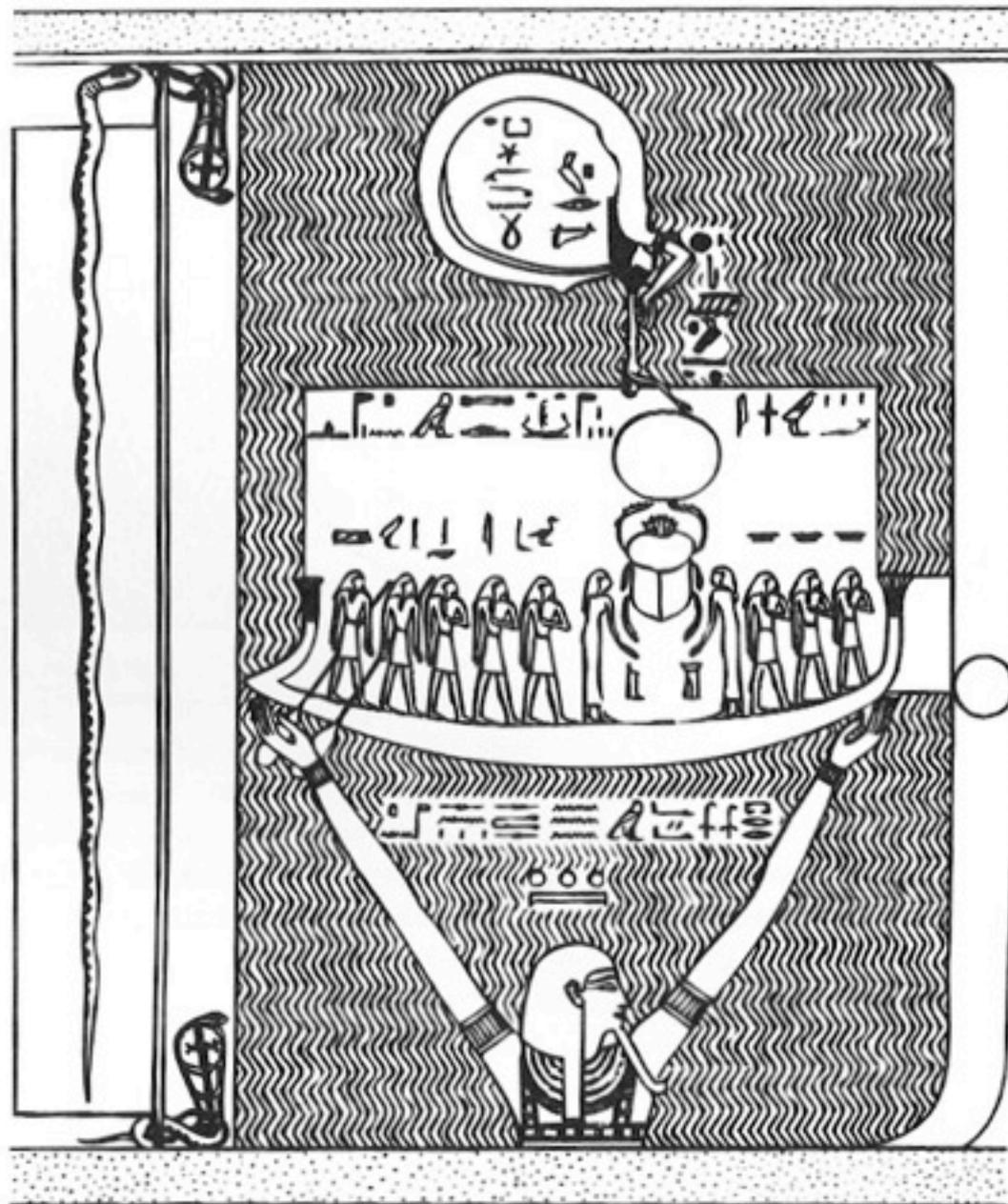
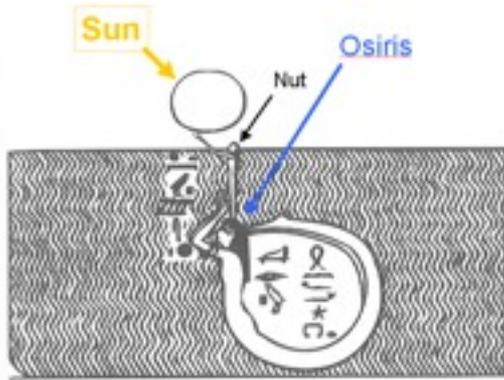


**Scarab Beetle**  
Tutankhamen





.....  
*Fig. 2.14. Nut and Osiris. From the Book of Gates, division 12. Tomb of Ramesses VI. Twentieth Dynasty.*



Nun

Fig. 2.15. Nun, the primordial ocean, raises up the sun boat. From the Book of Gates, division 12. Tomb of Ramesses VI. Twentieth Dynasty.

# The Separation of Heaven and Earth

Nut

Geb



Third Intermediate Period *Book of the Dead* of Tameniu, from Lorna Oakes and Lucia Gahlin, *Ancient Egypt* (New York: Hermes House, 2002).

# Understanding the Ancient Egyptians

In modern times, we tend to think of the "spiritual" dimension as internal, located in human psychology, conscious or unconscious. Egyptians saw inner space as objective and existing independently of the human psyche.

Modern consciousness feels that it contains within itself an inner world. Egyptian consciousness felt itself *surrounded* by an inner world.

Objects were not "in" space: they *contained* a metaphysical space. Humans could see through them to the spiritual reality beyond.

Modern world: "wholeness" means "totality"

Egyptians: "wholeness" meant the indwelling presence was inside every part. Thus any god, with apparently limited functions, could also be experienced as the ultimate Godhead and source of all existence.

# Cycle of Seasons



Deficiency (April to June)

**Inundation (July to October)**

Coming Forth or Emergence (November to March)

Every celestial object was a symbol of the god behind it. The sun was the outward manifestation of Ra. The life process of Ra determined the behavior of the sun, being renewed in the Dwat every night and reborn every morning.

# The Murder of Osiris

Seth was jealous of his brother, Osiris, the popular king.

Seth offers special box to whoever can fit into it. When Osiris tries, Seth locks him in box, ferries it to delta of Nile, casts it into sea.

Isis searches for Osiris, has adventures, finds box in Byblos, tries to bring it home. But Seth discovers her, cuts Osiris into many pieces, scatters them throughout Egypt.

Isis embarks on search, finds the pieces, puts him together again with help from her sister Nephthys, revives him with her magic.

Osiris and Isis have a son, Horus, who grows up to avenge his father. They battle, but ultimately a tribunal of gods decides that Seth is wrong and must be punished.

Osiris becomes god of underworld and the judge of souls.

# Egyptian picture of the universe: the mythical landscape

**Isis** is Sirius

**Osiris** is Orion (and sometimes the moon)

**Seth** is Ursa Major

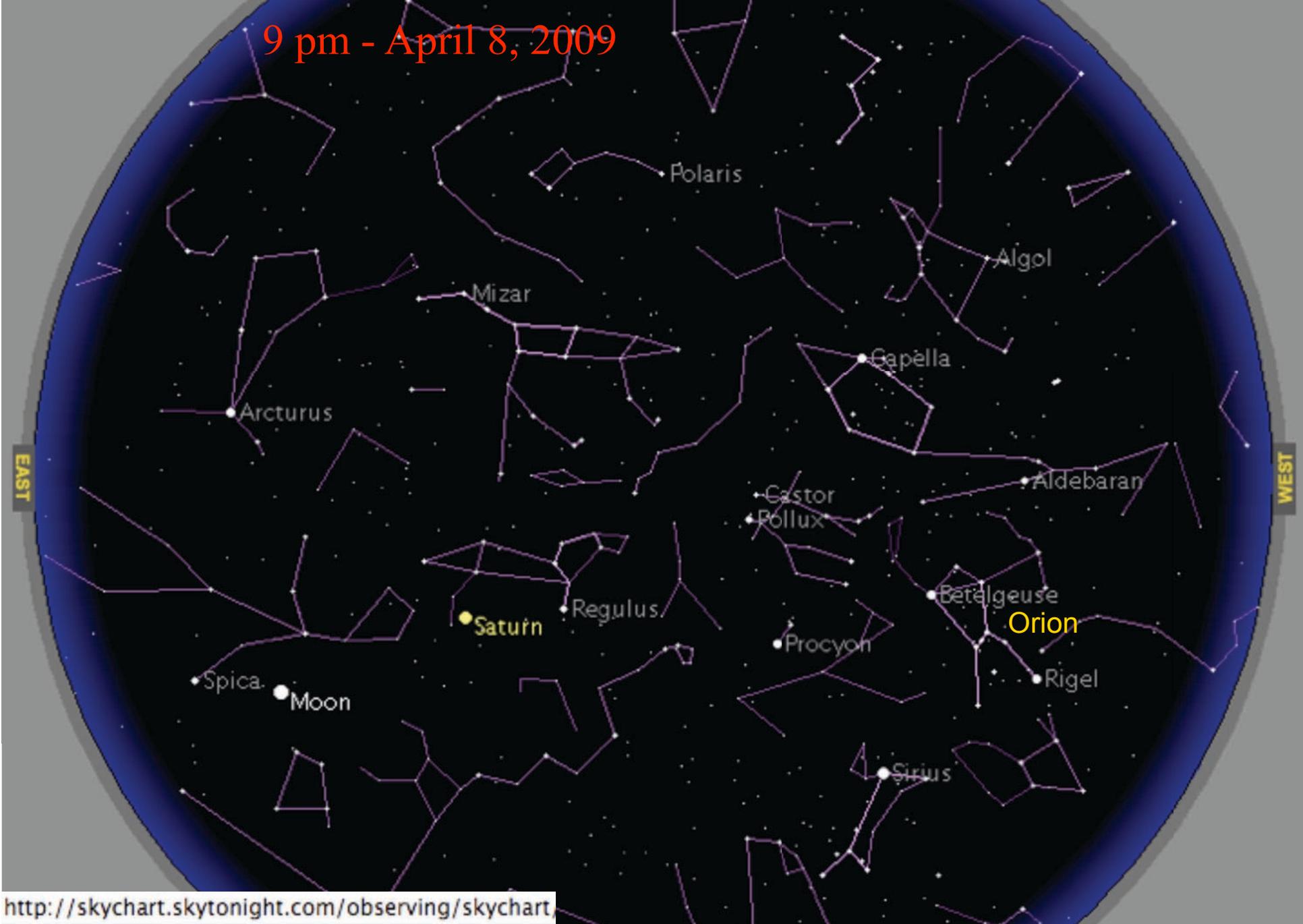
**Nephthys** is the sphere of the stars below the horizon

Just before the season of flood, the world is dry and dead (Seth in power). Orion becomes visible, signaling the flood is coming. When the flood arrives, Sirius reappears. The flood is Isis's tears for her lost Osiris. The flood brings him back, fertility returns.

The gods are represented by stars and planets, and their carefully observed appearances in the sky determine the mythological stories. The enactment by the stars of the divine stories reinforces the sense of cosmic orderliness that derives from the Egyptian landscape and climate.



9 pm - April 8, 2009



<http://skychart.skytonight.com/observing/skychart>

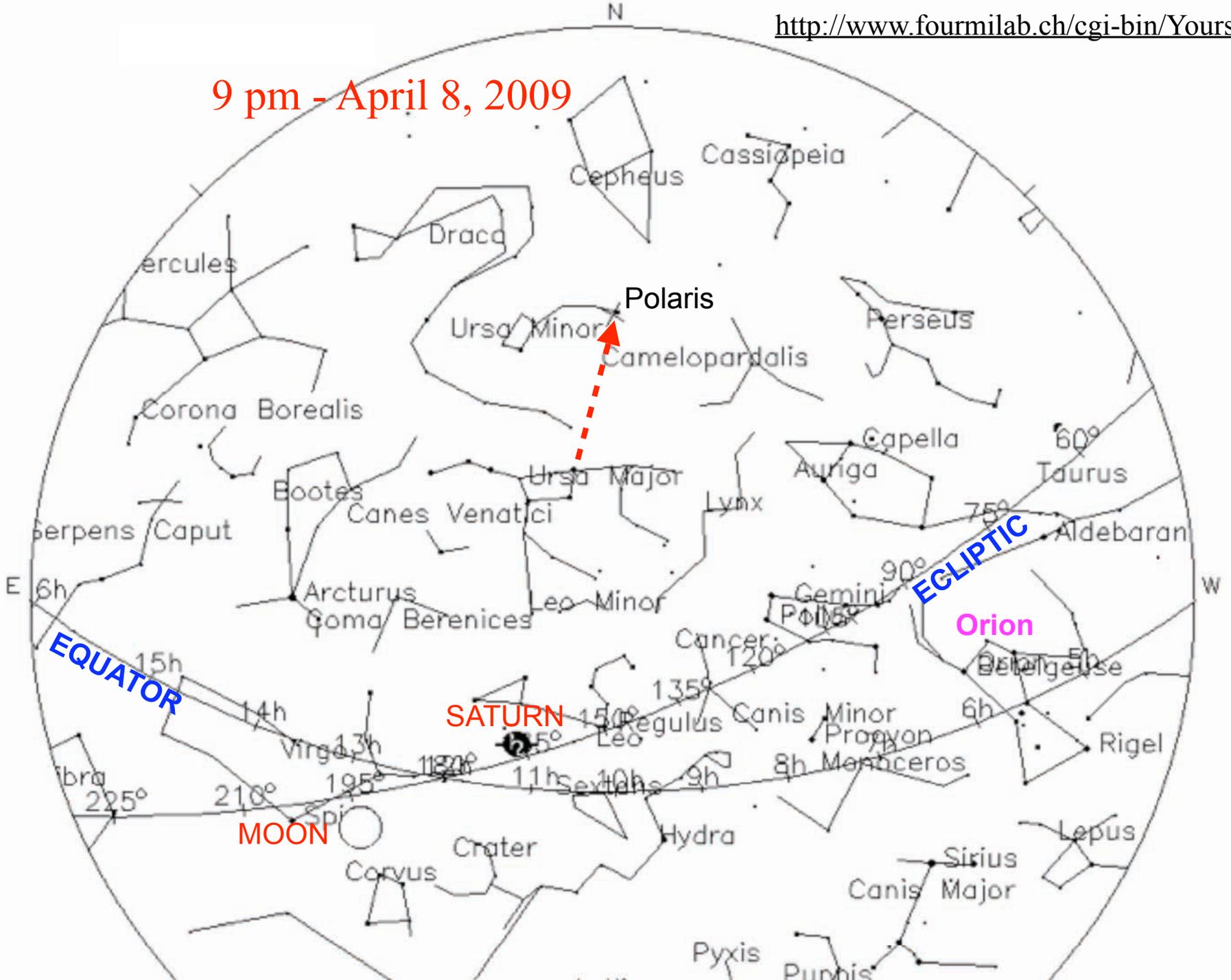
SANTA CRUZ, CA 95060

LATITUDE: 36° 59' N

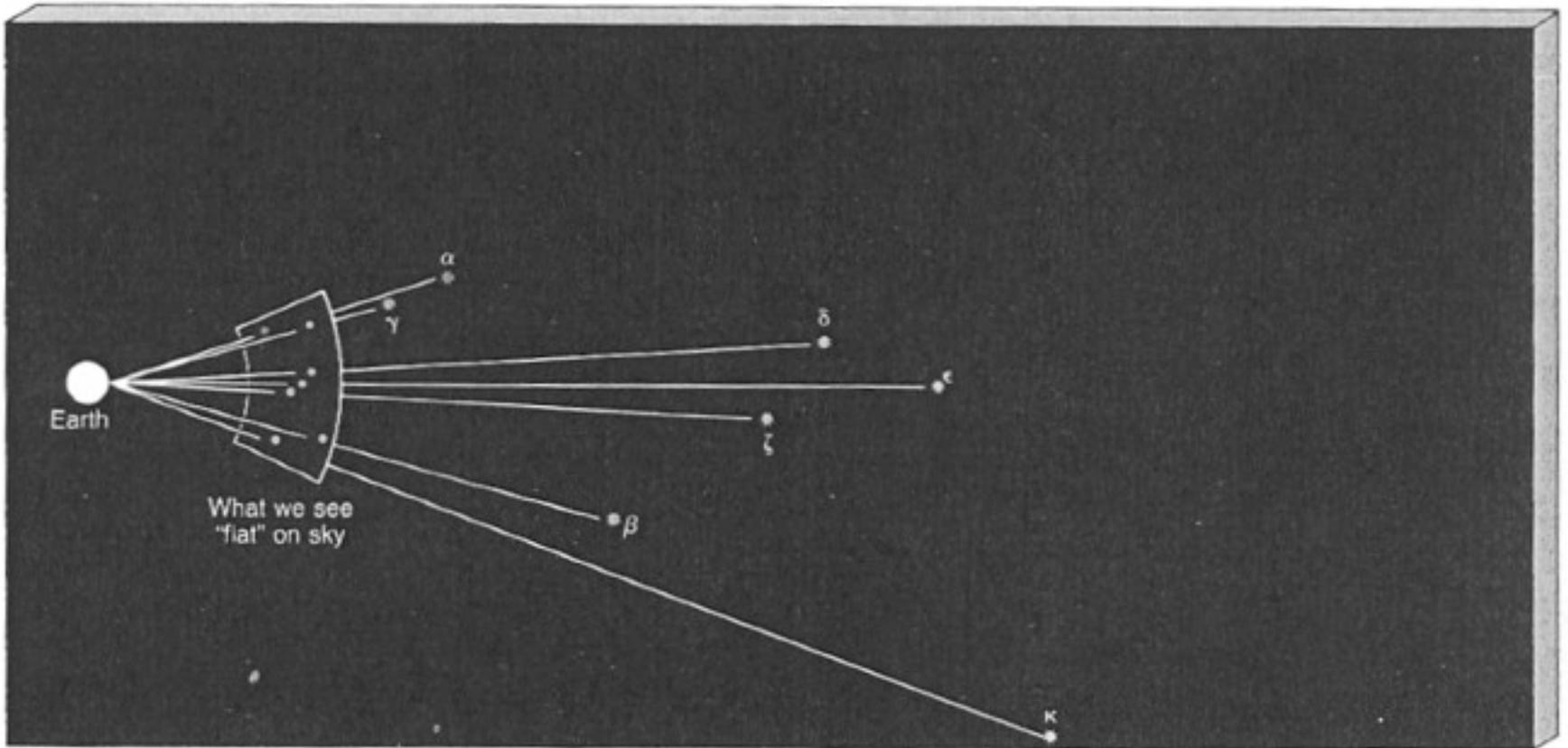
LONGITUDE: 122° 03' W

Apr. 8, 2009, 09:00 pm

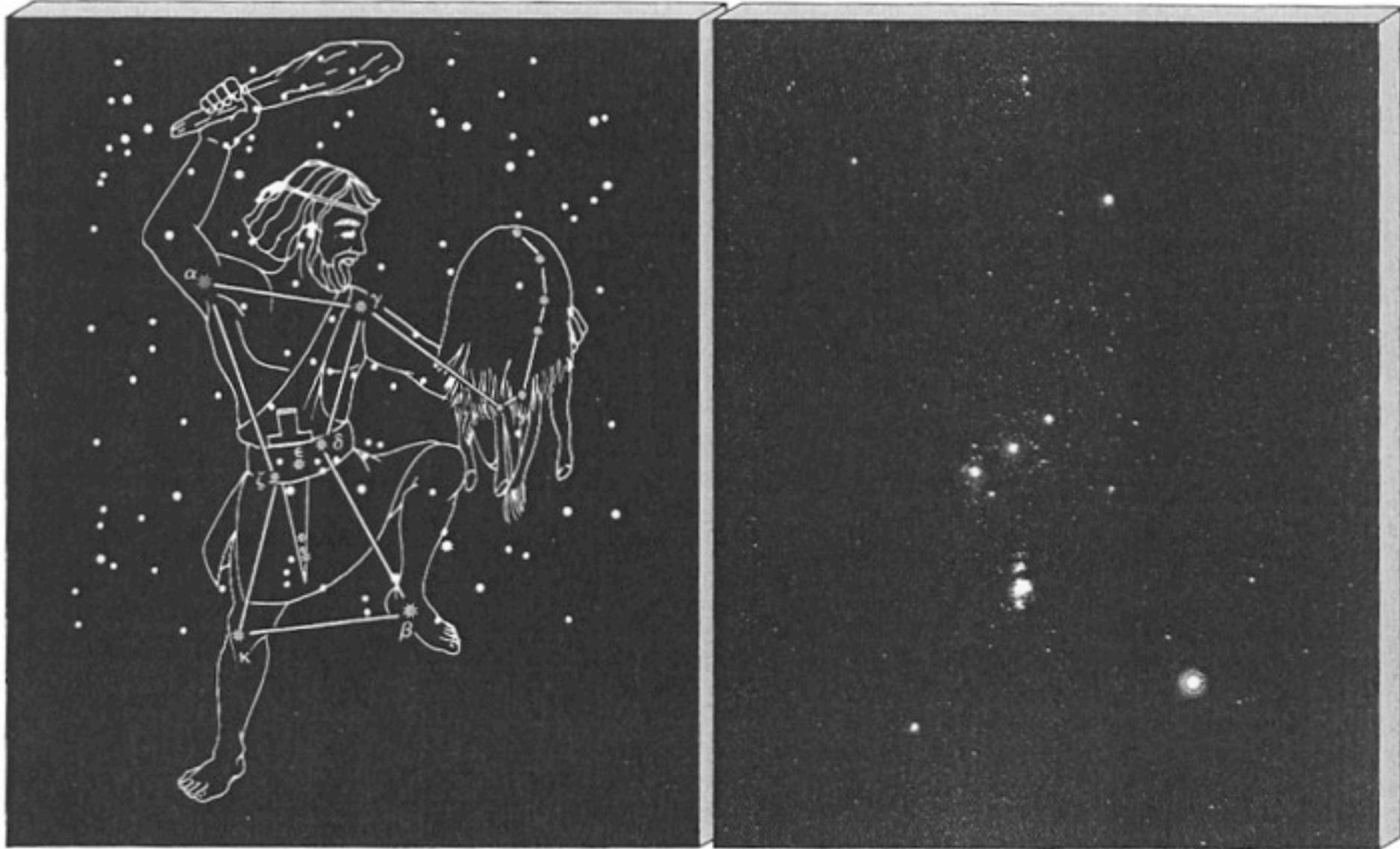
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# Orion



# Orion



# Ancient Egyptian Cosmos

“To the ancient Egyptians, the physical universe was still to a certain extent transparent to the spiritual world that lay beyond it. It would be a mistake, therefore, to think of them as imaginatively interpreting the physical cosmos. Rather, through the symbolic image and the power of imaginative perception, the spiritual order was made accessible in and through the physical. If the flat-earth cosmology of the ancients appears to the critical modern mind as physically naïve, we should remind ourselves that it related primarily to the inward, or vertical dimension of existence....For all its physical naivete, it had a spiritual profundity that is totally absent from the physically sophisticated but metaphysically barren modern cosmography.”

*Temple of the Cosmos*, Jeremy Naydler

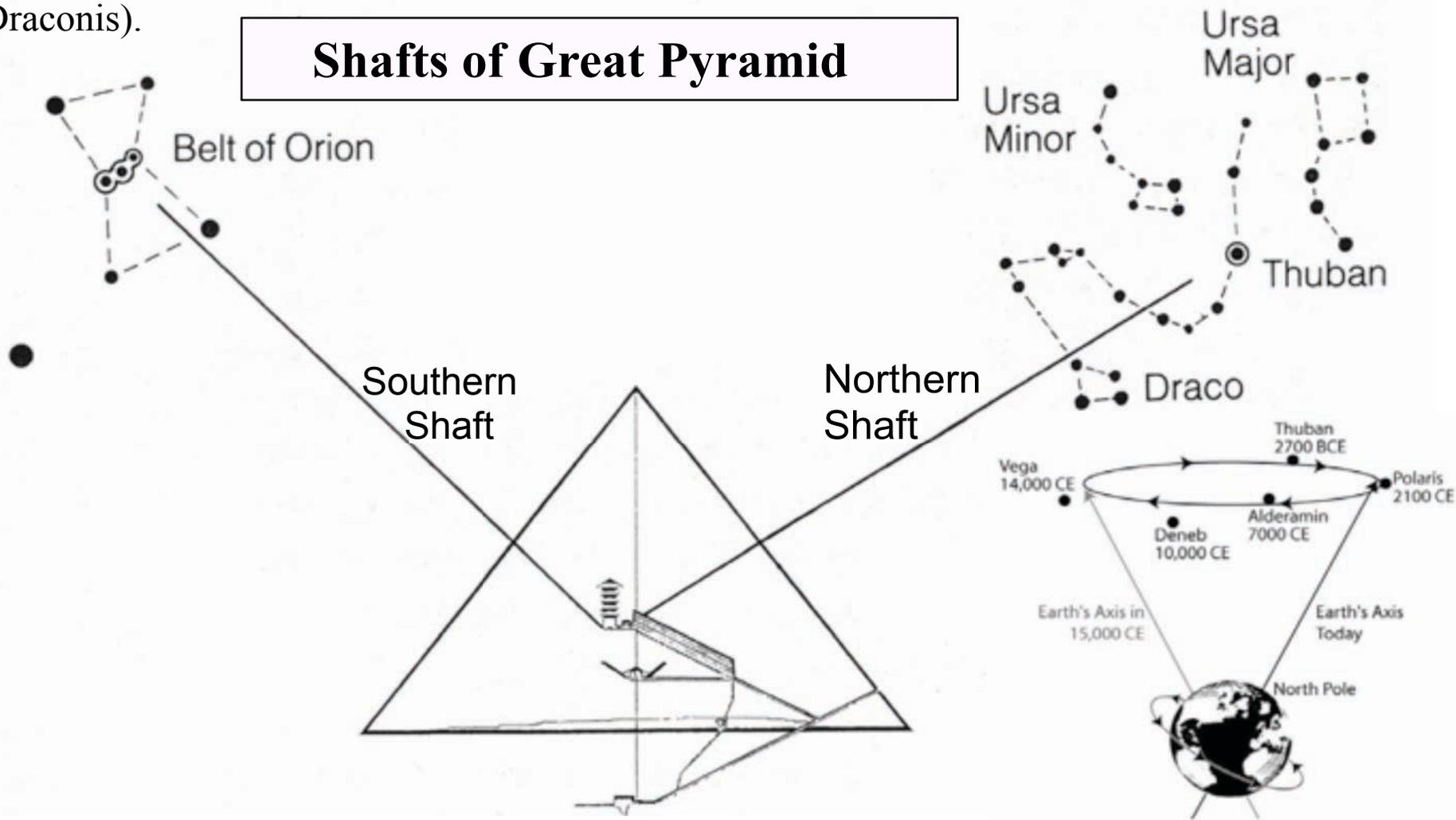
We like to think that symbolic thinking is a high form of thought, since it is hard for many people, and thus it must be a relatively modern achievement. We assume that ancient cultures believed their myths at surface value, as children usually do. But this is completely backward. In fact, symbolic thinking was far more natural to the Egyptians than to us. People today value first order, literal, objectively verifiable subjects of thought over second order, symbolic, personally experienced ones. What is striking is that the ability to think symbolically about deep questions is disappearing in modern life.

# The Great Pyramid and Orion's Belt

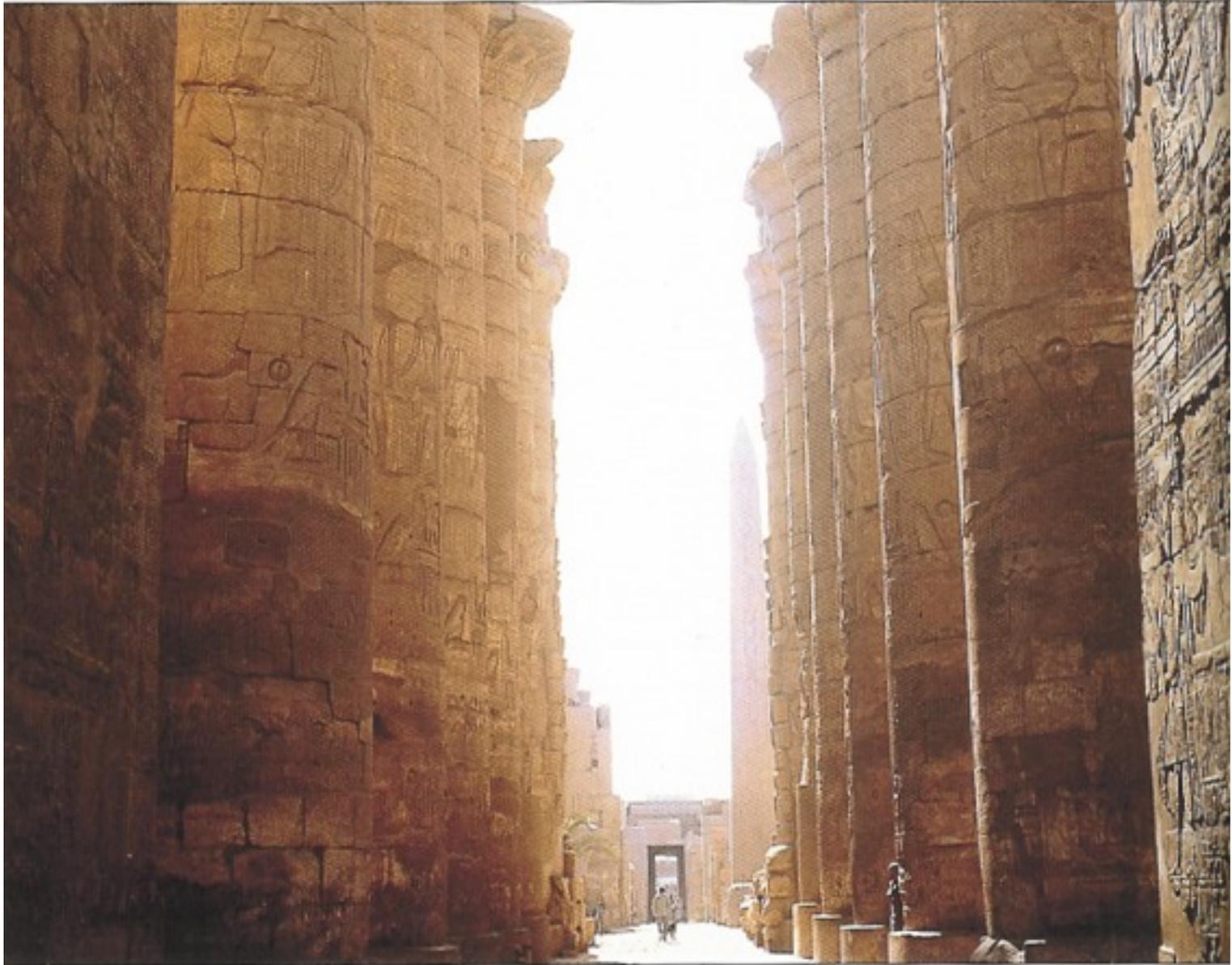
The largest of all the Egyptian pyramids were built by the 4<sup>th</sup> Dynasty pharaohs Sneferu (who built two pyramids at Dashour), his son Khufu (known to the Greeks as Cheops), Khufu's son Khafra (Chephren), and Khafra's son Menkaura (Mycerinos). The latter three built the three pyramids at Giza, of which the Great Pyramid of Khufu is the largest and best built. The King's Chamber of the Great Pyramid has two small shafts; the northern one rises at an angle of 31°, the southern at about 44°. In 1964, UCLA Egyptologist Alexander Badawy and Virginia Trimble (then a graduate student, now a well-known astronomer) showed that when the Great Pyramid was built, about 2650BCE, the southern shaft pointed toward the belt stars of Orion when they were highest in the sky. The northern shaft points toward the North Star (which is now Polaris, but was then, because of the earth's precession, the star Thuban, or  $\alpha$  Draconis). In *The Orion Mystery* (Crown, 1994), Robert Bauval and Adrian Gilbert point out that the two shafts from the Queen's Chamber similarly point toward Sirius and stars of the constellation Ursa Minor. The constellation Orion (Sah or Sahu to the ancient Egyptians) and the star Sirius (Sothis) corresponded the gods Osiris and Isis of ancient Egyptian mythology. The first rising at dawn of Sirius was coincident with the annual flood of the Nile. According to the *Pyramid Texts* from the pyramid of Unas, the last pharaoh of the 5<sup>th</sup> Dynasty, Thuban and the Orion belt stars were stellar destinations of the soul of the dead pharaoh. Osiris was the ruler of the Duat (Netherworld), the husband (and brother) of Isis, and the father of Horus (who represented the new pharaoh).

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## Shafts of Great Pyramid



# Egyptian Temples



Temple of Karnak Now ...



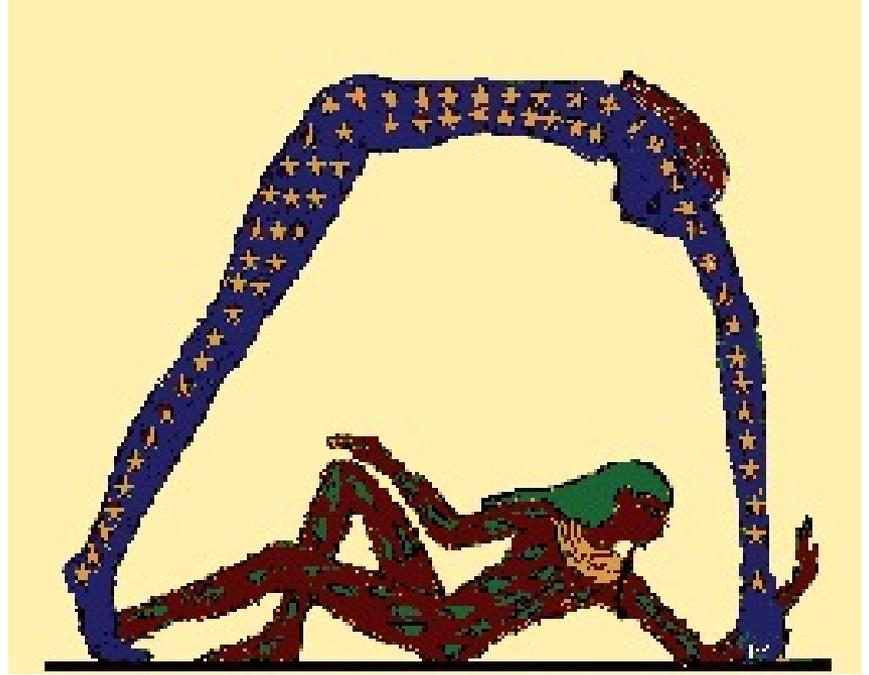
and Then



*Imagine that you are an ancient Egyptian, sitting on a hilltop in total darkness on a warm, moonless night. There are no fires tonight, not even in the valley you know is below but cannot see. You look upward, and the sky is blacker than you have ever noticed it, sparkling with stars – far more stars than you can see from the village. A great swath of pale white light crosses the entire sky. That is the Nile, the real Nile, the Winding Way. The river here on earth is its reflection. You lie back and relax into the beauty of the stars. You can feel the presence of their mother, the great goddess Nut, arching over you and the earth god, Geb, whose warm, sweet body is the ground you lie on. Nut is as huge as the sky. You can feel her protecting you from the forces of chaos beyond. If you look deeply into her, between the stars, you can almost see the world of spirit, the Dwat, ruled by Nut's son, Osiris. In the perpetual darkness within the goddess Nut, the sun is traveling on his nightly journey, stripped of his brilliant outward form, being renewed and prepared to be reborn in his next life tomorrow. You too were born from the Dwat, and at death you will return. The night feels long, but Nut will give birth to the sun again when the time is right. The story of creation surrounds you -- how Nut and Geb, heaven and earth, were born in loving embrace and how their father Shu, the air or space, aided by the gods of wind, split apart his children to create the space between heaven and earth. Even in the deepest darkness, you know that Shu is standing firmly upon Geb, supporting Nut with his life force to keep her from falling back into the embrace of Geb, her lover. This arrangement was foretold by the Law of the Universe, which is older than heaven and earth, and even older than their father Shu. The Law is eternal. You wonder which of the countless stars above are actually past pharaohs who have risen after death, as the Law requires, to serve forever with Osiris in protecting the order of the universe. Could all the stars be long-dead pharaohs? Can Egypt possibly be that old? All you really know is that as long as your kings sit upon their thrones and uphold the Law of the Universe, the order of the gods will be maintained and the world is safe. "Oh, My Mother Nut," you pray, using well-known words carved into the stone of the pyramids, "spread yourself above me so that I can be placed among the unchanging stars and never die."*

# Egyptian Flat-Earth Cosmos

Nut (sky) and Geb (land)



The sky goddess Nut painted on the inside of a **coffin** lid.



# Four Lessons from Ancient Egypt

**1. Taking seriously a cosmology based on the best understanding of one's time, even if it turns out later to be scientifically wrong like the flat earth, can inspire a civilization.**

*The Egyptians believed that the cosmos depended on them, and thus they mattered. Their cosmology provided a purpose to life: to take care of the creation – “the whole reach of the sky, to the limits of the eternal darkness” – by preserving and upholding the Law of the Universe.*

**2. Egyptians were in a position to think of time as virtually eternal, yet they never took their world for granted but were always ritually protecting it from the forces of Chaos.**

*Ancient Egypt is often seen as morbidly obsessed with death, mummification, and the afterlife. The Egyptians were not obsessed with the afterlife just as individuals – they were obsessed with the longevity of their civilization, which to them was identical with the longevity of the cosmos itself. We modern people should be so obsessed with protecting the longevity of our world! Instead, in the starkest possible contrast, our society glories in the short-term present, rewards large-scale despoliation and profiteering, values change for the pure entertainment of it, and ignores the wisdom of the past even though now we have the scientific means to ascertain much of what it was. Today's attitude is more like Louis XV's: “Après moi, le deluge.”*

**3. The commitment to make sense of the cosmos led to a flowering of imagination and creativity and a level of culture the human species had never before seen.** *Egypt invested a huge amount of resources and cultural energy into symbolic art and ritual, and this riot of imagery and ideas created a mental homeland for its people. Cosmology is always based on symbolism – there has never been and can never be any way of describing the universe in straightforward language. Modern cosmology is no exception: it is worked out mathematically, but pure mathematics by its nature never describes anything. What equations refer to, if anything, is always a matter of interpretation.*

**4. Basing their cosmology in the stars stabilized their culture.**

*It helped sink foundations for the ages into the most stable material anyone could possibly know at the time: the stars. On a practical level, the mobilization of resources and people necessary to build the Great Pyramid created a concentration of economic and political power that helped stabilize the institutions of Egypt and strengthen it against domestic disorder and potential invaders. When the Great Pyramid of Giza launched the Pharaoh Khufu's soul, it in some sense also launched the civilization.*

*A civilization without stability can do nothing of lasting importance – it can neither build pyramids nor send humans into space on any kind of extended voyage. It cannot invest in the future because it doesn't believe in the future. **One of the gifts of modern cosmology is a way to grasp the immensity of time and space and to carry that consciousness into our understanding of our own lives and futures.***



# MODERN MESOPOTAMIA



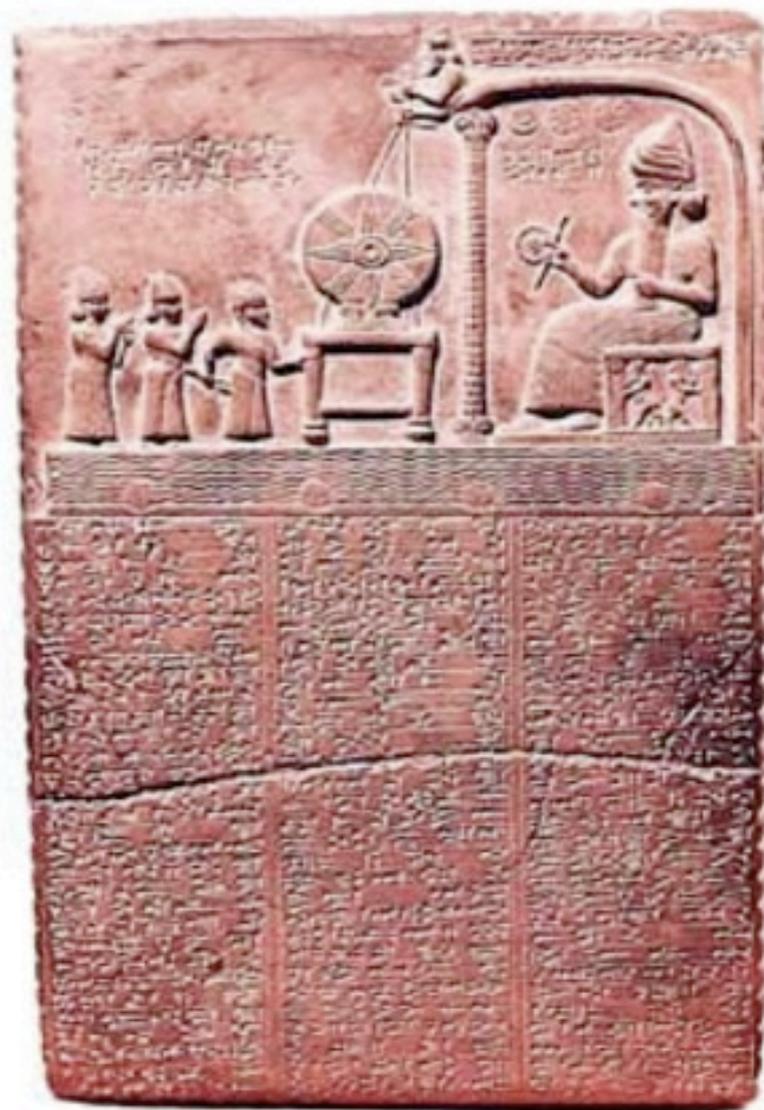
5500-539 BC

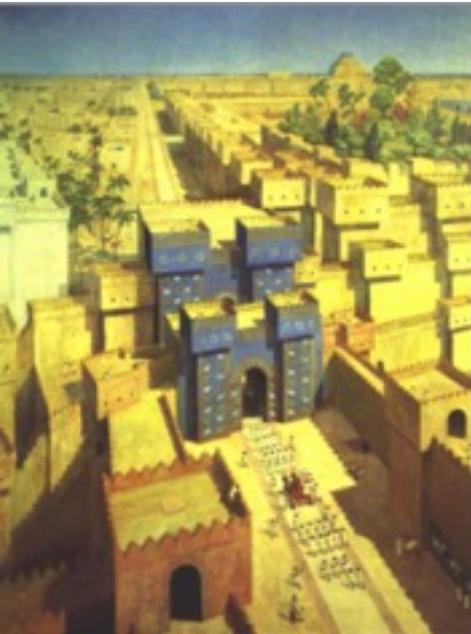
# ANCIENT MESOPOTAMIA



# A Cuneiform Tablet

**This stone tablet, from around 870 B.C., depicts the sun god Samas. The Babylonians developed very accurate knowledge of many astronomical phenomena. (The Granger Collection)**





## Enuma Elish

Babylonian Creation Story, re-enacted each year in a great festival

Apsu and Tiamat want to kill their annoying offspring.

Ea casts a spell on Apsu, then kills him and establishes his own abode on Apsu. Demonstrates:

- 1 magical power of the Word (Ea's)
- 2 why earth rests above water

Next part of story has Tiamat and forces of Chaos go to war against the gods. Here a word is not enough to stop her.

Marduk is chosen to fight Tiamat, accepts on condition he be given total authority. Gods agree. Beginning of State and King.

*First scientific experiment: gods test Marduk to see if their grant of authority really does make him strong. Ask him to destroy a garment and then re-create it intact by command. He succeeds.*

Marduk carries weapons of storm-god Enlil, indicating original story was about Enlil. Wind splits Tiamat open so Marduk can shoot into her mouth and kill her. Then she is kept apart by the wind so part of her is the sky. Humans created as servants of gods, made from body of the evil Kingu. Gods reward Marduk – they build him a city and temple.



# Sumerian Art

Ur, c2685 BCE

## Thorkild Jacobsen on the *Enuma Elish*

Apsu (sweet water) — Tiamat (sea)  
Lahmu and Lahamu (silt)  
Anshar (horizon of sky) and Kishar (horizon of earth)  
Anu (god of sky)  
Nudimmud = Ea (god of sweet water) = Enki (lord of earth)

Creation story is based on geology of Mesopotamia:  
sweet waters of Tigris and Euphrates deposit silt at mouth of rivers and thus continually create land extending into the Persian Gulf.



The plaque and the head are from the bull-headed lyre. The plaque is constructed of shell and lapis lazuli, and depicts four separate scenes. In the first scene, a naked hero is wrestling two bulls. In the second scene, a dog with a dagger in his belt is carrying a table with meat joints, while a lion follows him carrying a cup and a jar. The third scene shows a boar steadying a lyre, while a donkey plays it as a jackal sits at the donkey's feet. The fourth scene shows a mythological creature with a scorpion's tail and a gazelle holding two plated tumblers like those from Lady Pu-ab's tomb. The bull, constructed of copper, and the plaque are well-preserved.

# Lessons from Mesopotamia

1. **Babylonian astronomy was the most advanced in the ancient world, but because of the cosmology through which they understood it, Babylonians did not get the full benefit of it.** *By keeping astronomy mathematical, without asking why the stars and planets moved as they did, they divorced the celestial bodies from reality. By using astronomical knowledge for secret prophecies for the powerful, they limited its cultural effect and limited their own imaginations*

2. **The Mesopotamians believed the order of the cosmos depended on them and thus they mattered.**

*For the Mesopotamians, maintaining harmony with and in the cosmos was their ultimate goal, but unlike Egypt they had no all-powerful king symbolically making the cosmic connection for the entire population. Instead they had multiple city-states, each with its high god, always in competition with each other. Mesopotamians believed that the way to uphold the harmony of the cosmos was to free the god that ruled their city to participate fully in the cosmic assembly.*

3. **Cosmological imagery is based on people's experience of the natural world. Mesopotamia's story of watery Chaos in the beginning went off in a different direction from Egypt's. By seeing the creation of heaven and earth begin with silt from the Tigris and Euphrates, the Mesopotamians gave their own land the status of the center of the cosmos.**



## Genesis Chapter 1 (Revised Standard Version)

1 In the beginning God created the heavens and the earth. 2 The earth was without form and void, and darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters.

3 And God said, "**Let there be light**"; and there was light. 4 And God saw that the light was good; and God separated the light from the darkness. 5 God called the light Day, and the darkness he called Night. And there was evening and there was morning, one day.

6 And God said, "**Let there be a firmament in the midst of the waters, and let it separate the waters from the waters.**" 7 And God made the firmament and separated the waters which were under the firmament from the waters which were above the firmament. And it was so. 8 And God called the firmament Heaven. And there was evening and there was morning, a second day.

9 And God said, "**Let the waters under the heavens be gathered together into one place, and let the dry land appear.**" And it was so. 10 God called the dry land Earth, and the waters that were gathered together he called Seas. And God saw that it was good. 11 And God said, "**Let the earth put forth vegetation, plants yielding seed, and fruit trees bearing fruit in which is their seed, each according to its kind, upon the earth.**" And it was so. 12 The earth brought forth vegetation, plants yielding seed according to their own kinds, and trees bearing fruit in which is their seed, each according to its kind. And God saw that it was good. 13 And there was evening and there was morning, a third day.

14 And God said, "**Let there be lights in the firmament of the heavens to separate the day from the night; and let them be for signs and for seasons and for days and years, 15 and let them be lights in the firmament of the heavens to give light upon the earth.**" And it was so. 16 And God made the two great lights, the greater light to rule the day, and the lesser light to rule the night; he made the stars also. 17 And God set them in the firmament of the heavens to give light upon the earth, 18 to rule over the day and over the night, and to separate the light from the darkness. And God saw that it was good. 19 And there was evening and there was morning, a fourth day.

# Parallels Between *Enuma Elis* and *Genesis 1-2:4*

Mesopotamia's canonical version of cosmic origins is found in the so-called Babylonian Creation Epic, or *Enuma elis* (“When on High”). The numerous points of contact between it and the opening section of *Genesis* have long been noted. There is not only a striking correspondence in various details, but--what is even more significant--the order of events is the same, which is enough to preclude any likelihood of coincidence. The relationship is duly recognized by all informed students, no matter how orthodox their personal beliefs may be. As an example, here is the tabulation given by Heidel, *The Babylonian Genesis*, p. 129:

## *Enuma elish*

Divine spirit and cosmic matter  
are coexistent and coeternal

Primeval chaos; Ti'amat enveloped  
in darkness

Light emanating from the gods  
The creation of the firmament  
The creation of dry land  
The creation of luminaries  
The creation of man  
The gods rest and celebrate

## *Genesis*

Divine spirit creates cosmic  
matter and exists independently  
of it

The earth a desolate waste,  
with darkness covering the  
deep (tehom)

Light created  
The creation of the firmament  
The creation of dry land  
The creation of luminaries  
The creation of man  
God rests and sanctifies the  
seventh day

[From E. A. Speiser, *The Anchor Bible: Genesis* (Doubleday & Co., 1964), pp. 9-10.]



Gilgamesh & Enkidu  
cylinder seal, Ur



## The flood story told to Gilgamesh

The god Enlil is upset by humans, convinces the council of gods to drown them in a flood.

Ea warns Utnapishtim in a dream to build boat but tell others that Enlil is only angry with U., who must leave to live with Ea.

U. builds boat, as dream said.

Many gods join together to create storm, but it's worse than they expected.

Gods flee to highest heaven, *regret their actions*.

After flood, U. offers sacrifice. Gods flock to him. Ishtar bans Enlil, who is enraged that any humans survived. (All gods agreed in council, but now blame only the one who proposed idea.)

Enlil accepts result. Takes U. by hand, enters boat, and blesses him and his wife with eternal life.

# The Flood

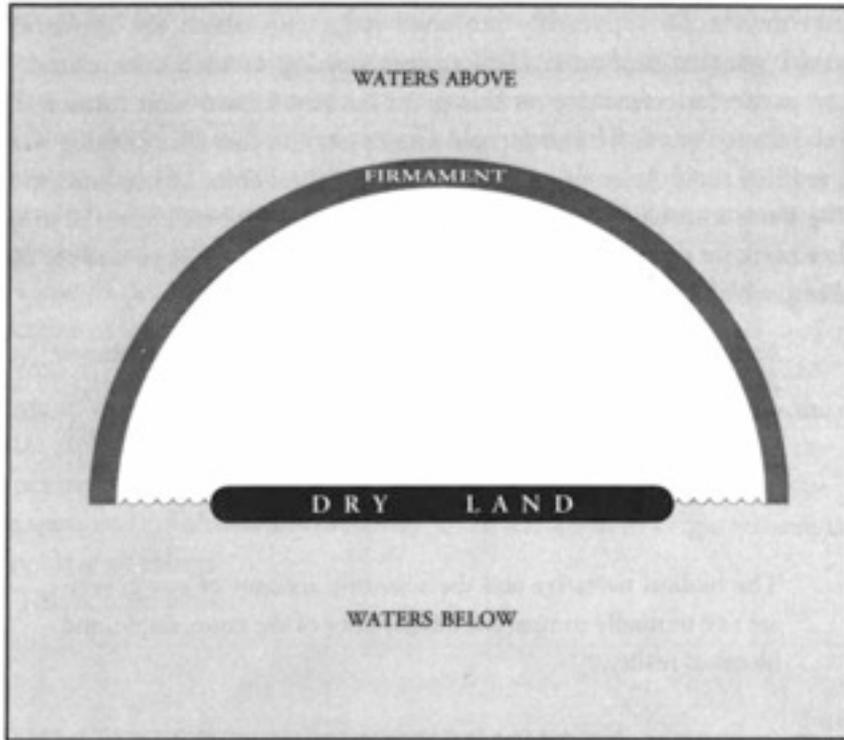
## BIBLE (500 BC)

1. God angry at humans
2. One man warned
3. Build ark
4. Take creatures
5. Tremendous storm
6. Sent out a dove (J version) or raven (P version)
7. In J, sacrifices to God
8. In J, God smells sacrifice
9. God makes covenant with humans through Noah

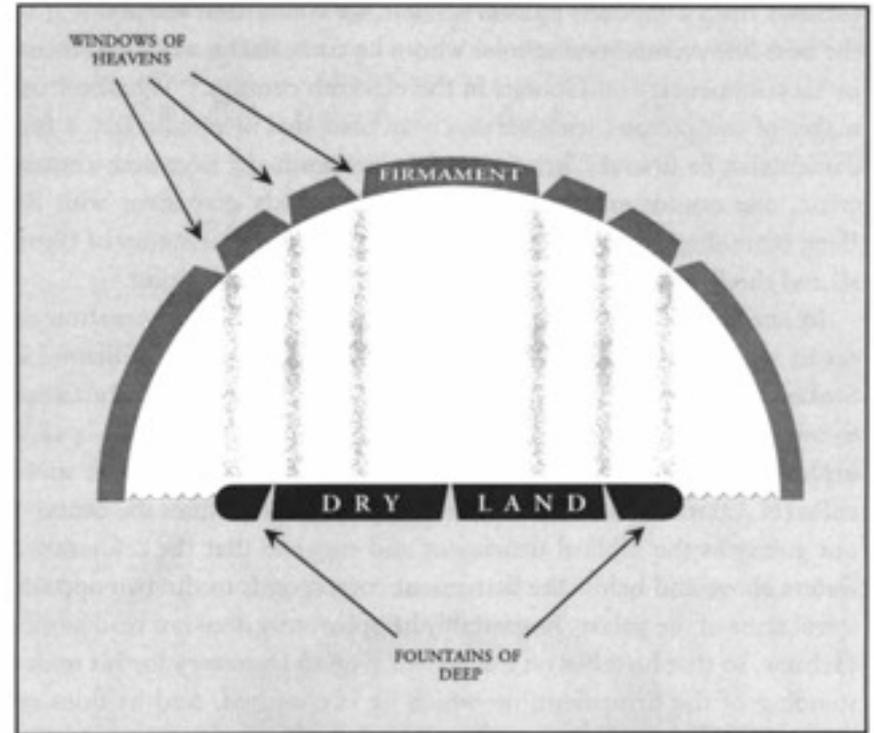
## GILGAMESH (2800 BC)

1. Gods angry
2. One man warned
3. Build boat
4. Take seed of living creatures, including plants
5. Storm
6. Sent out dove and raven and swallow
7. Sacrifice to gods
8. Gods smell sacrifice
9. Enlil makes covenant of immortality with Utnapishtim

# The Genesis Cosmos



The 2<sup>nd</sup> Day



The Flood

# Comparison of two Noah stories

## J

The Lord (YHWH)

Noah takes 2×7 of the clean, 2 of the unclean animals.

Flood lasts 40 days and nights.

Flood caused by rain.

Noah sends out dove.

The Lord is embittered at humans, acts because of his feelings of regret. Foresees no covenant. Flood is an end, not a means.

Only decides to make covenant when he smells the sacrifice.

Never said mankind was good, and still believes “the devisings of man’s mind are evil from his youth.”

Lord must be seduced out of a recurrence of his rage.

## P

God (Elohim)

Noah takes 2 of every animal.

Flood lasts 150 days, almost a year until land uncovered.

Flood caused by opening of windows of heaven and fountains of the deep (a cosmic catastrophe).

Noah sends out raven.

God acts without anger, in perfect knowledge, because cleansing destruction is necessary.

God coolly foresees a new covenant and each step that lies between his decision to destroy earth and his proclamation of the covenant.

God requires no sacrifice, in fact makes an offering to Noah: the rainbow.

# The Noah Story

P (Priestly) version is BOLDFACE and J (Yahweh/Jehovah) is upper-and-lower-case

Genesis 7:

1 And Yahweh said to Noah, "Come, you and all your household, to the ark, for I have seen you as righteous before me in this generation.

2 Of all the clean beasts, take yourself seven pairs, man and his woman; and of the beasts which are not clean, two, man and his woman.

3 Also of the birds of the heavens seven pairs, male and female, to keep alive seed on the face of the earth.

4 For in seven more days I shall rain on the earth forty days and forty nights, and I shall wipe out all the substance that I have made from upon the face of the earth."

5 And Noah did according to all that Yahweh had commanded him.

6 AND NOAH WAS SIX HUNDRED YEARS OLD, AND THE FLOOD WAS ON THE EARTH.

7 And Noah and his sons and his wife and his sons' wives with him came to the ark from before the waters of the flood.

8 OF THE CLEAN BEASTS AND OF THE BEASTS WHICH WERE NOT CLEAN, AND OF THE BIRDS AND OF ALL THOSE WHICH CREEP UPON THE EARTH,

9 TWO OF EACH CAME TO NOAH TO THE ARK, MALE AND FEMALE, AS GOD HAD COMMANDED NOAH.

10 And seven days later the waters of the flood were on the earth.

11 IN THE SIX HUNDREDTH YEAR OF NOAH'S LIFE, IN THE SECOND MONTH, IN THE SEVENTEENTH DAY OF THE MONTH, ON THIS DAY ALL THE FOUNTAINS OF THE GREAT DEEP WERE BROKEN UP, AND THE WINDOWS OF THE HEAVENS WERE OPENED.

12 And there was rain on the earth, forty days and forty nights.

13 IN THIS VERY DAY, NOAH AND SHEM, HAM. AND JAPHETH, THE SONS OF NOAH, AND NOAH'S WIFE AND HIS SONS' THREE WIVES WITH THEM CAME TO THE ARK,

14 THEY AND ALL THE LIVING THINGS ACCORDING TO THEIR KIND, AND ALL THE BEASTS ACCORDING TO THEIR KIND, AND ALL THE CREEPING THINGS THAT CREEP ON THE EARTH ACCORDING TO THEIR KIND, AND ALL THE BIRDS ACCORDING TO THEIR KIND, AND EVERY WINGED BIRD.

15 AND THEY CAME TO NOAH TO THE ARK, TWO OF EACH, OF ALL FLESH IN WHICH IS THE BREATH OF LIFE.

16 AND THOSE WHICH CAME WERE MALE AND FEMALE, SOME OF ALL FLESH CAME, AS GOD HAD COMMANDED HIM. And Yahweh closed it for him.

17 And the flood was on the earth for forty days and forty nights, and the waters multiplied and raised the ark, and it was lifted from the earth.

24 AND THE WATERS GREW STRONG ON THE EARTH A HUNDRED FIFTY DAYS.

Genesis 8:

1 AND GOD REMEMBERED NOAH AND ALL THE LIVING, AND ALL THE BEASTS THAT WERE WITH HIM IN THE ARK, AND GOD PASSED A WIND OVER THE EARTH, AND THE WATERS WERE DECREASED.

2 AND THE FOUNTAINS OF THE DEEP AND THE WINDOWS OF THE HEAVENS WERE SHUT, and the rain was restrained from the heavens.

3 And the waters receded from the earth continually, AND THE WATERS WERE ABATED AT THE END OF A HUNDRED FIFTY DAYS.

4 AND NOAH'S ARK RESTED, IN THE SEVENTH MONTH, IN THE SEVENTEENTH DAY OF THE MONTH, ON THE MOUNTAINS OF ARARAT.

5 AND THE WATERS CONTINUED RECEDING UNTIL THE TENTH MONTH; IN THE TENTH MONTH, ON THE FIRST OF THE MONTH, THE TOPS OF THE MOUNTAINS APPEARED.

6 And it was at the end of forty days, and Noah opened the window of the ark which he had made.

# Genesis versions

*J*

*Eden, no cosmology*

*Talking snake*

*Personal God*

*Flood: 40 days of rain*

*Divine mercy, forgiveness  
only*

*P*

*Cosmological creation*

*Humans in god's image*

*Transcendent God*

*Flood: cosmic crisis*

*Divine justice*

Redactor created composite God  
combining mercy and justice!

# Common Ground in Ancient Near East Creation Myths

- A. The cosmos is viewed as a closed, three-storied whole (water above and below earth), all under control of divinity.
- B. The divine sphere established the mundane sphere: a creator-god was responsible for the existence of the cosmos and humanity.
- C. No creation *ex nihilo*: something exists prior to the creation act.
- D. The creation act above all establishes the proper order of things; e.g. Egyptian *ma'at* (world-order, correctness, truth, righteousness), Hebrew *tob* (good, beautiful, useful, reliable, suitable, correct).
- E. The gods are sovereign, and the creator or “high god” ultimately maintains and judges the world.

# Distinctive Features of Hebrew Cosmogony

A. Cosmogony and anthropogony (stories of the origin of the universe and the origin of people) in Israel are strictly divorced from any theogony (a story of the origin of the gods).

B. In the creation of the world there is no struggle between the creator and any other gods.

C. In Genesis 1, God majestically calls the entire universe into existence verbally. Two chapters later, God associates intimately with Adam, Eve, and other creatures. Each sort of divine behavior separately has parallels in the Ancient Near East. But only in the Hebrew Bible are they juxtaposed, suggesting that both grandeur and intimacy belong to creation and can be willed by the same divinity.

D. Humans are created good – not of evil or rebellious substance (as in the *Enuma elish*), nor with a tragic flaw (as in Greece) – and they are given dominion. But humans have free will, and they exploit their freedom to ill ends.

# Ethical Implications

*The order symbolically depicted in the creation myth points to the nature of the good, the cosmic context of moral behavior, and the consequences of immoral behavior.*

A. Integrity of the created world: “God saw that it was good” (except for the 2<sup>nd</sup> day). The cosmos is founded not on caprice or evil, but on righteousness, justice, covenantal love, and constancy -- an orderliness attributed by some to the role of wisdom in creation. Consequently, whenever there is an apparent dysfunction, the people complain directly to God for immediate deliverance and restitution.

B. Adam and Eve, by disobeying God and eating the forbidden fruit of the knowledge of good and evil, are responsible for the occurrence of evil in the world. Evil has no independent existence, it is simply deleterious acts by humans directed against other humans and against God. (It is not until their contact with Zoroastrianism during the Babylonian captivity that the Hebrews encountered an Evil One who opposes both humanity and God. But there is an aspect of inevitability about the eating of the forbidden fruit.)

## Ethical Implications continued

C. The just, benevolent deed brings reward and harmony; the evil, destructive, foolish act yields punishment or deprivation. But if this is not always so, and if there is no afterlife where earthly accounts will be settled, then why should one be moral? Job complains to God that cosmic justice has failed him. God replies: “Where wast thou when I laid the foundations of the earth?” A human has no chance to understand God’s system. The Jewish sages defend divine justice through creation theology: they have resolute faith that God established a just order.

D. God created the world according to *sedaqa* (righteousness, moral and cosmic orderliness, harmony, peace). An act of sin requires a decisive act of *mispat* (justice) to restore *sedaqa* -- not an impartial judging concerned simply with punishing the guilty, but an act to restore both the victim and the guilty party to full participation in the community.

E. Whatever humans do, whether for good or evil, will necessarily have repercussions in nature as well as among people (e.g., the flood). Dominion over nature carries with it responsibility. The world must be respected, and its viability must be preserved and enhanced.

# Implications for Cosmology

Cosmological imagery is based on people's experience of the natural world. Mesopotamia's story of watery Chaos in the beginning went off in a different direction from Egypt's. By seeing the creation of heaven and earth begin with silt from the Tigris and Euphrates, the Mesopotamians gave their own land the status of the center of the cosmos. The Hebrews, on the other hand, had no native tradition associated with a specific land going back to 3000 or 4000 BCE but were originally a nomadic people. They were struggling, while surrounded by competing polytheistic cosmologies, to understand creation by a single, all-powerful yet abstract God. For them the focus was not on the physical world but on the nature and role of God in the story. They didn't think of themselves as borrowing anything; they simply made assumptions about the physical facts they did not care about so deeply in order to focus on what they did care about, and thus they gave to the question of God tremendous original thought.

By borrowing other cultures' ideas and imagery to help carry their own message while staying focused on the moral issues that mattered to them, the Hebrews developed a cosmology of human meaning and purpose some of whose aspects are still going strong in the present day. However, their flat earth picture was within a few centuries (very short on the ancient scale) stripped from its moral interpretation and replaced among Jews and Christians alike by the Greek picture, which answered questions about the celestial patterns that the ancient Hebrews had never even asked.

People need sooner or later to ground their cosmology in the natural world, and they will never stop asking questions about it; therefore, the best knowledge of the time will eventually get incorporated into the cosmology.

# The Greek Invention of the Geocentric Picture

## 575 BCE Thales of Miletus

Conceived the founding idea of science: to explain the seemingly infinite complexity of the world by means of a small number of hypotheses. Proposed the first theory of matter: that there is a substance from which everything was made, and the substance is conserved. It cannot have been created and cannot be destroyed. The principle of conservation was a limit on what even gods could do.

Thales and his students made science possible *within* a universe of willful gods, not by denying the supernatural but by inventing that very concept, because in doing so they also invented its opposite, the natural. Natural phenomena, they could then claim, are those which are not the products of willful divine influences but are regular and governed by cause and effect.

## 550 BCE Pythagoras

*Proposed the first new picture of the universe since the flat earth.* Earth, sun, moon and planets all turned around a central fire. Made major discoveries in mathematics. Used “cosmos” to mean the organization of the entire universe.

## 525 BCE Heraclitus

*Proposed the first explanation of the universe that required no beginning. Cosmos for Heraclitus meant not simply an explanation of where the current order came from but an explanation of the world itself in a dynamic order*

Focused an active principle – fire – that can burst out and which, when not bursting out, is a kind of hidden soul of all matter. The ever-changing world could be explained by eternal transformations and re-mixings of the elements earth, water, and fire.

## 400 BCE Plato

*Timaeus* tells this creation story: *In the beginning there are only the eternal Ideas – and a Demiurge or supreme artist thinking them. The Demiurge clarifies the Ideas in his divine mind and, working like a great Craftsman, transforms the pre-existent chaos into order by moving matter in accordance with the Ideas. The Demiurge is intelligent, generous, loves beauty, and – unlike the Greek gods – is without envy or pettiness, but all this is secondary. The key is that the Ideas were there before him, and he follows them. The cosmos thus created is spherical and rotates around the spherical earth, which sits like a stately queen at the center. The supreme artist creates a soul for the universe out of knowledge and music, and the soul moves the celestial bodies according to their patterns and regulates time.*

It was Plato in the *Timaeus* who “introduced, for the first time in Greek philosophy, the alternative scheme of creation by a divine artificer, according to which the world is like a work of art designed with a purpose.” (See F. Cornford, *Plato’s Cosmology*.) He was a great philosopher, but because of fuzzy distinction between science and philosophy in his time, Plato also set the agenda for astronomy. His astronomical assumptions were based on reason, not on observation. Led to problems because science is founded on the willingness to let go of wrong ideas, no matter how reasonable and beautiful they seem, if the data don’t support them. Plato put a question to his students at the Academy that became the fundamental question of astronomy for the next 2000 years: “*By the assumption of what uniform and orderly motions can the apparent motions of the planets be accounted for?*” This was not a hypothesis but the equivalent of a religious conviction.

**Eudoxus**, Plato’s student, created the original geocentric picture of multiple spheres.

## **4th - 3d centuries BCE**

The order of the universe was a source of lively philosophical discussion and there were competing schools of thought. In Egypt there were multiple versions of creation, and special myths associated with each city's high god. The teller of a myth would never be criticized for inconsistency with some other myth. But among the Greek thinkers, it was understood that different cosmological theories were in competition with each other. *Not all of them could be true.* Without any way of testing their theories, however, they had no real way of choosing among them.

Athenian democracy excluded women and slaves and put Socrates to death, yet the search for truth was considered by a substantial portion of the most brilliant and wealthy people at the time to be life's highest goal.

## **384-322 BCE Aristotle**

Took Eudoxus' geometric solution one step further by concocting a explanation for it:

Primum Mobile, Love as cause of turning

Key ideas of Aristotle that were later ignored:

1. He said he was relying on the work of astronomers and was not one himself, and therefore he remained open to new information. But followers took his suggestions as absolute truth.
2. The spheres were formed of a very subtle, ethereal substance, moving with no friction. But followers changed his spheres into solid crystal.

**Alexander the Great** 342-335 BCE (from age of 13 to 20) tutored by Aristotle.

Became ruler of Greece, conquered the Persian Empire, then Egypt. The meeting of a young man of Alexander's education and self-confidence with the culture of ancient Egypt was electric. The city-state he founded there, Alexandria, became the center of culture of the known world and the site of the greatest library, museum, and research center of antiquity. It became the prototype for medieval monasteries and universities.

Leading scientists who worked at the Library of Alexandria included **Aristarchus** (310-230 BCE), who applied Alexandrian trigonometry to estimate the distances and sizes of the sun and moon, and also postulated that the planets, including earth, revolve about the sun. **Eratosthenes** (275-194 BCE), the third librarian, studied prime numbers and many other subjects. He figured out the circumference of the earth, and proposed adding a day every fourth year ("leap" years). **Hipparchus** (190-120 BCE) is credited with inventing longitude and latitude, importing the 360-degree circular system from Babylonia, calculating the length of a year within six minutes accuracy, and amassing the first great sky-chart of constellations and stars. He discovered and measured the procession of the equinoxes, the size and trajectory of the sun, and the moon's path. 300 years later **Claudius Ptolemy** (80-150 AD) worked out his system of epicycles to support the geocentric model of the universe. Ptolemy wrote treatises on astronomy and astrology which became the classic works on their subjects for more than a millennium.

# The New Library of Alexandria, Egypt



*Photograph courtesy of Bibliotheca Alexandrina*

A microchip, a rising sun, a flying saucer, the new Library of Alexandria —Bibliotheca Alexandrina—gleams on the edge of the Mediterranean, on the Eastern Harbor near the site where archaeologists believe the ancient library once stood. Hieroglyphs and characters of 120 different languages line the curving exterior rear wall of the Bibliotheca Alexandrina. The slanted glass roof allows natural light into all seven interior floors of the library.

A large population of Jews lived in Alexandria, and many of them, educated in Greek schools, didn't speak Hebrew. A ruler of Egypt, Ptolemy Philadelphus II (ruled 285–247 BCE), arranged with the chief priest, Eleazar, in Jerusalem, for 76 experts to translate the Torah into Greek (the *Pentateuch*) for the Library of Alexandria. The rest of the Hebrew scriptures were translated into Greek later (the *Septuagint*). Philo, a leading figure in the Jewish community of Alexandria, was a philosopher who synthesized Greek and Jewish thought through his allegorical interpretation of the Pentateuch. Thus in Alexandria, Egypt, in the early part of the first millennium CE, Greeks, Jews, Christians, and others all interacted, and a picture of reality began to take shape combining the Hebrew story of creation, the Greek physical picture of the cosmos, and still-developing Christian concepts of God. (See Pelikan, “Athens and/or Jerusalem,” in *Cosmic Questions*.)

*What resulted was a functional cosmology synthesized from the meeting of vastly disparate cultures, which became the basis of the Medieval cosmology shared by Jews, Christians, and Muslims for 1500 years.*

### Timeline: End of the Ancient Mediterranean World

c.4BCE - 30AD	<b>Jesus</b>
35	Paul's conversion; Philo of Alexandria (20BCE-50AD)
60-100	Gospels of Mark, Luke, Matthew, John
140	Ptolemy summarizes astronomy & astrology; Galen, medicine
313	Constantine: Christianity official religion of Roman Empire
400	Hypatia killed, Alexandrian library burned; St. Augustine →
410	Visigoths sack Rome

