

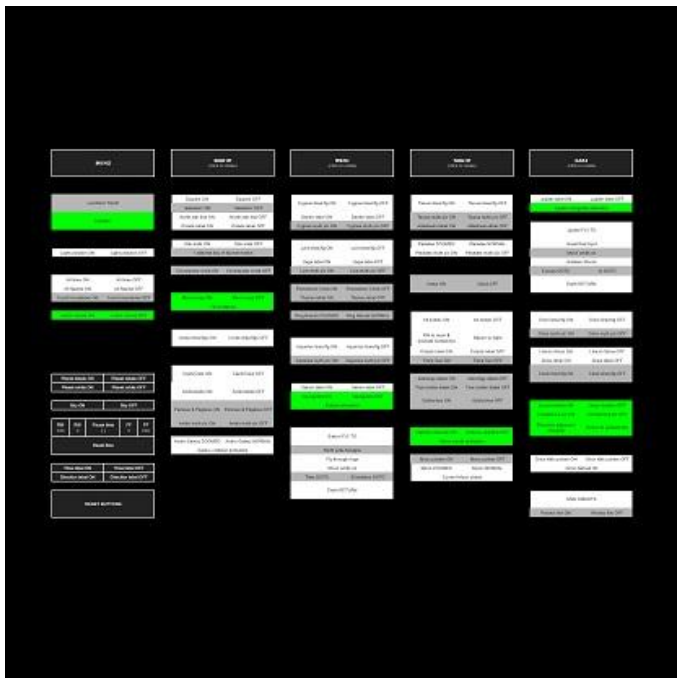
Holiday 2025

Last updated: 12/7/25 by P. Hess

INTRO

Launch tour

INTRO

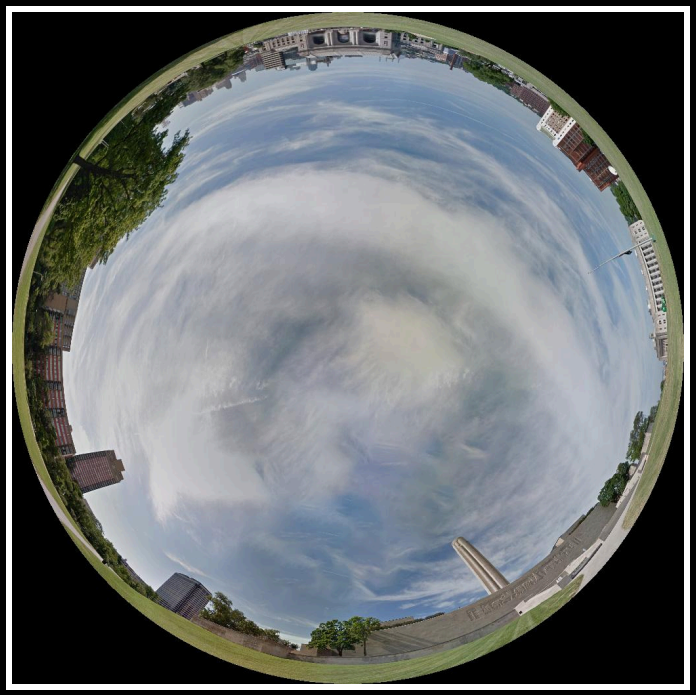


Summary: Set up SkyExplorer software to the current daytime sky view for audience seating.

Script: “Hello everyone, and welcome to the Arvin Gottlieb Planetarium! My name is *[YOUR NAME]* and I will be presenting your star tour today! For your safety, please stay in your seats for the duration of the show. If you need to leave at any point, be very careful on your way out, and remember that there is no re-entry during the presentation. Please keep your feet off the chair backs in front of you, and please turn off your mobile phones and any other illuminated electronics, as the smallest amount of light may affect others’ enjoyment of the show. Now sit back, relax, and enjoy the stargazing!”

Sunset

INTRO

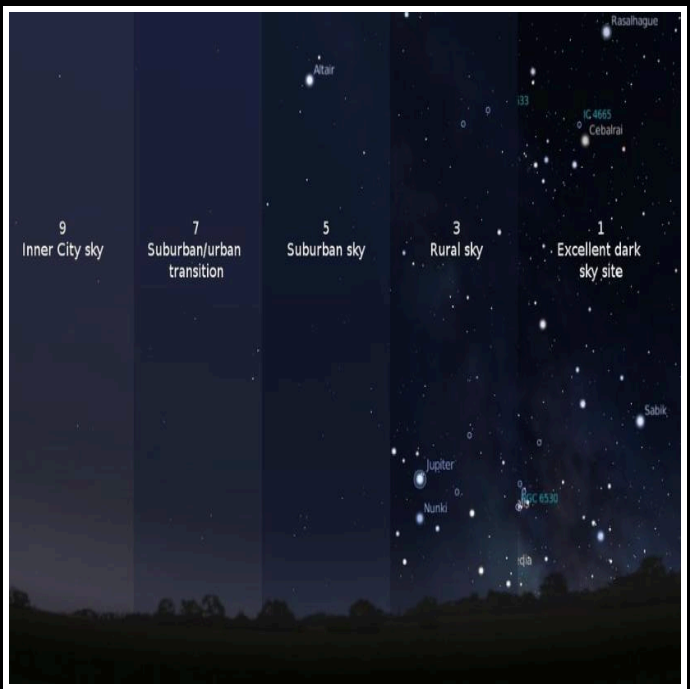


Summary: Stars of Faith special edition

Script: “Welcome to a very special edition of our seasonal star tour! During this 40-minute presentation we will be taking a look at stars, planets, constellations, and deep-space objects visible in the evening sky tonight. And as a special treat this holiday season, we will also be discussing the many ways in which different faiths are connected to astronomy and space. Before we begin our tour, we must speed up time and send our daytime star, the Sun, below the horizon to reveal the evening stars. As the Sun sets, our Kansas City night sky is revealed!”

Light pollution

INTRO



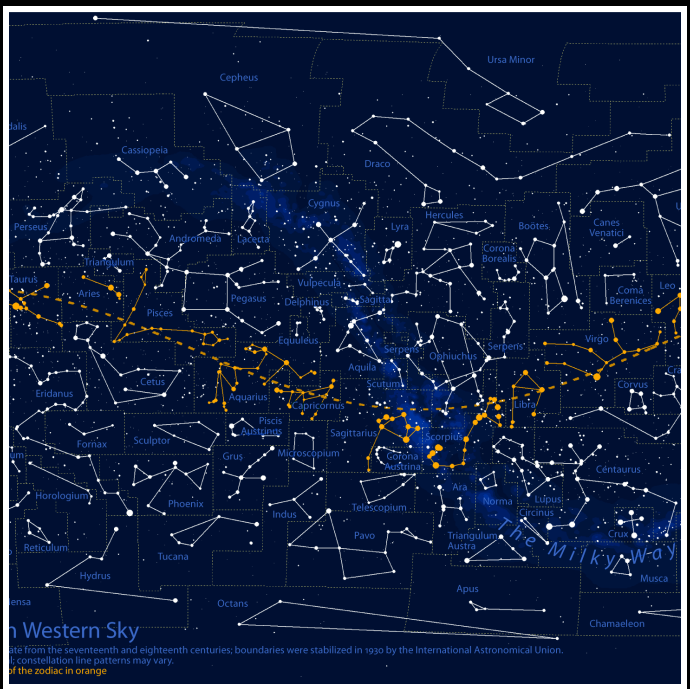
Summary: Rural vs urban night sky.

Script: "Near a city like Kansas City, our views of the night sky are limited by multiple factors. Light pollution from man-made sources like buildings, street lights, and cars causes the sky to glow, blocking light from fainter stars. Being around so many bright sources of light also leaves our eyes little time to adjust to darkness. This results in a night sky with very few stars visible, if any at all. Fortunately, the planetarium can take us far away from the city lights. Just an hour away from downtown KC, thousands of more stars, and even the faint outline of the Milky Way, can easily be seen.

"In ancient times, this view of the heavens could be seen by everyone on Earth, so it is no wonder that so many different cultures and religions felt a sense of awe and connection to the night sky."

All constellation lines

INTRO



Summary: Briefly discuss the significance of constellations & astronomy through history.

Notes:

- International Astronomical Union, 1930

Script: "Constellations are not only representations of stories from mythology; they have also been used by humans for thousands of years as important tools, helping to guide travelers on land and sea, as well as assisting farmers with predicting the beginning of the harvest season. Today, we recognize 88 official constellations, which were formally defined by the International Astronomical Union in 1930. What do these shapes look like to you?"

All constellation figures

INTRO



Summary: Describe our modern constellations.

Notes:

- 42 animals, 29 inanimate objects, 17 human or mythological characters
- Northern hemisphere = mostly Greek
- Southern hemisphere = navigation

Script: "42 of these patterns are animals, 29 are inanimate objects, and the remaining 17 are characters from different mythological traditions, mostly from the ancient Greek pantheon. Many constellations in the southern hemisphere were adapted from imagery described by Western explorers in the 16th through 19th centuries.

"Humans have been connecting the dots in the sky and telling stories about them for thousands of years, but it wasn't until more recently that we began measuring and cataloging the stars and planets."

Arabic influences

INTRO

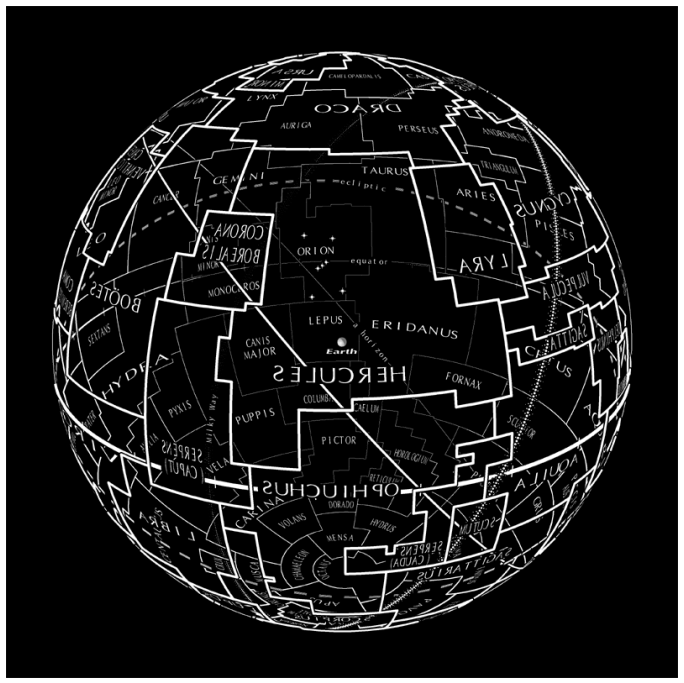


Summary: Islamic astronomy influences

Script: "After the Dark Ages, when almost all scientific knowledge was lost in Europe, the Islamic Golden Age brought the first revival of science and technology to the Middle Ages. From the 9th to 13th century, Islamic astronomers produced some of the most detailed and accurate catalogs and maps of the stars and heavens. Today, the lasting influence of Islamic astronomy can be seen in the names of stars themselves, the majority of which are derived from the Arabic language. In addition to creating some of the first detailed star maps, Islamic astronomers also created complex calculations for predicting the positions of the Sun, Moon, and planets, as well for as precisely calculating the *qibla* (**KI**-bluh), the direction towards the sacred city of Mecca in Saudi Arabia."

Constellation boundaries

INTRO



Summary: Relate the constellation boundaries to the zodiac.

Notes:

- constellation: an internationally recognized shape or pattern defined by a grouping/region of stars

Script: “To astronomers and scientists, constellations are technically defined as ‘regions’ of our night sky, which we can plot out around the traditional star patterns. As you can see, constellations vary quite widely in shape and area. This doesn’t affect the average stargazer, but it is helpful for identifying the locations of deep space objects, and is also sometimes relevant when discussing traditional astrology.”

NORTH

Rotate North

NORTH



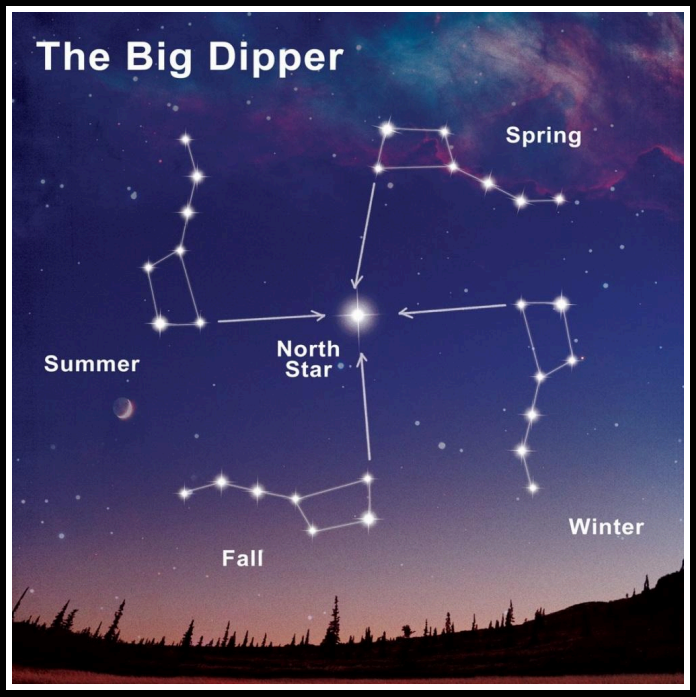
Summary: Motion sickness disclaimer

Script: "Speaking of directions, we will now rotate our view to face North to discuss the *qibla* and begin our star tour. As we rotate, please remember that if you experience any motion sickness or dizziness, simply close your eyes or look down towards your feet, & you should feel better.

"The *qibla* is an important part of Islamic daily prayers known as *salah*. To orient ourselves towards a specific direction such as Mecca using the night sky, we must first locate the North Star."

Dippers and Polaris line

NORTH



Summary: Locate Polaris using the dippers

Script: "Some of the most recognizable patterns in the northern sky are the Big and Little Dippers! Here we can see the seven stars of the Big Dipper shining brightly near the North-East horizon in the early evening this season. Following the two stars at the end of the big spoon, we find Polaris, or the North Star, which is the end of the handle of the Little Dipper."

Star trails/diurnal motion

NORTH



Summary: Tracing stars' movements reveals the motion of the night sky.

Notes:

- notice how Polaris isn't exactly north

Script: "Polaris is known as the North Star because it is unique in that, throughout the night, it will remain stationary as the other stars appear to move around it. Of course, the stars themselves are not moving; the Earth is simply rotating, and from our viewpoint on the Earth, we see the heavens rotating above us. Because the Earth rotates around the North Pole, the star directly above the North Pole remains stationary. This star is Polaris!"

Locating Mecca

NORTH



Summary: Straight lines and Great Circles

Script: "Once you know which way is North, finding the *qibla*, or the sacred direction towards Mecca, is not as simple as just facing East. Because the Earth is curved, the shortest distance between two points may not be as intuitive as you might think. For example, looking at a map it would appear that Mecca is to the South-East. However, due to the curvature of the Earth, a Muslim person here in Kansas City would actually direct their prayers towards the North-East to face the shortest distance towards Mecca. This is also why airplane or boat routes drawn on flat maps appear curved! These paths are segments of what astronomers call Great Circles."

Ursa Major & Minor

NORTH

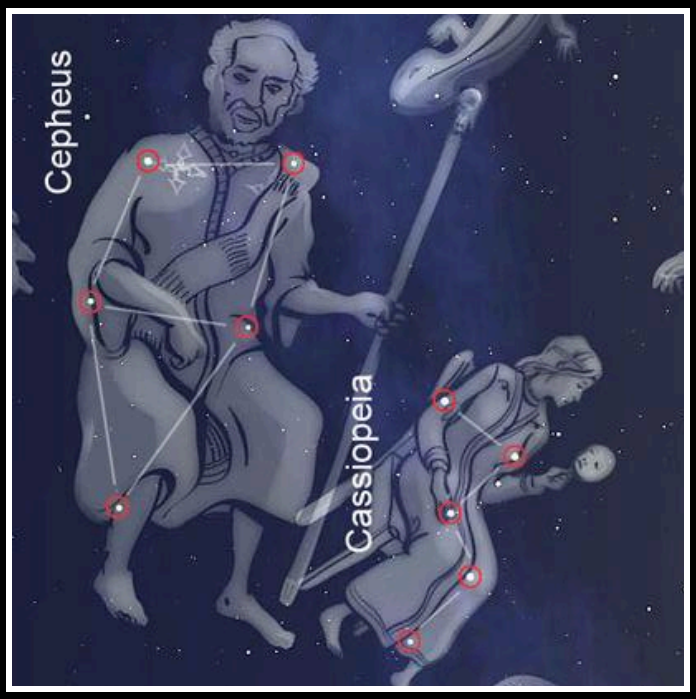


Summary: Briefly discuss the mythology of Ursa Major.

Script: “The Big and Little Dippers are unofficial star patterns that belong to the official constellations Ursa Major and Ursa Minor, or the Big and Little Bears. In Roman mythology, Jupiter, the king of the gods, fell in love with a young mortal named Callisto. Jupiter’s goddess wife Juno became jealous and turned beautiful Callisto into a bear so she no longer attracted Jupiter. Callisto’s son Arcas found his mother and almost accidentally shot her with his bow, but at the last second Jupiter turned him into a bear as well and threw them both up into the sky so he and his mother could be safe together forever. It is said that Jupiter threw them with such force that their tails stretched out, which is why the bears have long tails.”

Cepheus & Cassiopeia

NORTH



Summary: King and queen of ancient Africa.

Notes:

- Cepheus: upper left, house shape
- Cassiopeia: lower right, ‘W’ or ‘3’ shape

Script: “Here we can see one of the most famous stories from Greek mythology played out during late fall through early spring. The story begins with Cepheus and Cassiopeia. In mythology, this pair was said to be the king and queen of an ancient African nation. Cassiopeia, famous for her vanity, once claimed that she was more beautiful than the daughters of Poseidon, god of the sea. As punishment, Poseidon cursed Cepheus and Cassiopeia’s kingdom with terrible floods, destroying many of their crops and sending their kingdom into a great famine.”

Andromeda

NORTH

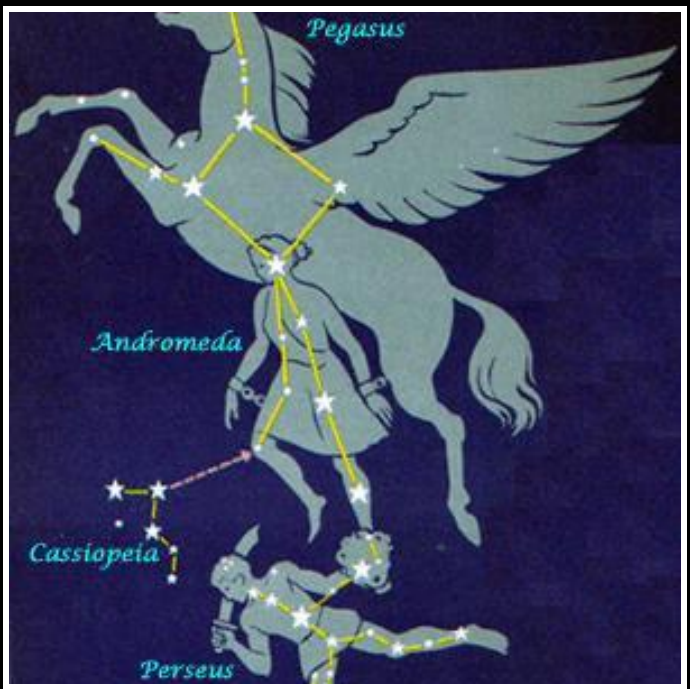


Summary: Sacrificed daughter, saved by Perseus

Script: “In a desperate attempt to appease Poseidon and ease his wrath, Cepheus & Cassiopeia decided to sacrifice their own daughter Andromeda to the sea-god! We can see Andromeda in our night sky near her loving parents. She is often depicted as being chained to some rocks by the ocean to be eaten by Cetus, a terrible sea monster and one of Poseidon’s other children.”

Perseus & Pegasus

NORTH



Summary: Legendary hero and his winged horse who saved Andromeda.

Notes:

- Perseus was flying home after defeating Medusa

Script: “Luckily for Andromeda, however, the Greek hero Perseus happened to be flying by on his winged horse Pegasus. He swooped in and, using the severed head of the recently defeated Medusa, he slayed the sea monster and saved Andromeda’s life just in time. And as all classic stories about heroes and monsters go, Perseus and Andromeda eventually fell in love, got married, and lived happily ever after.”

Andromeda Galaxy

NORTH



Summary: Enlarges the Andromeda Galaxy.

Notes:

- 2.5 million light-years away
- twice as big as Milky Way (1 trillion stars)
- would be 6X as wide as moon if brighter

Script: “Andromeda is also often associated with another legend of our night sky. Near her knee, a very faint glow can be seen. Using the power of the planetarium, we can enlarge this object to see that this is none other than the Andromeda Galaxy, the largest galaxy in our local galactic neighbor-hood! Andromeda is the closest spiral galaxy to our own Milky-Way Galaxy and it contains over one-trillion stars, making it twice as large as the Milky-Way. If it were brighter, it would appear over six times as wide as our moon in the night sky.

Galaxy collision animation

NORTH



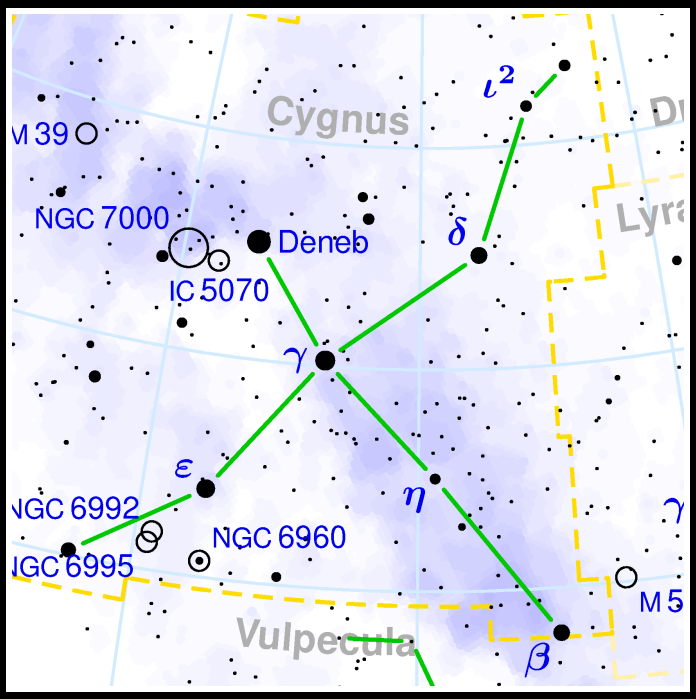
Summary: Andromeda’s possible collision with the Milky Way galaxy.

Script: “Most galaxies are accelerating away from each-other due to a phenomenon known as cosmic expansion. Andromeda, on the other hand, is heading in the opposite direction and may actually be set on a collision course with the Milky-Way Galaxy! Though Andromeda is speeding towards us at an ultra-fast 68 miles-per-second, this collision would not happen for another 4 billions years, so it is unlikely humans would be around to witness this event. Also, recent evidence collected by the Hubble telescope just this year suggests the chances of this collision are actually closer to 50-50, so perhaps it won’t happen at all!”

WEST

Cygnus & Deneb

WEST



Summary: Swan constellation flying parallel to Milky Way, with tail star Deneb.

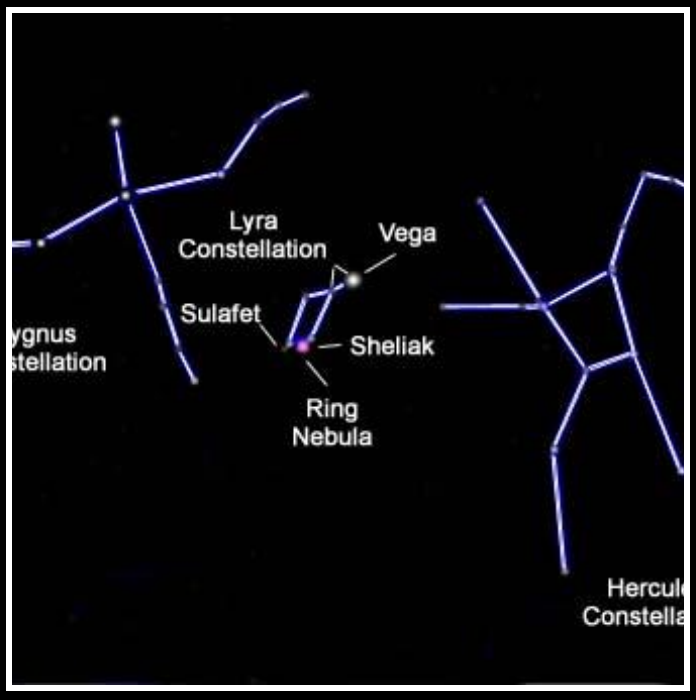
Notes:

- Northern Cross asterism
- Deneb = 'tail' in Arabic
- mythology: Zeus disguised himself as a swan to seduce King of Sparta's wife, fathered Gemini twins and Helen of Troy

Script: "Setting in the west in our Winter skies is Cygnus, the swan. The lines of the constellation resemble a cross shape, which is why Cygnus is sometimes called the 'Northern Cross.' Cygnus represents one of Zeus's many disguises that he would take when he came to Earth to interact with humanity. Its brightest star is Deneb, whose name means 'tail' in Arabic, as it represents the swan's tail."

Lyra & Vega

WEST



Summary: Lyra the harp, containing Vega

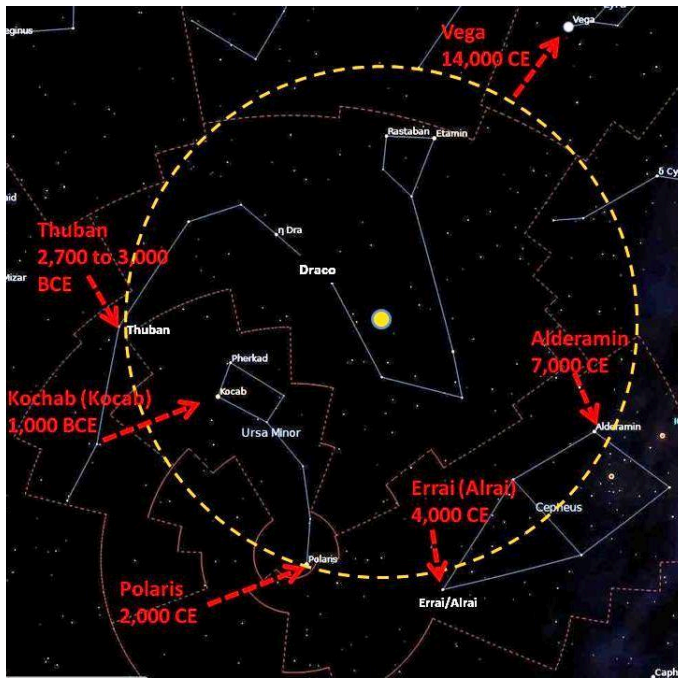
Notes:

- Vega: 5th brightest star, will become north star in 12,000 years due to precession of Earth

Script: "One of the smallest constellations is Lyra, the harp, though it does contain the 5th brightest star in the night sky: Vega. Legend has it that after the great poet and prophet Orpheus died, Zeus ordered that his harp be placed in the heavens to be remembered forever.

Precession Circle

WEST



Summary: The changing of the North Star

Notes:

- Exactly 25,772 years for a full cycle

Script: "You may not believe it at first, but Vega will eventually become the North Star! Just like how a toy top slowly wobbles on a table after it is spun, the Earth's north pole slowly changes its orientation over the course of tens of thousands of years. So, Polaris is not always the North Star, and in about 12 thousand years, Vega will be the closest bright star to geographic north, becoming the new navigation star! This also means that Polaris has not been the North Star throughout human history; around 4 to 6 thousand years ago, the star Thuban in Draco was the North Star. The construction of some of the pyramids actually align with Thuban's position during this time period!"

M57 - Ring Nebula (Webb)

WEST



Summary: New imagery from Webb telescope (Aug 2023) of planetary nebula in Lyra.

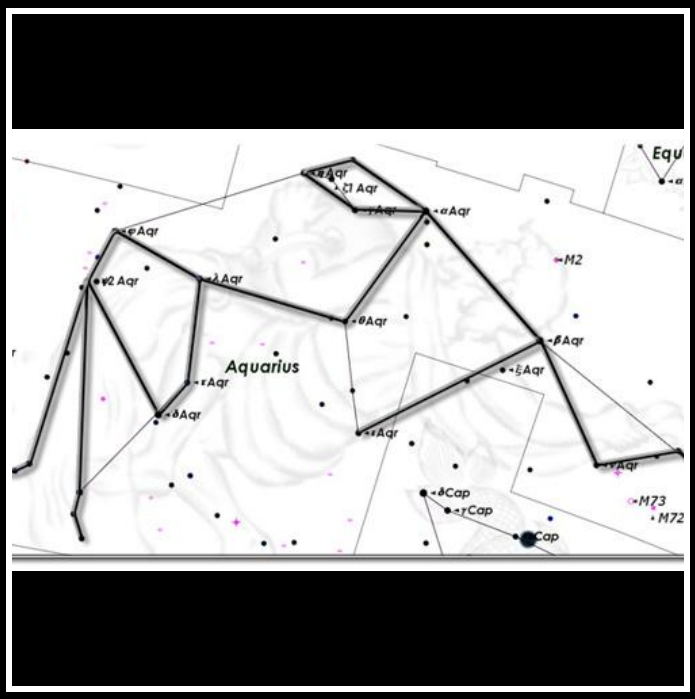
Notes:

- ring is one light-year in diameter
- 6,000 to 8,000 years 'old' (dead star)

Script: "Hidden between two stars in the Lyra's harp is a beautiful deep-space object and a memorial to one of our universe's most breathtaking events: the death of a star. This object is the Ring Nebula. Over a light-year across, this planetary nebula reveals the colorful layers of gasses once contained inside this distant sun, as well as the tiny inert White Dwarf that is all that remains of the star's once volatile core. Recently, the James Webb space telescope, captured this amazing new view of the Ring Nebula, peering even deeper into the stellar remnant than ever before."

Aquarius

WEST



Summary: Ganymede's constellation form.

Script: "Towards the Southwest this season we find Aquarius. Aquarius is Latin for "cup-bearer" or "water-carrier," and we can see the constellation outlining a figure pouring water out of a vessel. Babylonians & Egyptians saw him as a harbinger of monsoon season and the annual flooding of the Nile River. To the Greeks, he was known as Ganymede, a young prince who was kidnapped by their king of the gods, Zeus, to serve as cup-bearer to the gods. Ganymede became well known for his kindness towards mortals, and was eventually glorified as the god of rain Aquarius when he ended a long drought by pouring his cup down to Earth."

Saturn - ID

WEST



Summary: How to tell planets and stars apart.

Notes:

- Venus can also be seen setting earlier in the evening prior to the tour start time

Script: "Near the constellation Aquarius, you may have noticed a bright point of light that appears out of place amongst the surrounding starlight. Unlike those nearby stars, you may notice this point of light does not twinkle! This object is much closer than distant stars, so its light is able to pass through the Earth's atmosphere without being distorted, or twinkling. This is the planet Saturn! Planets, of course, often pop up in pantheons of mythology and religion, so let's take a look at a very prominent example next!"

Navagraha

WEST



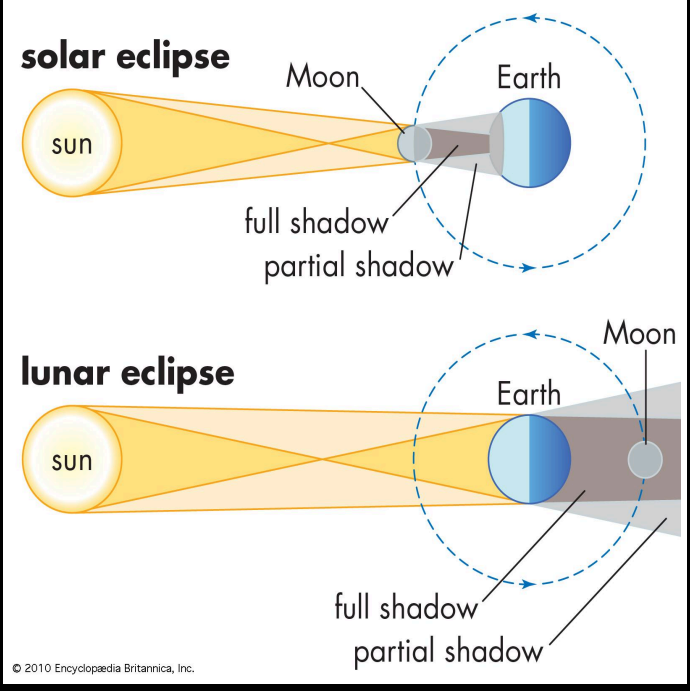
Summary: Nine heavenly bodies in Hinduism.

Script: "Some of you may believe there are still 9 planets (poor Pluto), but in Hinduism, there are still 9 heavenly bodies, though they are a bit different than what you might expect. Known as the Navagraha, it includes the 5 visible planets, Mercury, Venus, Mars, Jupiter, and Saturn, as well as the Sun, the Moon, and two more bodies called Rahu and Ketu, which we'll get to in a minute. Each body is believed to have great influence over the life and luck of a person, and these bodies are worshiped together or individually in temples.

Rahu and Ketu were called 'shadow planets,' and unlike the other 7 deity planets, they are said to be demons who managed to trick their way into the Navagraha. They represent solar and lunar eclipses, respectively."

Eclipses

WEST

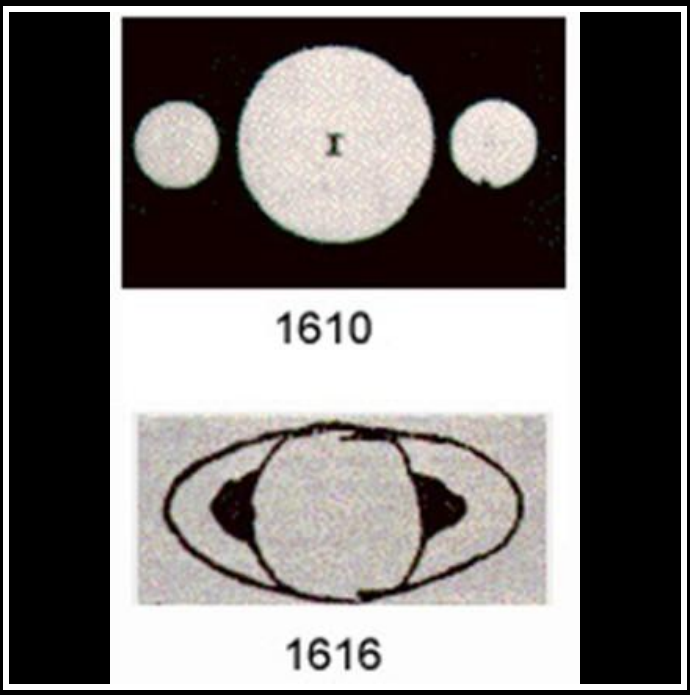


Summary: Rahu and Ketu personifications.

Script: "Rahu and Ketu are said to be 'shadow planets.' In Hinduism, they are portrayed as opposite spirits, Rahu representing mischief, fear, and obsession, and Ketu representing mindlessness, loss, and detachment. Their supposed orbit corresponds to what are known in Astronomy as Lunar Nodes. These are the points in which the Earth, Moon, and Sun align to cause either lunar or solar eclipses. Because the Earth-Moon and Sun-Earth planes are offset, these alignments only take place a few times per year, though they follow predictable patterns on an 18-year cycle."

Saturn - fly to

WEST



Summary: King of the planets.

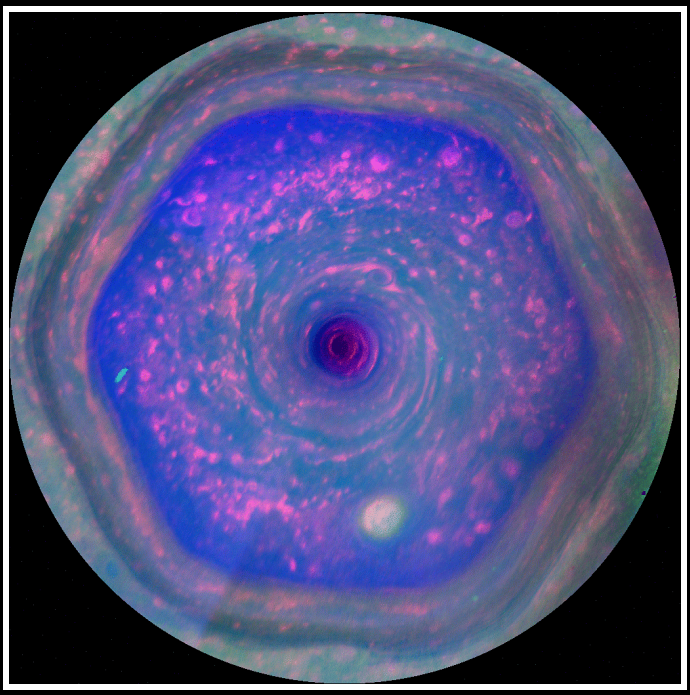
Notes:

- currently 800 million miles away
- Closest approach was September 21st

Script: "Let us now journey to Shani, or as you probably know her: Saturn! Saturn is the second-largest planet in our Solar System. It is a gas giant planet, similar to its big brother Jupiter, although it is not quite a stormy as Jupiter (no Great-Red-Spots on this one). This is because it has a very low density. In fact, it has a density that is lower than water, meaning that if all of the planets in our Solar System took a bath, Saturn is the only planet that would float!"

Saturn - polar hexagon

WEST



Summary: Mysterious storm on Saturn's north pole.

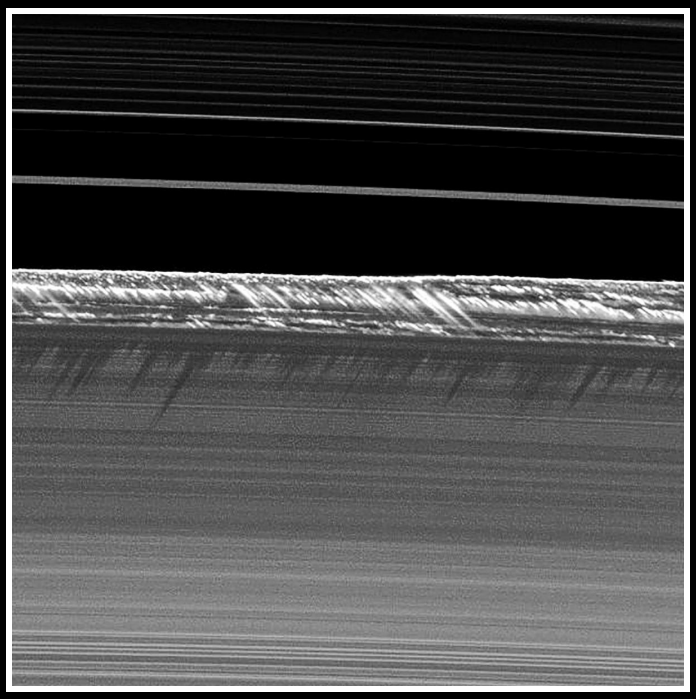
Notes:

- Eye = 50x larger than Earth hurricane

Script: "One of our Solar System's more unknown features is Saturn's mysterious polar hexagon. This six-sided hurricane can be found rotating on the north pole of Saturn and changing colors as the planet's seasons shift. Scientists are still unsure exactly how the atmospheric winds and turbulent vortices interact to cause this unique cloud pattern."

Saturn - rings

WEST



Summary: Icy particles from destroyed moon.

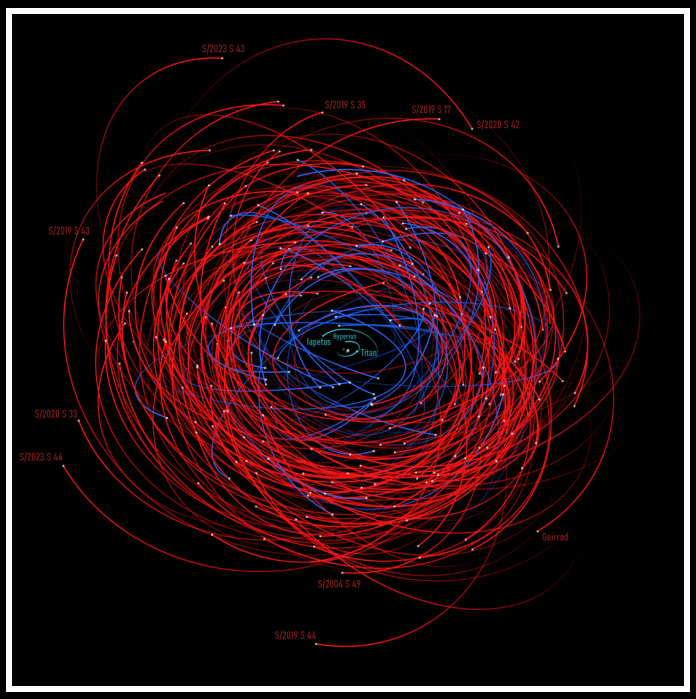
Notes:

- composition = 93% water ice
- average thickness = 30 feet
- age = a few hundred million years old
- origin = shattered moon

Script: “Saturn’s most notable feature is, of course, its highly visible system of rings. These rings are composed of mostly water ice, grouped in chunks ranging in size from baseballs to houses. Though they extend over 175,000 miles above the surface of Saturn, they are only an average of 30 feet thick. Scientists theorize that they were formed a few million years ago from a shattered moon.”

Saturn - moons

WEST



Summary: Most moons in the Solar System!.

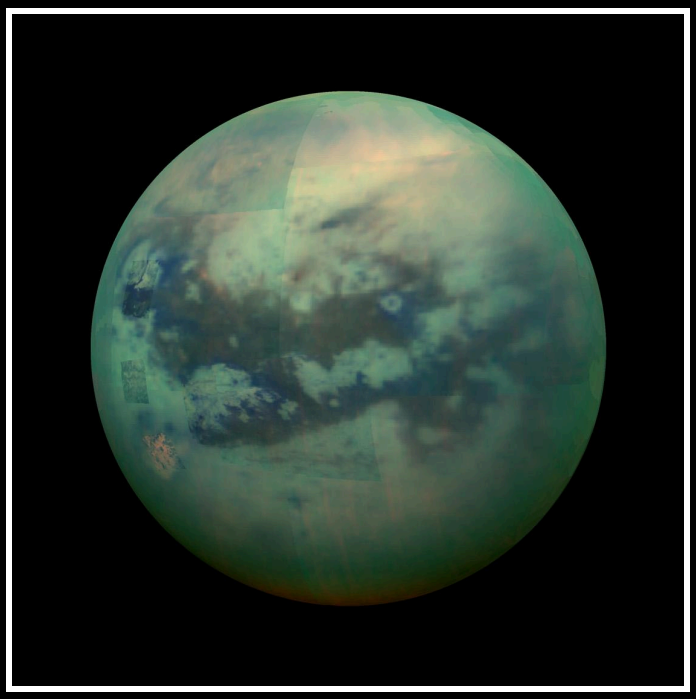
Notes:

- 128 new moons announced March 2025

Script: “Saturn currently holds the crown for most known natural satellites in our Solar System, with a whopping 274 known moons, 128 of which were announced earlier this year! While some of Saturn’s major moons orbit close to the planet, in line with its equator and ring system, most of its moons orbit farther out at a variety of angles. Unlike the inner moons, which were formed during the planet’s formation, these outer moons were likely captured asteroids or comets! Saturn, along with its brother Jupiter, have captured many rogue objects, protecting the Earth from potentially catastrophic impacts. Thanks Saturn!”

Saturn - goto Titan

WEST



Summary: An almost Earth-like moon.

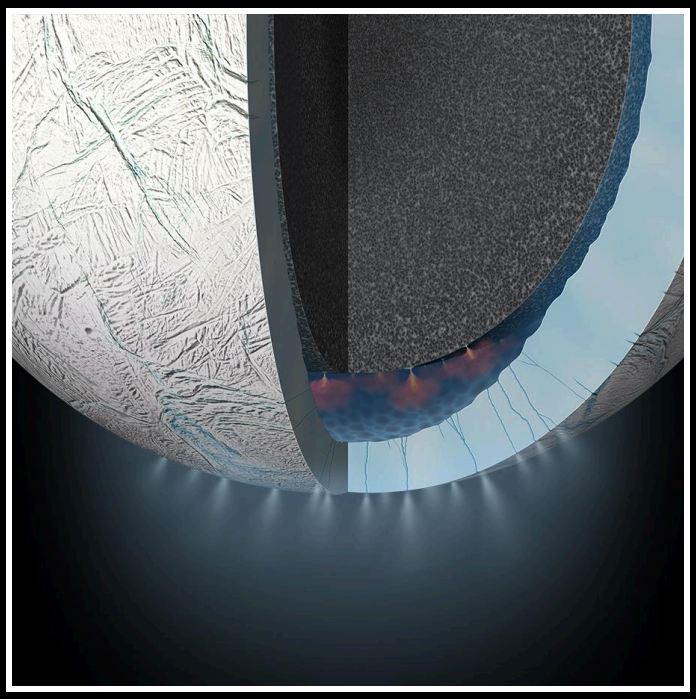
Notes:

- largest Saturnian moon, 2nd largest in SS
- only moon in Solar System with a dense atmosphere
- only other body in SS with surface liquid

Script: “Saturn’s most famous moon is Titan. The second largest moon in the Solar System, Titan is the only known natural satellite with a dense atmosphere, as well as significant amounts of liquid on its surface. Like Earth, it is composed mostly of water ice and rock, with an atmosphere of primarily nitrogen, as well as rivers and oceans covering its surface. Unlike Earth, however, this liquid is mostly super-cooled methane.”

Saturn - goto Enceladus

WEST



Summary: Icy moon of Saturn with water vapor geysers.

Notes:

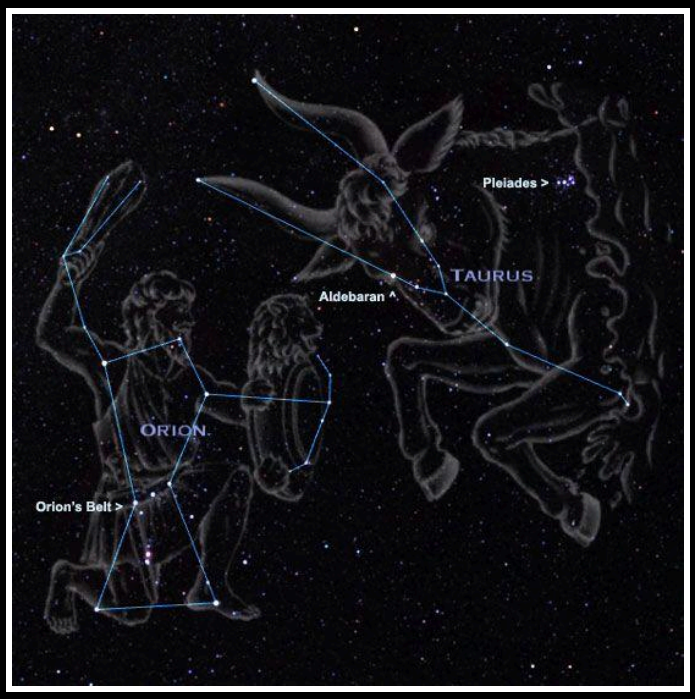
- sixth largest moon of Saturn
- icy moon like Europa, subsurface ocean

Script: “Enceladus is an interesting moon of Saturn. It is covered in a thick sheet of very fresh ice, making it one of the most reflective bodies in the Solar System. Scientists also recently discovered that it is geologically active, constantly deforming its terrain and heating its subsurface ocean. This heat is thought to lead to the giant geysers that were discovered a few years ago when the Cassini space probe flew close to the moon’s surface. Cassini detected both water vapor and molecular Hydrogen from these geysers, both key ingredients for life here on Earth.”

SOUTH

Taurus

SOUTH



Summary: Bull constellation, zodiac.

Notes:

- Aldebaran: “The Follower”
- Epic of Gilgamesh, Zeus and Europa

Script: “The bright “V” pattern appearing near Orion belongs to Taurus the Bull. Stories about this bull date back thousands of years. In Mesopotamian tradition, the great hero Gilgamesh saved his city from a giant bull that was sent by the love goddess Ishtar as punishment for refusing her advances. The Greeks saw this bull as either representing Io, one of Zeus’s mistresses, whom he transformed into a bull to hide his adultery from his wife Hera, or as representing Zeus himself in disguise, a form he used to kidnap Europa, a legendary princess.”

Pleiades star cluster

SOUTH



Summary: “Seven Sisters” open star cluster.

Notes:

- brown dwarfs: hot glowing jupiters

Script: “Rising in the East in the Fall we find the beautiful Pleiades Cluster. This deep space object is identified by seven bright stars, nicknamed the ‘seven sisters.’ The stars you can see with the naked eye actually belong to an open star cluster of over 1000 stars & brown dwarfs. These stars are also siblings, and were born relatively recently together from the same nebula, the leftovers of which we can see reflecting their young, blue light. Star clusters like the Pleiades are useful tools for astronomers, as they help us to understand the evolution and lifespans of stars.”

Pleiades Lakota myth

SOUTH



Summary: The story of the Devil's Tower.

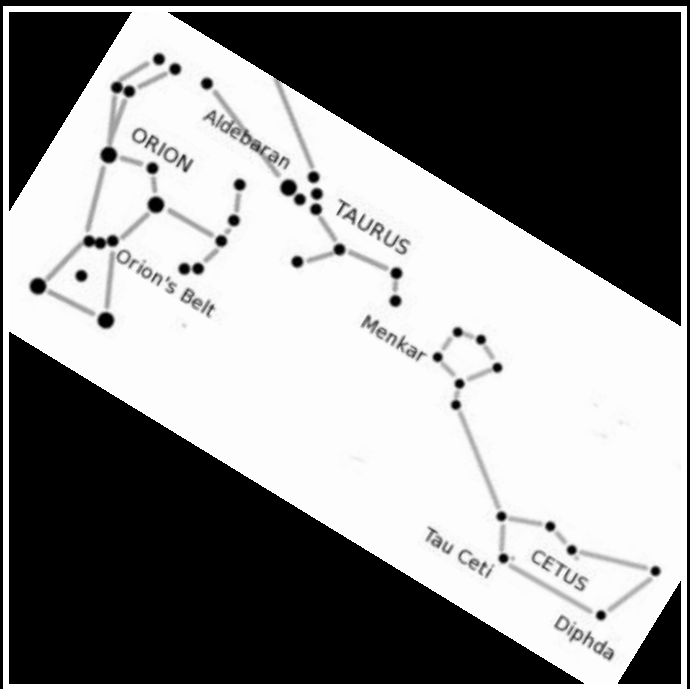
Notes:

- Greek: daughters of Atlas

Script: "The Pleiades are present in dozens of myths from around the world, including Native American folklore. According to the Lakota tribe, a group of girls went out to play, but were spotted by several giant bears, who began to chase them. The girls climbed a big rock to escape and prayed to be saved. Hearing their prayers, the Great Spirit lifted the rock towards the heavens, and though the bears tried to climb it, it was too steep and they slid back down, leaving behind huge scratches from their claws. The rock is seen today as the Devils Tower in Wyoming's Black Hills. When the girls reached the sky, they were turned into the stars of the Pleiades."

Cetus

SOUTH



Summary: Fishlike monster that was meant to eat Andromeda.

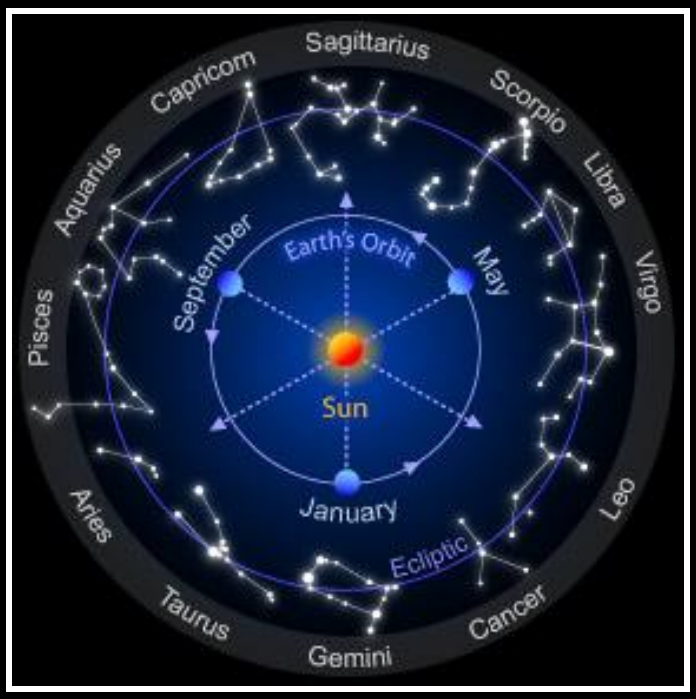
Notes:

- 4th largest constellation
- located near other water-related figures like Aquarius, Pisces, and Eridanus
- passes close enough to ecliptic that the Sun actually passes in front of a section of it occasionally

Script: "A ferocious beast often depicted as being fish or whale-like, this constellation represents the monster that was sent to accept the sacrifice of Andromeda. Mythological traditions other than the Greeks' have seen this constellation as the god of hurricanes and other violent storms."

12 zodiac constellations

SOUTH

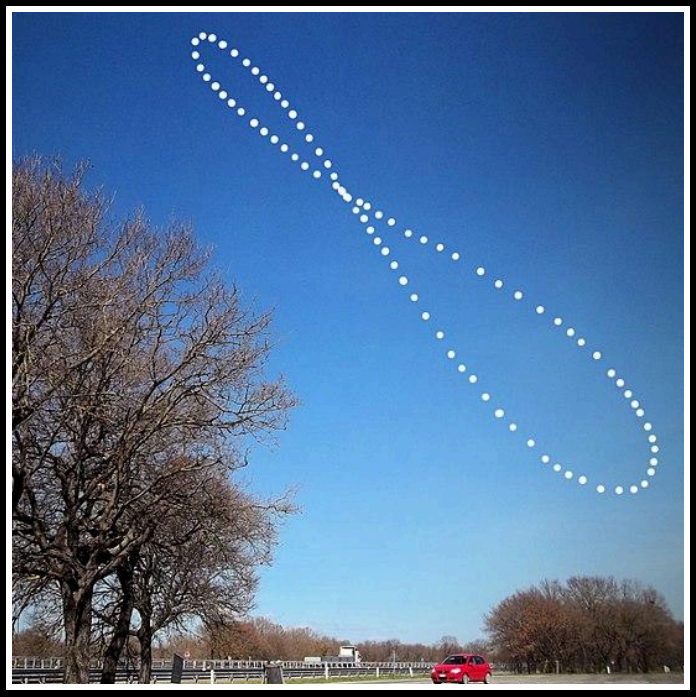


Summary: Introduce the constellations of the Zodiac and relate to astrology.

Script: “Stretching across the southern sky each season are a group of fairly well-known constellations that appear in many cultures and religions: the zodiac! For thousands of years, these 12 constellations have served as both a primitive solar calendar system, as well as a pseudo-religious guide for explaining and predicting human behavior. The origin of these signs can be traced back at least three-thousand years to Babylonian astronomy, where they were used to create the first known celestial coordinate system. There are 12 traditional symbols in total, though only a few are visible each season.”

Daytime Analemma

SOUTH



Summary: Return to daytime to reveal the true relationship between the zodiac & the Sun.

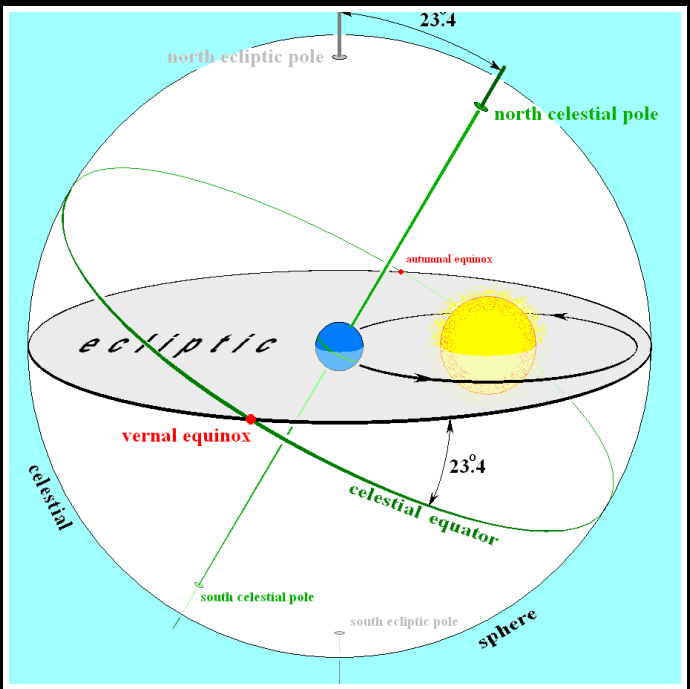
Notes:

- analemma: a diagram showing the relative position of the daytime Sun throughout the year.

Script: “Although astronomers do not believe the zodiac can predict your future, these patterns do have an interesting relationship with our Sun. Throughout the year, the Sun’s position at noon changes, appearing to travel in front of where each zodiac sign would be if we could see them behind the blue daytime sky. Just as the stars appear to rotate each night, the Sun’s apparent motion is due to our perspective shifting as Earth follows its orbital path. In astrology, the Sun is in front of, or ‘in the house of’ your constellation on your birthday.”

Plane of the ecliptic

SOUTH



Summary: Plane of the ecliptic, plane of solar system.

Notes:

- ecliptic: the apparent path on the celestial sphere through which our Sun travels during the year

Script: "This imaginary line that the Sun appears to follow throughout the year is called the plane of the ecliptic. This ring marks the apparent path along which our sun travels through our daytime sky during the year. You can also think of it as designating the 'plane of our solar system.' It is near this line that you will also find the planets in our nighttime sky!"

Zodiac calendars

SOUTH

TRADITIONAL ASTROLOGICAL DATES		
Constellation	Date Span	Days
Aries	21 Mar - 19 Apr	30
Taurus	20 Apr - 20 May	31
Gemini	21 May - 20 Jun	31
Cancer	21 Jun - 22 Jul	32
Leo	23 Jul - 22 Aug	31
Virgo	23 Aug - 22 Sep	31
Libra	23 Sep - 22 Oct	30
Scorpio	23 Oct - 21 Nov	30
Sagittarius	22 Nov - 21 Dec	30
Capricorn	22 Dec - 19 Jan	29
Aquarius	20 Jan - 18 Feb	30
Pisces	19 Feb - 20 Mar	30-31

ACTUAL ASTRONOMICAL DATES TODAY (c. 2000 C.E.)		
Constellation	Date Span	Days
Aries	19 Apr - 13 May	25
Taurus	14 May - 19 Jun	37
Gemini	20 Jun - 20 Jul	31
Cancer	21 Jul - 9 Aug	20
Leo	10 Aug - 15 Sep	37
Virgo	16 Sep - 30 Oct	45
Libra	31 Oct - 22 Nov	23
Scorpius	23 Nov - 29 Nov	7
Ophiuchus	30 Nov - 17 Dec	18
Sagittarius	18 Dec - 18 Jan	32
Capricornus	19 Jan - 15 Feb	28
Aquarius	16 Feb - 3/11	24-25
Pisces	12 Mar - 18 Apr	38

Summary: Show the difference between the astrological zodiac and the true zodiac

Notes:

- Scorpio is only a few days
- Ophiuchus is Nov 29 - Dec 17

Script: "You might notice that the Sun spends a very uneven amount of time in front of each zodiac sign; so uneven, in fact, that it might not actually be in front of your sign on your birthday! You might also notice that there is a 13th constellation the ecliptic passes through. It's name is Ophiuchus. Traditional astrology leaves this constellation out, but if you asked an astronomer, they would say that the sign of someone born between November 29th & December 17th should really be Ophiuchus!"

Ophiuchus

SOUTH



Summary: Mythology of the 13th zodiac.

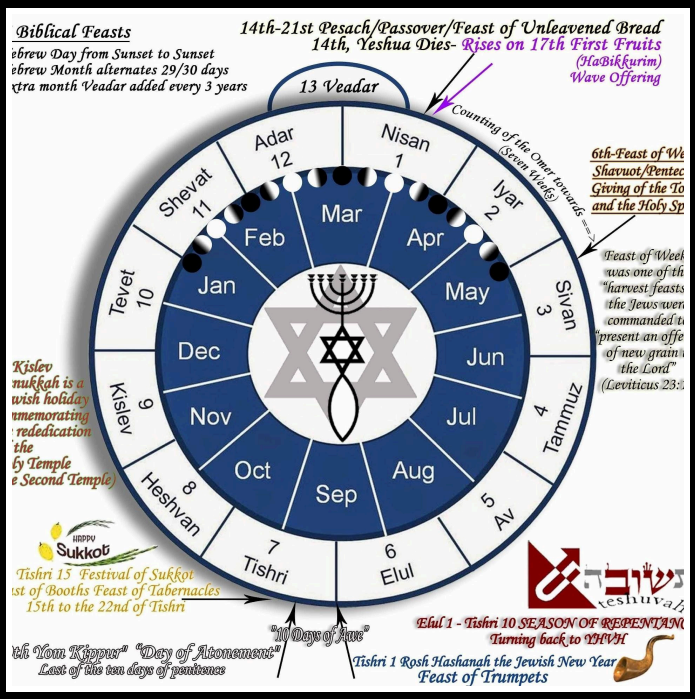
Notes:

- Greek: the serpent-bearer

Script: “To the ancient Greeks, this large constellation represented the god Apollo struggling with a huge snake that guarded the Oracle of Delphi. Other myths identified this character as Laocoön, the Trojan priest of Poseidon, who warned his fellow countrymen about the Trojan Horse and was later slain by a pair of sea serpents sent by the gods to punish him. Later, the Romans associated this figure with Asclepius the healer, who learned the secret to immortality by observing one serpent bringing another healing herbs. His iconic snake-entwined staff remains a modern symbol of healing and medicine to this day.”

Hebrew calendar

SOUTH

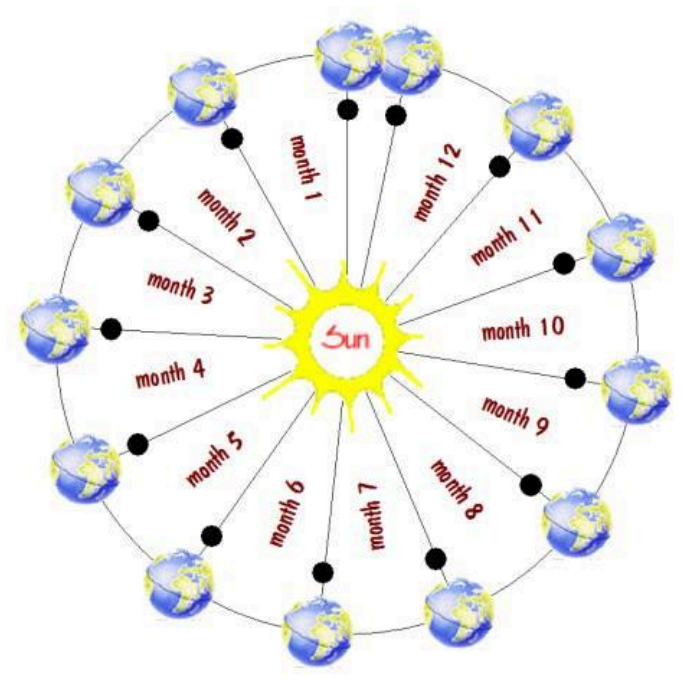


Summary: Lunar calendar used in Judaism

Script: “Unlike the typical Gregorian calendar or the Zodiac calendar, the Hebrew calendar is based on the Moon instead of the Sun. The Hebrew calendar is the official calendar of Israel and is used for religious purposes by Jewish people all over the world. It is used to determine the dates for Jewish holidays. For example, Hanukkah begins on the 25th day of the lunar month Kislev, and Passover begins on the 15th day of Nisan, which is a full moon. It also dictates the timing of important public reading from the Torah and is used for other ceremonial uses such as recording the death of a relative.”

Lunar phases & cycles

SOUTH



Summary: View lunar phases from space.

Script: "Each month begins after a New Moon or *Rosh Hodesh*, when the Moon begins its new cycle and appears again as a thin crescent. The Moon appears to go through phases simply because we are observing its day and night cycle from Earth, which takes around one month to complete unlike the 24 hour day on Earth. Because a lunar cycle is slightly less than 30 days, however, 12 lunar months is about 11 days shorter than a solar year. This means that every two or three years, a leap-month must be inserted to keep the Hebrew calendar in tune with the seasons. The next Jewish Leap Year will be 2027, for example! It's a bit like instead of adding a single leap day on February 29th, we instead add a full second February!"

Moon phase

SOUTH



Summary: CHECK PHASE AND LOCATION BEFORE TOUR.

Notes:

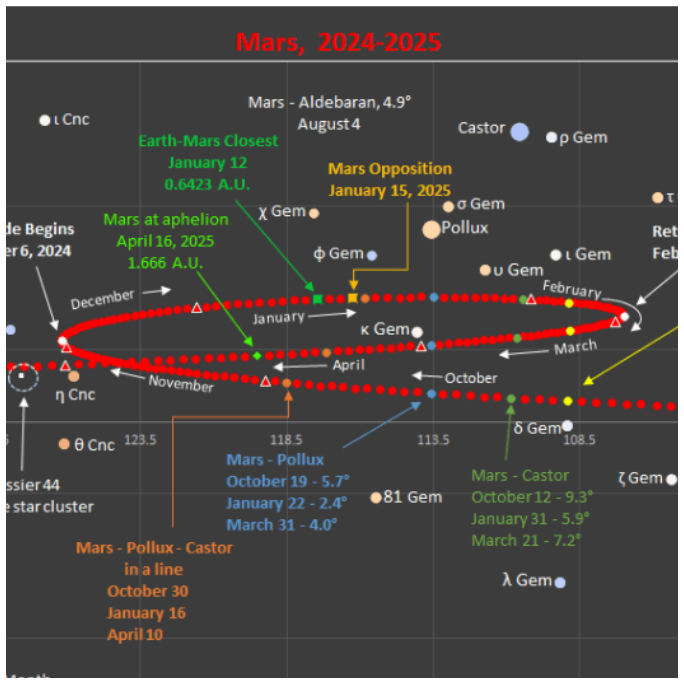
- tidally locked: same side always faces us
- 5th-largest moon in Solar System
- formed soon after Earth, possibly by Mars-sized object impact

Script: "Speaking of the Moon, can we see it tonight? What phase is it in? As it grows brighter, we can see it in the early evening and we say that it is 'waxing.' As it shrinks and becomes dimmer, it is 'waning' and we cannot see it in the early evening sky. A moon that is over half full is 'gibbous' and a moon that is less than half full is a 'crescent.' When the moon is waxing and half-full, it is said to be in its 'first quarter,' and when it is half full but waning, it is in its 'third quarter.'"

EAST

Jupiter - ID

EAST



Summary: King of the planets.

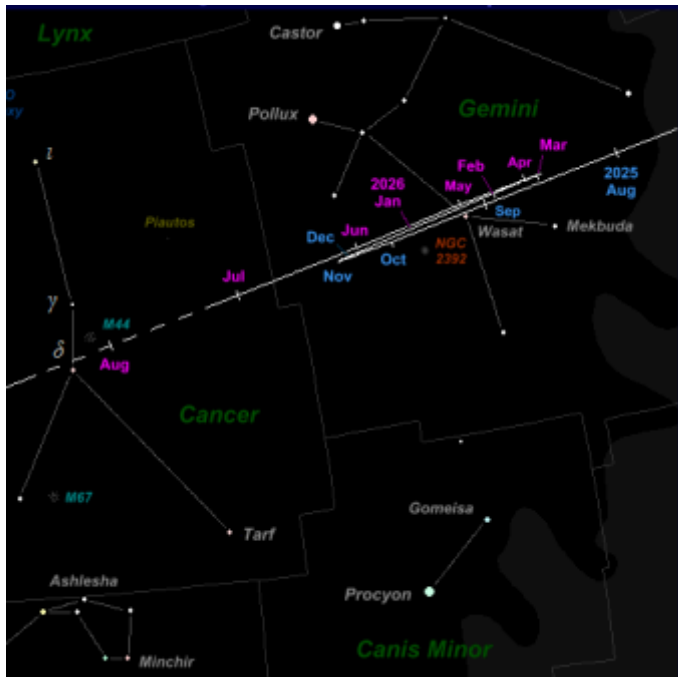
Notes:

- Next opposition (closest approach): 1/10/26

Script: "Rising in the East this holiday season is yet another bright point of light that stands apart from the stars around it. Known in the Navagraha as Brhaspati, it is currently the brightest point of light in tonight's sky. It is the king of the planets: Jupiter! Before we fly to this gas giant planet, though, we must first discuss something special that's happening to Jupiter right now: Jupiter is in *retrograde!*"

Jupiter - retrograde motion

EAST



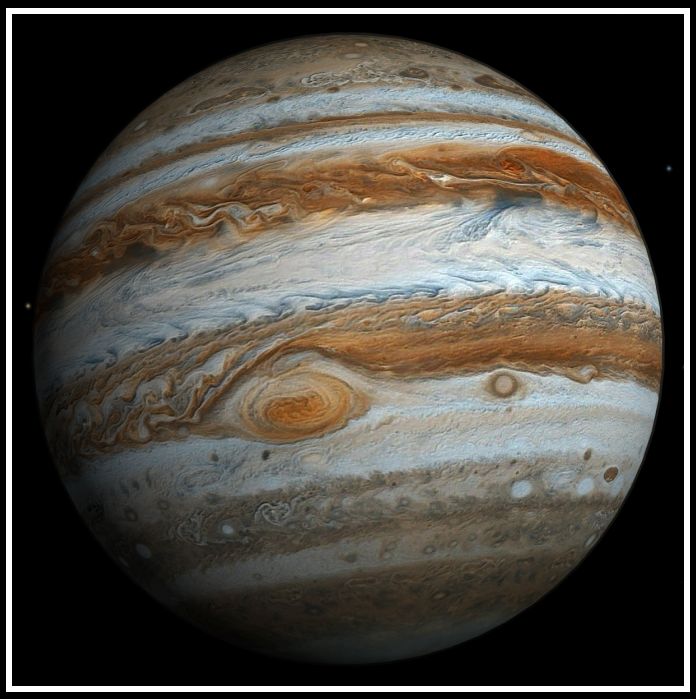
Summary: Planets and retrograde motion.

Notes: Retrograde from 11/11/25 - 3/10/26

Script: "The positions of the planets actually change every night, as they are all orbiting the Sun at different speeds. In fact, the word 'planet' means 'wanderer' in ancient Greek! Sometimes, however, the faster, inner planets overtake the outer planets on their orbital race around the Sun. When this occurs, the outer planet briefly appears to move backwards! When ancient astrologers observed this retrograde motion, it was believed to signal a time for reflection on past actions, especially around the supposed 'energy' of the planet in retrograde."

Jupiter - fly to

EAST

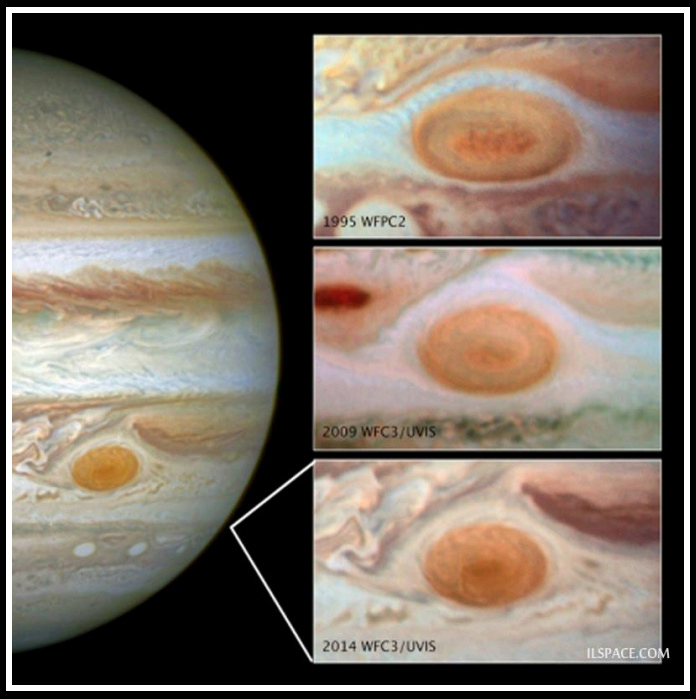


Summary: King of the planets.

Script: “Let’s now take a direct flight to the 5th planet from the Sun, Jupiter! Jupiter is by-far the largest planet in the Solar System, even bigger than all of the other 7 planets combined! Over 1,000 Earths could fit inside its cloudy figure. Jupiter, like our sun, is composed mostly of Hydrogen and Helium. If Jupiter were larger, in fact, it could reach a point of having enough gravity to ignite stellar fusion and become a star itself!”

Jupiter - Great Red Spot

EAST



Summary: Ancient hurricane.

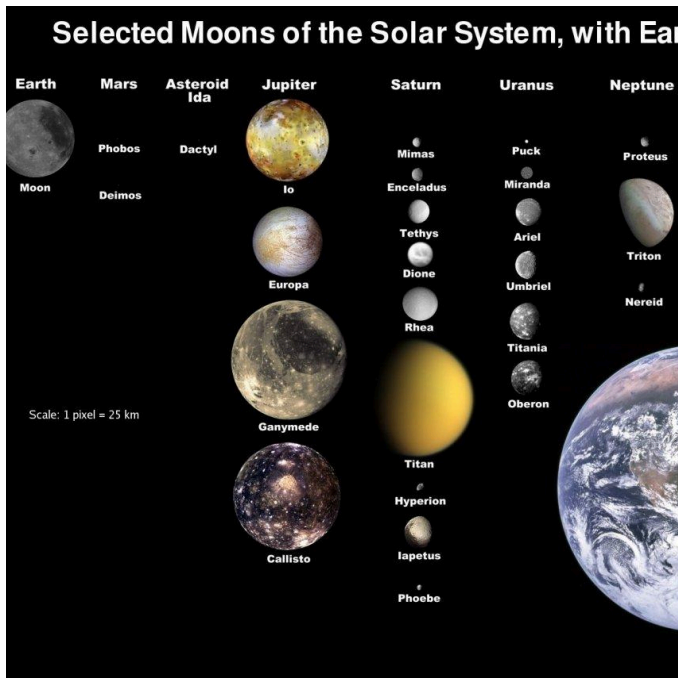
Notes:

- giant hurricane larger than Earth
- first spotted by Galileo, so it’s been around for at least 300 years
- has begun to shrink quickly

Script: “Jupiter’s Great Red Spot is definitely one of its most famous features. This giant hurricane, which is larger than the entire planet Earth, has been raging for at least 300 hundred years, when it was first observed by Galileo. This storm has been multiple times larger than Earth, but in recent decades, it has shrunk in size quickly, leading many scientists to predict its disappearance potentially in the next few decades.”

Jupiter - 95 moons

EAST



Summary: The 95 moons and their orbits.

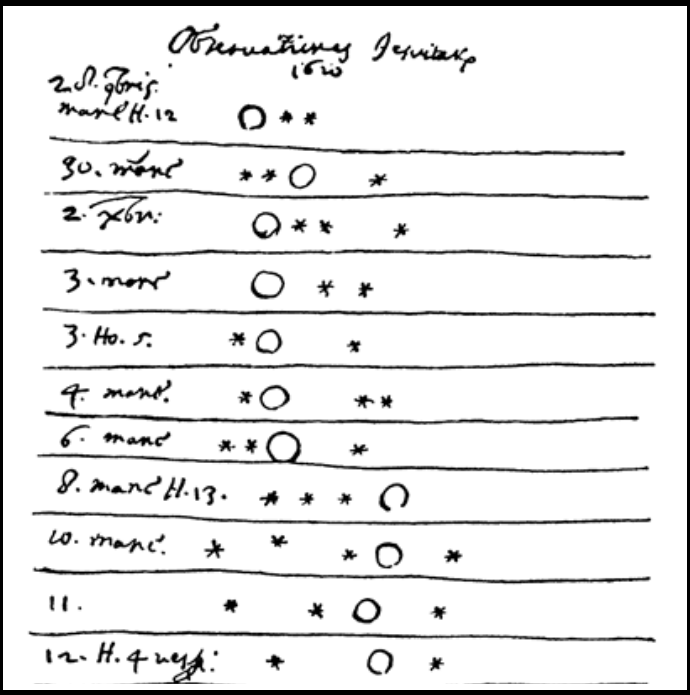
Notes:

- Latest 3 added Feb 2024
- closer moons formed at beginning of Solar System (hence their planar orbits)
- outer: likely captured asteroids/comets

Script: "As of February 2024, Jupiter is known to host a total of 95 confirmed moons! That may sound like a lot, but it's little sister Saturn holds the record for most moons at a whopping 146! -- The moons of Jupiter closest to it orbit on a flat plane. It is theorized that these moons were formed during the early days of the Solar System, their orbits being flattened out by gravity. The outer moons orbit at much more varied angles. These were likely captured asteroids or comets that were pulled in by Jupiter's intense gravity!"

Jupiter - Galilean moons

EAST



Summary: Early evidence of heliocentrism.

Notes:

- Io, Europa, Ganymede, and Callisto

Script: "Jupiter may have 95 confirmed moons, but four are bright enough to be visible even through a modest pair of binoculars! These moons were also observed by Galileo Galilei in 1610, using one of his pioneering early telescopes. Over the course of several weeks, he charted their positions, noticing they would sometimes disappear from view behind or in front of the planet. Soon after he published his observations, the world was shaken at the first widespread evidence of a brand-new approach to astronomical science: heliocentrism, or the view that it was not the Sun that orbited the Earth, but the Earth that orbited the Sun!"

Jupiter - go to Europa

EAST



Summary: Ice moon of Jupiter.

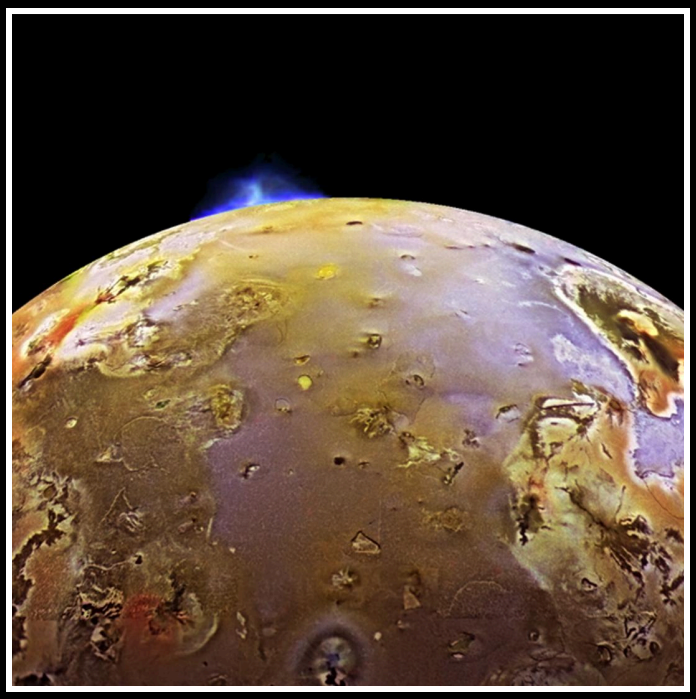
Notes:

- named after another of Zeus's lovers

Script: "Europa is one of the largest moons of Jupiter, and one that has become of great interest recently to astronomers and planetary scientists. It has been confirmed that Europa is covered in mile-thick sheets of water ice, as well as a very thin atmosphere. Many also theorize that below the icy surface there may be vast oceans of liquid water. For this reason, many believe Europa to be one of the best candidates in our Solar System for another body currently supporting some form of life. Earlier this year, NASA launched a probe named the *Europa Clipper*, which will arrive at Jupiter in 2030 to further study the moon's potential for hosting life!"

Jupiter - go to Io

EAST



Summary: Volcanic moon of Jupiter.

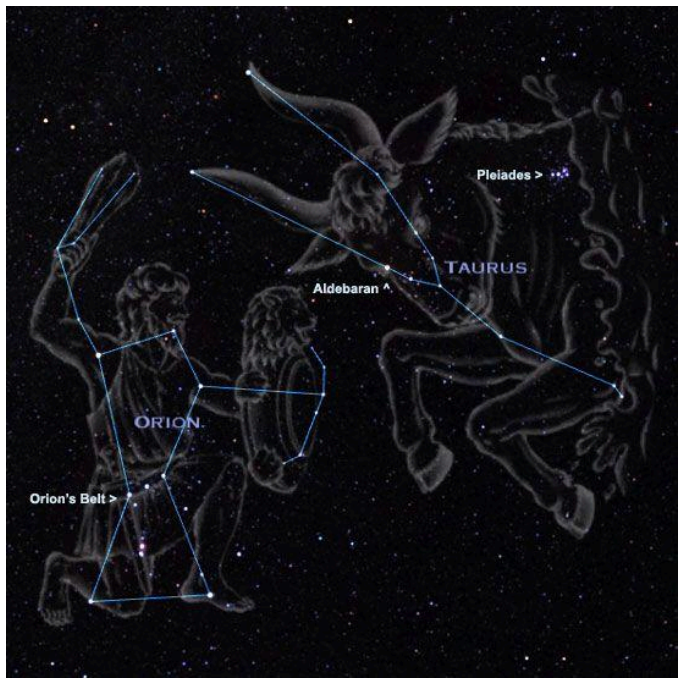
Notes:

- innermost Galilean moon
- 4th largest moon, most dense moon in SS
- named after one of Zeus's lovers

Script: "Io is a volcanic and active world. Its extremely high density, coupled with the fact that it is constantly pulled and compressed by the gravity of Jupiter and the other moons, give it the most extreme geologic activity of any body in the Solar System. Many of its volcanoes expel plumes of sulfur dioxide hundreds of miles above its surface, visible even from Earth-based telescopes. The discovery of Io and the other Galilean moons Europa, Ganymede, and Callisto, helped to confirm the heliocentric model of the Solar System."

Orion

EAST



Summary: The Hunter, or “Kesil” in Hebrew.

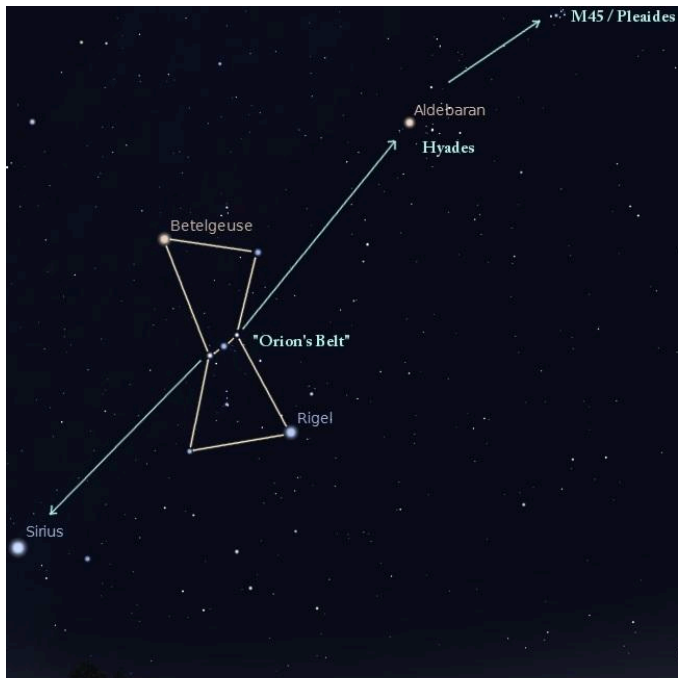
Notes:

- Brightest constellation in the night sky.

Script: “The lunar month Kislev is also connected to a very famous constellation we can see rising in the East this season: Orion the Hunter! Orion is mentioned a number of times in the Hebrew Bible by the name “Kesil,” which can be translated as “hope” or “positivity,” signifying a hope for winter rains in Israel. In Greek mythology, he was a hunter who angered Artemis by boasting about his skills, which resulted in the goddess sending a giant scorpion to teach him a lesson.”

Sirius

EAST



Summary: Brightest star in Earth night sky.

Notes:

- follow belt of Orion to find
- “dog days” of summer = when Sirius is visible in morning sky
- Procyon: “Before the Dog,” 8th brightest star in night sky

Script: “If you imagine a line passing through Orion’s belt down towards the horizon, you will find Sirius, the brightest star in Earth’s night sky. Found in the constellation Canis Major, Orion’s hunting dog, this star shines brightly in the early morning summer sky, which is where the term ‘dog days of summer’ originated.

“During the holiday season, seeing Sirius shining so brightly in the East might bring to mind another legendary bright star: the Star of Bethlehem.”

Jesus birth timeline

EAST



Summary: Errors in chronology from Dennis.

Script: “What was this supposed star that led the Magi to the nativity? If it was an astronomical event, the planetarium may be able to show us, but we must figure out a timeline. The Bible itself doesn’t say anything about the calendar date of the nativity. It was probably not in December, though, since shepherds herd their sheep in the spring. Plus, December 25th was celebrated as the winter solstice in Rome, which is why Christmas is on that date. It was said that the Magi visited King Herod, who died between 1 & 4BC, so it had to be before then. Also, Dennis the Small, the 6th-century monk who conceived of the current timeline, miscalculated the dates of the Roman Emperor at the time, as well as leaving out the year zero, since zero wasn’t considered a number in Medieval Europe.”

Comet/nova theories

EAST



Summary: What could the ‘star’ have been?

Script: “For this reason, most astronomers and Biblical historians today agree that this ‘guiding star’ must have appeared between the years 7 & 2 BC. Perhaps this ‘star’ was actually a transient astronomical event like a comet or nova! A comet could certainly have been bright enough, but comets were often seen as bad omens, and would have remained visible for weeks and have been recorded by numerous historians.

“A nova is an explosion on the surface of a White Dwarf, and bright ones occur every 20 years or so (the most recent was in August 2021). They appear as ‘new’ stars, and disappear within a day or so. This could be a satisfactory explanation, but there is no record of a bright nova occurring around that time in history.”

Planet alignments

EAST



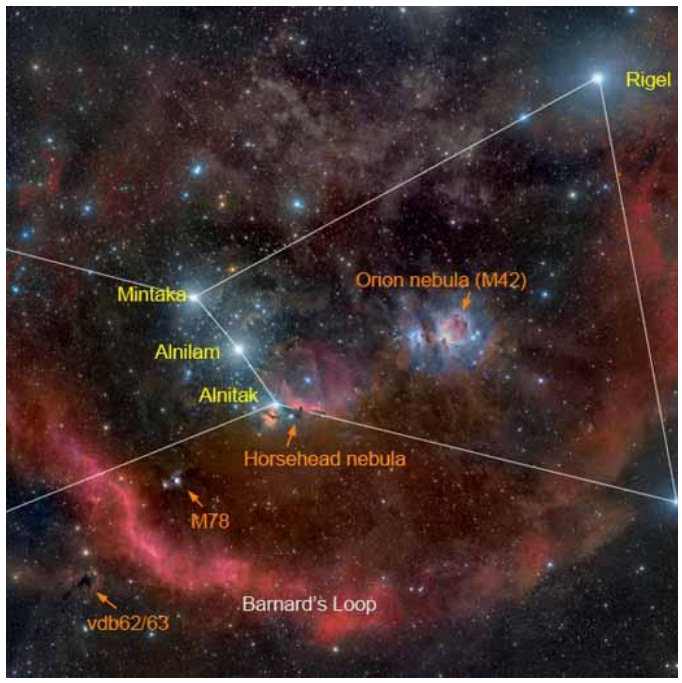
Summary: Potential significant alignments.

Script: “Most astronomers think the Star of Bethlehem may have been an alignment of planets. There are a few theorized events from that era, such as the Jupiter-Venus conjunction of 2BC or the triple-grouping of Jupiter, Saturn, and Mars in 6BC. Perhaps most promising, though, was the Venus-Jupiter alignment of August 3BC seen here, appearing near the star Regulus, whose name means ‘little king.’

“Some Biblical scholars, however, reject the idea that the writers of the gospels would place any astrological significance on a celestial event, since that doesn’t seem to align with their philosophies and worldview. And, of course, there is always a possibility that the Star of Bethlehem was not a natural phenomenon at all, and was instead something supernatural!”

Orion Nebula

EAST



Summary: Bright star formation nebula with Trapezium asterism.

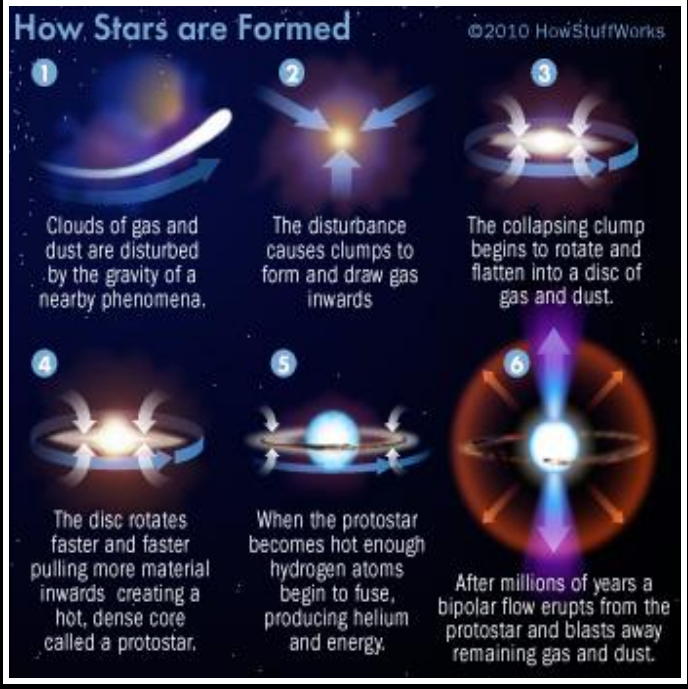
Notes:

- 1400 light years away
- Trapezium: four young stars in center, 300,000 years old, visible in binoculars

Script: "Faith often grapples with questions about where we are going, but occasionally astronomy can provide answers about where we're from. Below Orion's belt and at a distance of 1400 light years away is a cloud of hot and dense gasses and dust leftover from ancient supernova explosions. This structure is known as the Orion Nebula, and it contains a stellar nursery: a birthplace of new stars."

Star formation animation

EAST



Summary: Describe stellar ignition inside a nebula like the Orion.

Script: "Inside nebulae like this, swirling masses of dust and debris are pulled together by the force of gravity. Over millions of years, as these spheres of gas grow, their cores begin to compress and heat. Once they reach a certain point, nuclear fusion begins, and a new star is born. The leftover material surrounding the star may go on to create planets, and perhaps if all goes well, life may even form on them too. All of that matter was created by ancient stars that died billions of years ago, so in a very real and scientific sense, we are all made of stardust!"

End credits

EAST



Summary: Return to Earth, then press button in General section to FF time and initiate end credits.

Script: “Unfortunately, it is now time for us to wrap up today’s tour. If you stay up late, there are many more constellations you can see in our evening sky, and if you come back to the planetarium during a later season, we will be exploring even more of the wonders hiding in the cosmos above us. For now, though, this concludes our tour of this season’s night sky. Thank you all so much for coming to the planetarium today! If you have any questions, stop by back here on your way out. Otherwise, enjoy the rest of your visit to Union Station!”

Review link

EAST



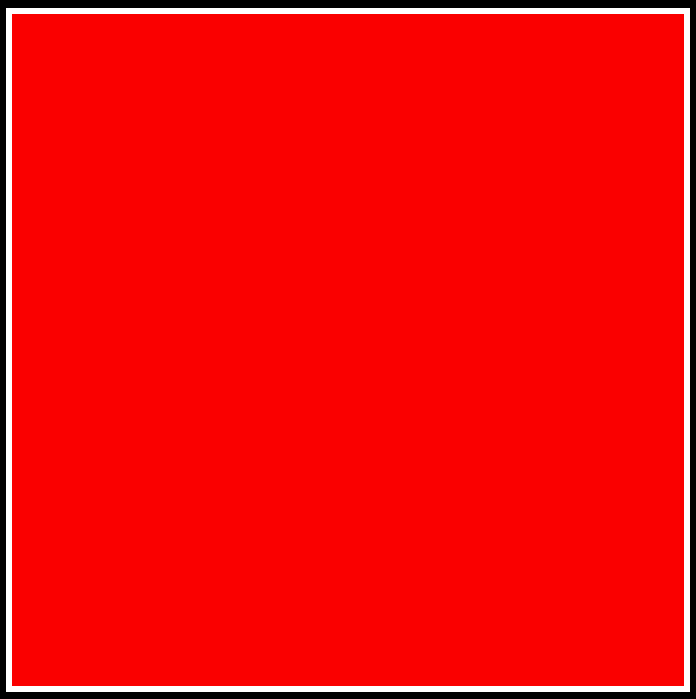
Summary: If you feel confident about your presentation, feel free to invite guests to leave a positive review online!

Script: “If you enjoyed your visit, please let us know! We love hearing your feedback, and you can find us on Yelp, TripAdvisor, and Google, or simply scan this QR code on the screen. Thanks again!”

ASDF

Asdf

ASDF



Summary: Asdf.

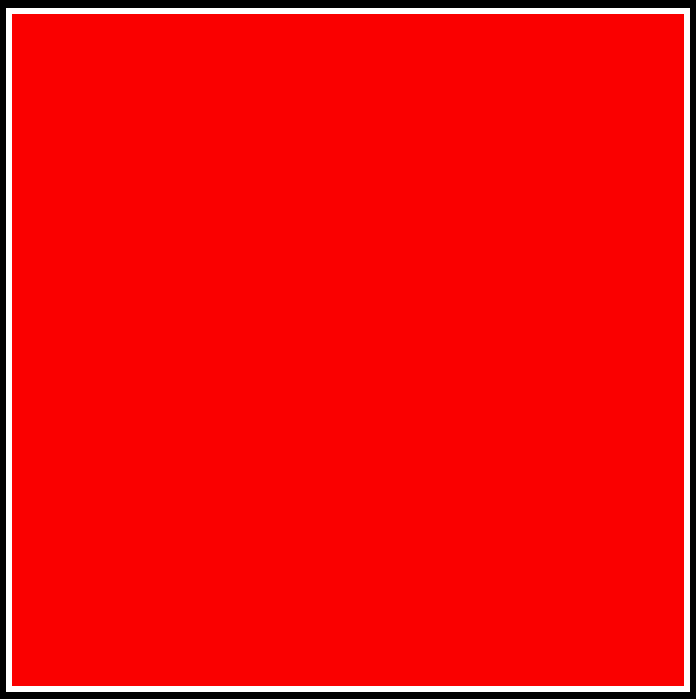
Notes:

- asdf

Script: “Asdf.”

Asdf

ASDF



Summary: Asdf.

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Script: “Asdf.”